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THE ELECTRICIAN

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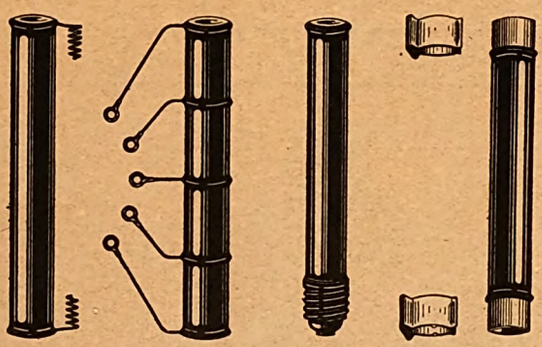

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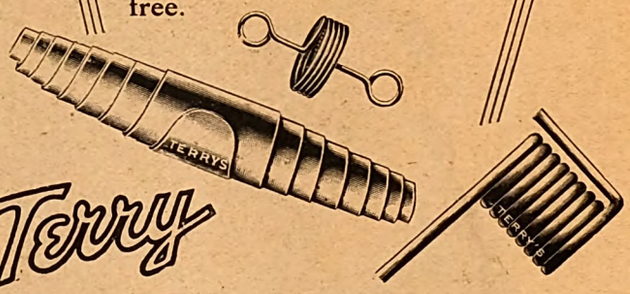

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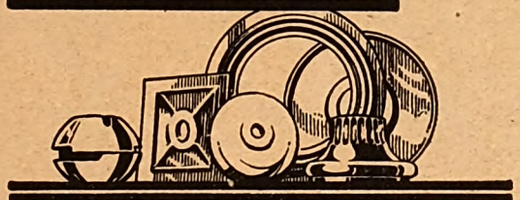

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Current Topics.

The Contractors' Conference.

IT is remarkable that in the comparatively short period that the Electrical Contractors' Association has been holding an annual conference, the conference spirit has become markedly evident. Each year sees a larger attendance—that at Bournemouth last week being a further record—and an increasingly free exchange of experiences which are of undoubted value, apart altogether from anything that may be learnt from the business sessions. Both the social and the business sides of the fourth annual conference were memorable, and the entire proceedings gave an impression of youthful vigour and zest that augurs well for the future of a trade organisation which, though one of the oldest in the electrical industry, has progressed farthest during the years since the war. If the natural beauties of the resort at which the delegates met facilitated enjoyment of the social functions, the quality and interest of the President's Address and of the two papers presented at the business meetings ensured the undivided attention of their crowded audiences. Mr. Walton's address provided eloquent testimony to the value of having a President with sufficient vigour and personality to get things done, and his plan for compiling a national trade register is a statesmanlike project of which more will doubtless be heard in the near future. The plan is one which will call for the expenditure of a very considerable amount of time and trouble, but as Mr. Walton and his associates have given unmistakable proof that they will not be daunted by any preliminary obstacles standing between them and complete realisation of their trading policy, it may be assumed that the register will, before long, be in active preparation.

The Irish Contractors.

MR. BRUTY'S laudable aim of increasing co-operation between the various sections of the electrical industry was somewhat discounted, if only temporarily, by his rather bitter remarks—even though they were couched in general terms—about certain electrical manufacturing firms, but it may be that, like the surgeon's knife, this laying bare of a sore place will lead to a healing of the wound. Undoubtedly the Irish contractors have been having a rough time of late, and it is well that their colleagues in this country should know of the difficulties with which they have to contend, and also of the assistance they have received from their trade organisation in the time of adversity. Somewhat unexpectedly, Mr. Taunton's paper on rural electrification possibilities from the contractors' point of view attracted a long and most informative discussion, and Mr. REYNOLDS'S recapitulation of what has already been done in the supply area of the S.W.S. Co. in a field which so many people have heretofore regarded as being destitute of immediate possibilities. With such a striking practical example as guide, other supply authorities and contractors have something definite to go on, and though, in some areas, such widespread rural electrification may not be immediately practicable, a start of some kind can be made in most districts. It was a pity that the authors were not asked to summarise their papers, as, in each case, the almost verbatim reading of matter which had been printed and circulated to all delegates some days before the conference occupied so much time that a number of prospective speakers could not be called upon. Anyone sufficiently interested in a paper to take part in its discussion would naturally have read the paper before the meeting, so nobody would suffer through such curtailment. On the other hand, those who might have had other views to offer might well have felt hardly done by through the operation of the "guillotine." Mr. WILLOUGHBY-ELLIS, the new President, shows every promise of further enhancing the prestige of the E.C.A. and its allied organisations, and, from what we know of him, contractors can look forward to considerable further progress under his urbane guidance during the coming year.

"Electrical Security."

CONTINUING the educational work recently inaugurated by the National Register of Electrical Installation Contractors, the E.C.A. has just issued a finely-produced booklet, entitled "Electrical Security," which is intended to place before architects and consumers of electricity in general a statement in clear and non-technical terms concerning the principal points to be observed and the pitfalls to be avoided, in order that the maximum benefit may be derived with safety and security from electrical installations. It discusses the need for electrical "safety first," emphasises

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the value of a sound installation, gives examples of the cost of good and bad work, and has a preface by Mr. WALTER TAPPER, President of the Royal Institute of British Architects. Delightfully printed and made up, it contains no direct advertisement of its sponsors except a statement that it is published by the E.C.A., and on the last page, where a paragraph states that "Where the professional or trade standing of any firm of electrical engineers is in question, reference should be made to the list of members of the Electrical Contractors' Association . . . and/or to the National Register of Electrical Installation Contractors." We are particularly glad to see this spontaneous reference to the National Register; both bodies have the same objects in view in this matter of sound installations, and though they must necessarily approach the problem from slightly different angles, their joint aim will best be realised by such mutual assistance as is implied in the mention to which we have referred. The booklet is a production which reflects the very greatest credit on the E.C.A., and we hope and believe that its circulation will be productive of a great deal of good.

The French Radio Industry.

CONSIDERABLE significance attaches to the announcement made in a French contemporary that an extremely close agreement has just been concluded between the Société Française Radio-Electric and the Western Electric Co. Under the terms of this agreement it appears that the former acquires all the radio patents of the latter, but will in future only manufacture American material. At the same time, it is stated, Western Electric, Thomson-Houston, and Matériel Téléphonique undertake not to concern themselves with wireless telegraphy and telephony in France. According to "Haut Parleur," which makes the above announcement, the agreement means, in fact, the destruction of the French wireless industry.

The Electrical Research Association.

IT is a little over twelve months since we drew attention to the financial position of the British Electrical and Allied Industries Research Association, and we publish elsewhere in this issue the contents of a letter which, signed by leading men in the electrical industry, points out that the demands on the Association are such that help on a more liberal scale is urgently needed. The importance of the Association and the nature of the work it performs are already well known, The bulk of the income of the Association is at present derived from manufacturers, and though they in their turn derive benefit from the researches which the Association conducts, such benefit also extends to other branches of the industry, branches which, up to now, do not appear to have contributed their fair share of financial support. Amongst these latter is the electricity supply industry, and representatives of all branches of the electrical trade have therefore decided in conference to appeal to such authorities to find a larger proportion than hitherto of the annual income, on the basis of a subscription of £10 for each £25 000 of annual revenue derived from their sales, when the constitution of the governing council would be so modified as to give equal representation to both supply and manufacturing interests. It is understood that about £1 000 000 a year has been saved to the supply industry during the last eight years as a result of researches undertaken by the Association, and, since the contributions from this branch of the industry amount to but £5 000 per annum, it is hoped that the work of the Association will in future not only be better appreciated but unhampered by lack of funds. The field of research is by no means fully explored, and since supply authorities will benefit from such research in equal proportion to other branches of the electrical industry, it is expected that they will play their part in bringing the Association's plans to a successful issue. Their appreciation of past favours seems to have taken the form of gratitude, but, since future development cannot be conducted on such reward, expectation of further economies must be encouraged by cash. If the funds necessary to carry on can be secured, there is good reason to believe that the Department of Scientfic and Industrial Research will favourably consider a continuation of its support and will contribute pound for pound for subscriptions received by the Association in excess of a minimum to be decided later. Results of signal benefit to all concerned have already been obtained; the promise for future benefits is bright. Those who have benefited are asked, therefore, to take their share in the endeavour to enable the Association to continue and extend its efforts, and, with the assistance from the Department of Scientific and Industrial Research, which we are confident such efforts will secure, to construct a sure foundation for the extension of our industry.

E.D.A. Activities.

THE current selling campaign of the E.D.A. is designed to cover both July and August, and the attractive window display for those months is entitled "Other Summer Uses." The appliances which form the subjects of the window are those suitable for table use, such as toasters, coffee percolators, etc., while electric irons and fans are also included. The electrical contractor desiring to make the most of the campaign should remember that during the summer, owing to the longer period of daylight, outdoor publicity is especially valuable. People spend more time out of doors, particularly during the evening, when the mind, relieved of the occupations of the day, is more receptive to advertising suggestions and appeal. E.D.A. posters therefore should not be overlooked, for, used judiciously through the summer, they will help materially the more intensive development work which will commence in the autumn. In this connection, it is interesting to note that the E.D.A. has introduced a special poster frame and a poster screen, each of which will display twelve posters. Both these fittings may be quite usefully employed in the showroom, the gay colours of the posters giving added attraction to the surroundings. We understand that the E.D.A. has preparations already in hand for work during next winter, one of the principal activities of which will be a campaign to encourage more adequate electric wiring of houses and premises. The association will, in fact, develop the work which the Electrical Association for Women started in their Outlet Campaign. The work already done shows that the public, architects and builders are all interested in this development, and it is clear that such a campaign, designed to appeal to all grades of society, will have far-reaching results. The campaign should also be of great value to the electrical industry, as it will tend to increase the average size of installations and make the public, the builders and architects realise the necessity for spending an adequate sum of money on the provision of the electrical installation.

Electrical Penetration in Belgium.

THE development of the use of electricity in Belgium is making such progress that it will not be long before even the most rural area has its supply. Consumption of power for both industrial and domestic purposes is being encouraged by propaganda, whilst the network and distribution of power and light are spreading all over the country. The construction of a high tension line between Louvain and Liège has completed the junction between the eastern and western parts of the country, whilst the line which links up the new central station of Schelle with those of the Charleroi Basin is in process of construction. This line when completed will ensure the junction between the northern and southern parts of the country. Moreover, four central stations in the Province of Hainaut will be linked up by lines of 70 000 V, whilst the construction of the h.t. line between the central station of the Warche and the station belonging to the Linalux at Liege is in process of realisation. The last centre will also be connected with a central power station at Auvelais by means of a line which will run partly through the Ardennes. As far as privaté companies are concerned, their lines continue to extend even into the smallest hamlets.

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THE E.C.A. CONFERENCE.

Big attendances at Bournemouth Meetings — The Mutual Responsibility of Contractors, Manufacturers and Supply Authorities — Possibilities for Contractors in Rural Electrification.

EACH time we write about the annual conference of the Electrical Contractors' Association and its allied organisations, we feel the need for more superlatives. The one which was held in the delightful town of Bournemouth during the latter part of last week was the fourth of its kind, and even if there might be some room for difference of opinion as to whether it was the most enjoyable, there is no doubt that it was by far the best attended, the total number of members and their friends registered for the conference reaching more than 450.

The visitors were favoured throughout with extraordinarily good weather, and this, together with the delightful natural surroundings and the handsome new Pavilion, in which several of the social functions were held, added materially to the enjoyment of the proceedings.

The social programme opened on the evening of Wednesday, June 26th, when the delegates were received in the ball room of the Pavilion prior to a dance which drew a large attendance.

Real business started on the Thursday with the annual general meeting at the Town Hall. This was followed by an address of welcome by Ald. C. H. Cartwright, Mayor of Bournemouth, and the President, Mr. W. H. Walton, after acknowledging the warm welcome extended, delivered his Presidential Address, which, together with the papers and discussions dealt with at the meetings, is reproduced in part in the pages that follow.

The afternoon session was occupied by the reading and discussion of Mr. A. G. Bruty's paper on "The Mutual Responsibility of Contractors, Manufacturers, and Supply Undertakings (*a*) to the Electrical Industry, and (*b*) to the Public." The discussion on this paper was long and interesting, and the time for adjournment arrived with several prospective speakers unable to have their say.

The evening was passed happily at a smoking concert at the Pavilion Restaurant.

On the Friday morning the Conference reassembled at the Town Hall, when Mr. H. R. Taunton read his paper on "Possibilities for Contractors in Rural Electrification." This elicited a surprisingly well-informed discussion which well repaid the foresight of the author and of the Association in selecting so live and new a topic.

After coffee Mr. Walton moved the vote of thanks to the Corporation of Bournemouth and installed Mr. H. Willoughby-Ellis as the new President. That the selection met with popular approval was evident from the hearty manner in which the new President was received. At the close of the meeting, the official photograph was taken, and in the afternoon the delegates left by special train for Southampton, where the R.M.S. "Aquitania" was inspected. Tea was served at the South Western Hotel, Southampton, and the party returned to Bournemouth in good time for dinner, preparatory to the ball and supper which was given at the Town Hall by invitation of the Mayor of Bournemouth. Dancing proceeded until the early hours of Saturday, and though a large number of the visitors left for home that day, a considerable number stayed over the week end.

The general impression was that the fourth Conference had been a worthy successor to the others, and the eager interest shown in regard to rumours as to the position of the next conference centre seems to augur well for the next gathering a year hence.

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THE PRESIDENTIAL ADDRESS.

High Standard Set by Association Maintained—Co-operation with the National Register—A Hand-Book on Installation Work for Public Consumption—A Trading Register for Discount Regulation.

IN his presidential address delivered at the opening of the conference on Thursday morning, Mr. W. H. Walton recalled that last year at Cheltenham he had suggested that the efforts of the Association should be directed along three main channels: (1) to the development of the Association itself; (2) to the promotion of better trading understandings with all other sections of the electrical industry; and (3) to secure the closest possible co-operation between E.C.A. members and all electricity supply authorities.

The time was opportune to inquire what progress had been made during the past twelve months in these important directions. In considering the development of the Association itself it must be realised that "development" represented a very comprehensive term. The word immediately suggests two alternatives, quantity and quality; he placed "quality" first, leaving "quantity" to settle its own dimensions.

This Association had always concerned itself seriously with the technical and business standing of its members; but in view of the hosts of untrained and inexperienced men who were prepared to carry out any electrical work they could find, and in view of the danger to the public and discredit to the industry thereby brought into being, the Association had been compelled to scrutinise the credentials of new applicants for membership with greater care than ever.

Mr. W. H. Walton, President of the E.C.A.

They were perfectly willing to confer the advantages of E.C.A. membership on sound and dependable men capable of rendering good service to the public, no matter how small their individual businesses might be; but they were not prepared to recognise the untrained and inexperienced worker who represented such a blight on the installation trade of to-day.

In this matter during the past year they had entered into the closest collaboration with the National Register of Electrical Installation Contractors to achieve identically similar ends. As a direct consequence of these conversations the National Register had published what might be termed a "crime sheet" designed to assist the removal of any questionable installation engineer already attached to the Register.

In this matter, it is an individual and collective duty to assist the Register to expose all shoddy workmanship whenever the means to that end came within reach. It was useless to suffer in silence or grumble in private. If Registered Contractors were abusing their certificate by executing potentially dangerous work, it was a duty to report such instances to the Executive Committee of the Register for careful examination and drastic treatment. The job was a thoroughly unpleasant one to have to undertake, but in this, as in all other matters, electrical contractors must put their own house in order.

The next move of the E.C.A. had been to raise the status of all dependable installation engineers, not only within the industry itself, but also in the eyes of allied and associated professional interests. In this direction steps had been taken during the past year to improve the appreciation of sound electrical work among a very important section of the professional community, namely, among all architects and surveyors practising in this country. With this object in view, neither trouble nor expense had been spared to produce a handbook devoted to really worthy installation work, and it was hoped and believed that this publication would go a very long way to enlighten an important section of the community concerning the short-sighted folly and essential danger of cheap and nasty electrical work.

In approaching the professional gentlemen they had had in view, they had been particularly fortunate in obtaining a preface to the booklet from Mr. Walter Tapper, A.R.A., President of the Royal Institute of British Architects. In this preface, Mr. Tapper gave a clear lead in favour of sound electrical installation work at a fair price.

Mr. Walton desired to make it perfectly clear that in this booklet they had made no attempt to boost individual firms or groups or associations of firms. They had attempted no sort of "advertising" as such. They had sought to explain the difference between good work and bad work. They had attempted to state the case in favour of good and convenient installations, and set forth the arguments against shoddy and inconvenient installations, thereby giving the architect an opportunity of appreciating the prime cause of the widely different tenders he might receive for one and the same piece of work.

During the past year they had had some anxious moments in their dealings with organised labour, but, regarded broadly, sane and good relations had been satisfactorily maintained.

In the direction of promoting better trading understanding with all other sections of the industry, very sound progress had been made during the past twelve months.

Coming to a matter which he regarded as of very great importance indeed to their future trading welfare, Mr. Walton referred to the National Trading Register which, it was proposed, might be applied to the whole electrical industry. Substantially more than half of the trading troubles of their own section of the electrical industry arose as a direct consequence of discount misunderstandings, and, in other cases, misapplications.

A reform calculated to strike at the very root of such troubles would be provided by a National Trading Register clearly defining all firms and individuals entitled to any electrical discount whatever. Recognised wholesalers would be registered as entitled to wholesale terms; recognised retailers would be registered as entitled to ordinary trade terms; while larger buyers would equally be registered as entitled to agreed quantity discounts. Trade terms, as such, would be allowed to nobody save those actually in the electrical trade or carrying on allied trades for the production of semi-electrical goods for resale; while all other buyers would be entitled to quantity terms or no special terms at all, depending entirely on the magnitude of their annual electrical requirements.

At first glance, such a comprehensive Register appeared to represent too large a task for practical and effective achievement, but he was confident that such is not the case.

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THE ANNUAL REPORT.

Activities of Association During Past Year—Membership Still Increasing—The E.C.A. and the National Register—The Contractor and the Supply Authority.

THE business of the conference opened with the annual general meeting, held at the Town Hall on Thursday, when Mr. W. H. Walton (President, E.C.A. and Allied Associations) presented his annual report.

He said that while the past year had brought forward no spectacular achievement, the activities of the Association continued to increase, and he was personally very gratified at the progress that had been made in several important directions. The progress in many directions was necessarily slow, but in his opinion it was none the less sure, and he believed it would have very far-reaching results, not only so far as the electrical contracting section of the industry is concerned, but also in the development of other sections.

Membership showed an increase during the year, and the few old-established contractors in the country who, for reasons best known to themselves, had held aloof from the Association were now recognising the value of united effort and were throwing in their lot with the Association.

Before proceeding with a brief survey of the Association's activities during the past year, Mr. Walton said he wanted to make one personal appeal to the membership.

Not only in the industrial world, but throughout the whole life of the community, apathy is responsible for many failures, and he begged all members to regard the Association's business as an integral part of their own lives and businesses, and give it the attention it deserved. After all, the Association belonged as much to any one member as to any other.

Since the last annual general meeting, a certificate had been obtained from Messrs. Price, Waterhouse and Co., with regard to the overhead expenses associated with the businesses carried on by their membership. The figures which had been circulated were extremely interesting, and already definite progress had followed the preparation of this document. He could not too strongly emphasise the necessity for every member to pay adequate attention to the Price, Waterhouse figures, and thus do his best to ensure that every job he carried out bore its proper proportion of overhead expenses. Only on these lines would they promote a really healthy state of affairs in the contracting section of the industry.

"I am, of course" he continued, "conscious of the price-cutting practice of certain firms which appears to go on unchecked; but to the best of my knowledge, no association has been able to prevent people pursuing a policy of losing money on contracts if they really wish to do so. In my opinion, however, it is far better to do a quarter of the work at a reasonable profit, than to do a very great deal without sufficient margin for overhead expenses, let alone profit. A committee of the Association has utilised the information supplied by Messrs. Price, Waterhouse and Co. in its negotiations with various Government Departments, etc., and although

The official photograph of E.C.A. members and their friends, taken during the last day of the Conference. Owing to the large number attending it has been necessary to reproduce the photograph in three sections, the left and right flanks being top and bottom respectively.

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a certain measure of success has already been achieved, I have reason to believe that more satisfactory progress will be made in the near future.

"All members will now be aware of the new regulations which have been introduced by the National Register of Electrical Installation Contractors. I believe that this effort on the part of the Registration Authority to improve the status of all those admitted to the Register is fully appreciated by all members of the E.C.A. I may add that, during the past year, close co-operation has existed between the National Register and the E.C.A. which, to a very large extent, has been responsible for the new regulations now put into force.

"You will also remember that at the commencement of the year, the Association supported the National Chamber of Trade in its resolution for *compulsory* Registration. Although the National Chamber did not see its way at the time to pursue the request for compulsory registration, it has signified its intention of exploring all possible means to secure a National Code of Wiring Rules.

The President went on to recall that at this time last year a proposal was brought forward to issue a pamphlet for distribution by electrical contractors to the public, emphasising the need for better installations. The proposal was, however, left in abeyance in view of a decision to publish a book upon the same subject particularly directed to architects and others who are frequently responsible for giving out electrical work. The book contained a preface by Mr. Walter Tapper, the President of the Royal Institute of British Architects, and was designed to emphasise the need for greater care to be exercised in considering tenders for electrical installation work.

The Council had regarded it as a duty to issue such a publication, and he was strongly of the opinion that the effort would go a long way to advance the interests of those in the industry who were anxious to carry out work of a good and sound nature, as against those whose only aspiration seemed to be to carry out work of any description at the lowest possible price.

The Law and Parliamentary Committee, under the guidance of Mr. W. Cross, had been particularly active. A very considerable amount of time and effort had been spent with a view to promoting the true spirit of Clause 48 of the Electricity (Supply) Act of 1926. The wording of this clause was well known to all, but the spirit behind the Clause breathed the word "co-operation." A large number of negotiations between the contractors and supply engineers had taken place in all parts of the country during the year, and, on the whole, the arrangements thus arrived at had been extremely satisfactory.

It must be remembered, once again, that the chief function of the supply authority was to sell the energy it generated, and he was quite convinced that if supply engineers were satisfied that contractors were rendering the service required to develop the consumption of energy, they would be prepared to recognise the contractors' efforts in a fair and reasonable way. It must not be lost sight of that if contractors failed to pull their weight and were not absolutely up-to-date in their selling of current-consuming devices, they could not possibly deny the supply authorities' right to take a hand in the work. Contractors must always remember that, as electrical contractors, they had a definite obligation to other sections of the industry, in addition to their direct duty to the public. One of their definite obligations was to equip their public displays so effectively that they were a potent factor in the locality. So much having been achieved, there would be no need for the supply authority to enter into competition.

The twenty-fifth anniversary of the Association's Charter of Incorporation was certainly a significant one so far as the Apprenticeship Committee was concerned. This year could be regarded as an extremely important one from the point of view of apprenticeship in that, during the year, the Committee had been successful in organising an Advisory Committee representing all interests from the electrical and educational points of view. The future of the industry was wholly dependent on the boys we were training to-day, and it was this single thought which had prompted the E.C.A. to devote so much attention to apprenticeship matters.

The Council had, during the past year, drawn up "Standard Conditions for Cost Plus Percentage Contracts" and "Conditions of Tender and Contract for Electrical Installation Work." The documents were now in the hands of all members, and he wanted to drive home the strong recommendation already made by the Council, that these forms and conditions should be utilised in place of the many varying documents hitherto used in the trade.

The Council, during the past year, had passed certain resolutions referring to electrical installation work for submission to the Electricity Commissioners and to the Institution of Electrical Engineers, and these could be classified under the following headings :—

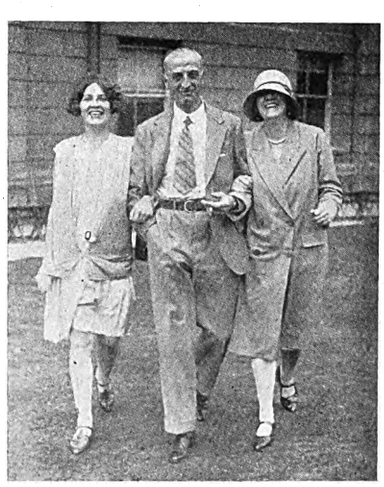
(*a*) *Earthing.*—The question of "Earthing" *versus* "Insulation" has been discussed at very considerable length not only by the Council, but by Branches; and, in addition, by many outside bodies, not forgetting the informal discussion under the auspices of the I.E.E.

(*b*) *The introduction of more than one phase of a supply system into one room.*—The Association has voiced its views very definitely upon this subject, and, mainly as a result of the protest which had been made, the Institution has recently set up a special Committee to consider the whole subject. This Committee is under the independent Chairmanship of Dr. Eccles, and the Association has been invited to appoint a representative to serve thereon.

(*c*) *Standardisation of Pressure.*—The extensions which are taking place in various areas without any apparent attempt to standardise the pressure of 230 V, as adopted by the Central Electricity Board, has been considered by the Council, and a resolution has been sent to the Electricity Commissioners and to the Institution of Electrical Engineers, stressing the necessity to do all in their power to ensure the early standardisation of pressure in all areas.

The activities of the N.E.C.T.A., Ltd., had, by the very nature of its constitution, been principally devoted to trading matters, not forgetting, of course, that the finances of all three Associations were in the hands of the company. No one

Mr. H. Simon enjoying a tête-à-tête in the sunshine during one of the quiet periods.



Though business was the main object of the Conference the holiday spirit sometimes prevailed.

Mr. and Mrs. Barnett admiring the flowers in the Royal Bath Hotel gardens.

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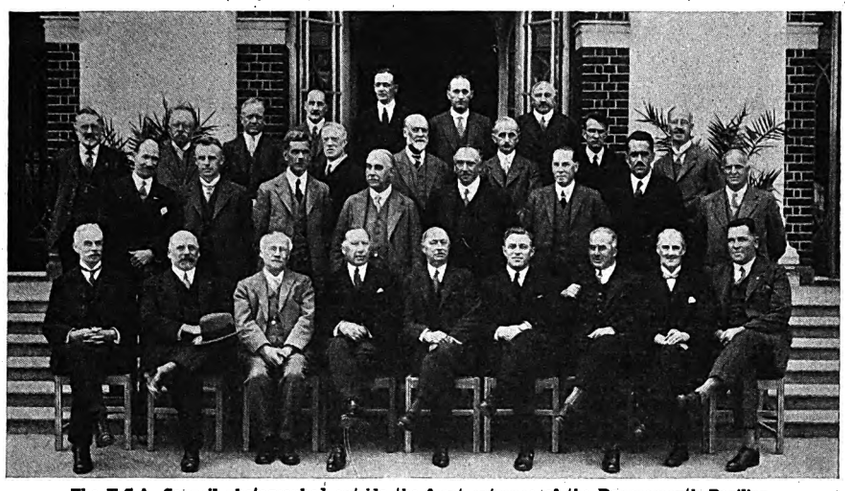
who was kept regularly posted with the minutes of the meetings of the Trading Committee would have any doubt as to the intensive efforts put forward this year. Indeed, he ventured to suggest that these efforts had been equal to, if not greater than, in any previous year of the Association's history.

The Committee's efforts to secure a National Trade Register for the whole of the electrical industry would not be new to a large number of members who had been cognisant of the activities of the Committee, but the subject was of such real importance that he was anxious to explain what is in the minds of the Trading Committee.



The E.C.A. Council photographed outside the front entrance of the Bournemouth Pavilion.

The electrical industry possessed so many sections, and in each section—particularly on the manufacturing side—there were so many kinds of material requiring different treatment, that any system of ordered trading seemed impossible by simply agreeing and adhering to particular formulas. Although the Association adhered to its policy that trade discounts shall be reserved exclusively for those in the trade, one must not overlook the very large buyers of electrical apparatus for their own use, who obviously must receive considerably better terms than the ordinary private buyer. As an example it was unthinkable that a user requiring the supply of 1 000 similar articles could not buy them at better prices than the thousand individuals who required only one each.

This argument alone justified, in his opinion, an agreed schedule of quantity discounts, available not only to the trade but to all classes of buyers. Unfortunately, however, a system of quantity discounts did not seem to meet the bill. At the present moment there were a very large number of industrial buyers who demanded, and received, the full trade discount upon their requirements, and although the efforts of the Association had gone a very long way to get rid of this practice, the fact remained that if one particular manufacturer or wholesaler withheld the trade discount, ways and means were usually found to obtain it from another source of supply.

In the opinion of the Council, this chaotic state of affairs could be satisfactorily corrected only by the introduction of such a Trade Register as that to which he had already referred. The intention behind the suggestion was that every buyer of electrical apparatus throughout the whole country should be graded. The Register thereby created would indicate at a glance :—

(*a*) Those to whom wholesale terms should be allowed ;
(*b*) Those contractors and/or retailers to whom the trade discount should be allowed ; and
(*c*) Those buyers who, for some special reason, are entitled to some discount to be mutually agreed between all sections of the industry.

The compilation of such a Register was, of course, a colossal task, but he was convinced that the utility of it would more than justify the trouble and expenditure which would be necessary to carry the project through. Those who said the task was too vast might be referred to the E.L.M.A. Register. The Register he had in view was much more comprehensive than that, but he was certain the task could be accomplished, and equally certain that the time and trouble involved would be amply justified by results.

In his personal opinion, the introduction of such a Register was the only solution of the chaotic conditions at present existing in the trade, and he was very pleased to report that an informal committee representing the majority of interests in the electrical industry had accepted the suggestion for recommendation to all concerned.

To say that in their negotiations with E.L.M.A. during the past year they had achieved all that they wished would be a very incorrect statement of the views of a large number of the members. He did not think it could be denied, however, that the progress made was not only very significant, but of extreme importance, and that it would have very far-reaching results in the future.

Mr. Walton said he referred particularly to the introduction of a new Register, the names upon which would be reserved as the exclusive province of E.L.M.A. retail agreement holders. The List already comprised a nucleus, and arrangements had been made by which additional names could be added to the List. Once such names were added they remained the legitimate province of the retailer, and were immune from attack either from manufacturer or wholesaler. In his opinion, a very important principle had been established by securing such an innovation.

The President contended that these same negotiations with the E.L.M.A. had placed a valuable asset in the hands of the contractor ; but, with this asset, there was also a very definite obligation. Obviously, the E.L.M.A., in making the concession, had done so in the hope that these buyers of E.L.M.A. lamps would continue to consume them, and that contractors would so nurse their clients that there was no possible chance of the business falling off to other than E.L.M.A. manufacturers.

The Association's relations and negotiations with other sections of the industry continued to be most cordial, and frequent meetings and discussions had taken place during the past year. The continued phenomenal growth of the industry demanded that contractors should adopt the most up-to-date and live methods of disposing of current-consuming devices.

He was generally of the opinion that if contractors were in a position to display fittings and current-consuming apparatus really adequately and thereby ensure the sale of the manufacturers' products in the quantities they desired, manufacturers would much prefer the business to go through the trade.

As never before, the present was a day when advertising was of the utmost importance, and it was interesting to note that many old-established and conservative firms, who had done little advertising in the past, were now doing so with considerable vigour.

The National Federated Electrical Association, being a Trades Union, dealt almost entirely with the labour side of the electrical contracting industry, and there appeared to be very little of spectacular importance which justified discussion. Wages had continued to operate in accordance with the National Sliding Scale Agreement of September, 1921, and although an application was put forward by the Electrical Trades Union for a national increase, this was not granted. However, a 5% rise was given in the London area.

There appeared to have been a tendency in one or two districts to break away from the National Agreement under which wages and other conditions were controlled ; but, from the point of view of the Association, every effort would be put forward to maintain the present national arrangement.

In concluding his report Mr. Walton made particular reference to the activities of the Chairman of the Main Committees of the Council for their loyal service. Mr. Shaw had once again ably directed the Development Committee in its deliberations, and the Trading Committee had had for another year the admirable guidance of Mr. H. Marryat. The work of Mr. Cross, the Chairman of the Law and Parliamentary Committee, had been referred to, and he wanted to add his appreciation of the services of Mr. Robson as Chairman of the Apprenticeship Committee, a position he had decided to relinquish, after practically a quarter of a century of service in various capacities on behalf of the Association.

The Labour Committee's activities, although conducted to a great extent without publicity, were none the less intricate and involved, and the Association owed a tremendous debt of gratitude to Mr. Walter Riggs, who had acted as Chairman for the past few years, and who had now retired from office.

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MUTUAL RESPONSIBILITY OF CONTRACTORS, MANUFACTURERS & SUPPLY UNDERTAKINGS.

Mutuality of Responsibility—Importance of Tariffs—The Irish Contractor—The Domestic Hot Water Problem.

By A. G. BRUTY, M.I.E.E.

MR. A. G. BRUTY in his paper on Thursday afternoon said that the mutual responsibility of supply authorities, manufacturers and contractors to the electrical industry lay, broadly speaking, in the direction of augmented goodwill, mutual recognition, and increased co-operation. To the public it lay in the direction of conscientious work and efficient service. We were, as an industry, far from fully recognising our responsibilities to each other, and in this way failing in our duty to the industry as a whole.

Mr. A. G. Bruty.

On every installation, no matter how simple or complex, there was mutuality of responsibility. The contractor called in to carry out the work decided upon suitable material for which he placed an order with a manufacturer. The manufacturer supplying such material under guarantee must rely upon the contractor to safeguard his reputation by seeing that it is properly installed and connected and the user carefully instructed in its use. The supply authority was relied upon for a supply of energy at reasonably constant pressure and periodicity without irksome conditions, and at simple reasonable rates.

In so far as the three parties co-operated to give the fullest service, to that extent had they discharged their mutual responsibility to the consumer, and to the same extent their duty to the industry.

This aspect of our daily work was too frequently overlooked. Even those put in authority over us were not free from blame in this respect. For example, a short time ago the Electricity Commissioners set up a Committee to consider the supply conditions and varying prices charged for electricity by supply authorities up and down Great Britain. The terms of reference were excellent, but what of the personnel?

The question of tariffs was of vital importance to manufacturers and contractors and their interest in this matter ought to be appropriately recognised.

Every contractor well knew there were hardly two supply authorities with similar tariffs and conditions of supply. It was part of the contractor's daily work to keep himself acquainted with supply conditions in all the areas in which he operates. He undertook the consumer's difficulties as well as his own, and if there was one class of person in this world who could speak with authority about the consumer's requirements, it was the contractor. He could give valuable guidance to any committee dealing with tariff and supply conditions. It was no less true of the manufacturer.

Unless rates were attractive and conditions of supply free from irksome restrictions there was a drag on the wheel of electrical progress and its reactions were felt throughout the industry.

While recognising that various and varying prices had been unavoidable in the past owing to location and size of station, load conditions, etc., etc., there did not appear to be quite the same reason for some of the supply authorities' regulations. For example, the prohibition of squirrel cage motors except of the very smallest sizes, coupled with stringent restriction of starting current, was a condition that in these days ought to be revised. In order to comply with the requirements unnecessary complications and expense were involved, resulting either in the abandonment of the electrical proposals or the adoption of a scheme where the full advantage of electrical driving could not be secured. Conditions which made the cost of the starting gear on the simplest and smallest electrical power installation more expensive than the motor ought to be the subject of inquiry, not by station engineers alone, but by all interested in the matter.

Another matter, in which manufacturers and contractors had a very definite interest, was the practice of supply authorities in many quarters making a charge for bringing in the most simple of services. One was told that it did not pay to put in a service for, say, a few lights. Judged by immediate results, this could be challenged, but one did not expect the consumer to stand still in the matter of electrical progress. Experience showed that in due time the lighting load would be increased, and an iron, kettle, radiator and all the rest would follow.

Most important of all was the question of the cost of electrical energy. Rates attractive enough to encourage heating and cooking except as emergency or short-hour expedients had, generally speaking, not been available until recent times, and even now were by no means general.

This would, we were led to believe, be changed in the future, when, with the national supplies now being organised, we looked forward to the day when rates would be such that the "all-electric" house would be within the bounds of practical politics.

A market for these abundant supplies had to be found. It would be found in one way only, and that by the co-ordinated effort of all in the industry. Not by grasping greed by one section to the detriment of the others, but by each section specialising in its own branch, avoiding overlapping and duplication of effort.

These thoughts were prompted by the development of the State-owned electricity undertaking in the Irish Free State. The generation, transmission and distribution of electricity for the whole of the country was in the hands of the Electricity Supply Board, and this Board had been given powers to wire, hire, sell, etc. During the passage of the Bill the Irish contractors, heartened by the measure of success obtained by their confrères in Great Britain, endeavoured to secure amendments that would leave the position in the Irish Free State no worse than in Great Britain. They failed. The idea of agreeing to the recognised retail price of an article was abhorrent to the authorities. The public, who were prepared to pay the proper price for other articles, were to be State-assisted in their electrical requirements.

Full use was being made by the Electricity Supply Board of the powers taken in the Bill. Wiring work was being carried out and showrooms had been opened for retail sales. Prices the author had seen for wiring work were such that no responsible contractor who wanted to remain in business could possibly quote. Assuming that quite cheap material was used, Trade Union labour was being employed, and proper provision made for establishment charges, there must be a loss on every light wired. How could a private trader compete in price under such circumstances?

A Difficult Position.

The Irish contractor had to comply with certain special requirements issued by the Board, and he lived in an electrical scheme of things where his work had to pass the inspection of his competitor, where he had to reveal his client's identity before commencing a job, and where, as far as one could judge, a squeezing-out process was in progress.

The contractors would not allow themselves to be squeezed out, and, in the interests of the national supply as well as the industry, it was to be hoped that the Board would before long reveal a disposition towards goodwill, recognition of the position of, and co-operation with, the contractors.

Turning to the manufacturer's interpretation of his responsibility the author first gave an example from the Irish Free State.

In the welter of cut-throat competition came the English manufacturer—not as one would imagine to help his friends, but to aid and abet the opposition, with an utter lack o responsibility. News was brought to the author's branch that one of a group of manufacturers, with whom the E.C.A. trading committee had very cordial relations, was supplying material to a competitor at a price at which no one in England or Scotland, not to say Ireland, could purchase it from the same sources.

Vigorous protests were made, and investigations proved that the news was true, but that the quality was lower than

(*Continued on page 10.*)

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the standard purchased by E.C.A. members, and was supplied without guarantee.

In the circumstances now obtaining it was easy to see that any departure from stability in quality and price to one of a set of competitors was an attack (unconscious, no doubt) upon the others.

An Unfortunate Case.

Another group of manufacturers had within the last few weeks floundered into difficulties, and left the contractors in an unenviable position, simply because they failed to realise that the E.C.A. existed for any purpose other than their own selfish ends. Without consultation with people competent to advise them, these manufacturers entered into negotiations, made concessions and agreements, ignoring the consequences. This action of the manufacturers only became known when its reaction were felt in another direction altogether. When difficulties arose the whole dismal story was revealed. Not only did it reveal a complete and absolute lack of a sense of responsibility to the industry, as it had existed hitherto, but showed the manufacturers to be blind to their own interests.

In contrast to the examples quoted, it was gratifying to acknowledge that in Great Britain things seemed to be managed somewhat better. It was satisfactory to observe that there was in certain quarters a strong desire on the part of manufacturers to co-operate with the organised contractors to secure fair trading conditions.

The object of this industry in trading matters should be to ensure that the distribution of electrical goods should take the shortest route from the manufacturer through bona fide trade channels to the consumer. How was this to be done, and, in the doing, secure to those engaged in the industry a fair reward? Mr. Bruty thought the answer was to be found in the definition he had given to "mutual responsibility" in his paper. That the increasing volume of business secured by manufacturers last year was for the smaller class of apparatus rather than for contracts of considerable magnitude was indicated by the Chairman of Associated Electrical Industries, Ltd., at the annual meeting. This would indicate that expansion in domestic electrification was taking place. Here it was that the contractor's activities very largely lay.

And what of the contractor? Where does he come in the electrical scheme of things? He occupied a key position. He was the co-ordinator of the efforts of the other units of the industry into the ultimate services rendered to the public. He, generally speaking, did not manufacture, he certainly did not provide the electrical energy, but into his hands fell the arrangement of the installation, and by his service to the public in this particular he occupied an extremely responsible position.

And what of the public? In all parts of these islands there were definite indications that great expansion in the uses of electricity was upon us, if indeed, it had not already arrived. On every side there were evidences that the public were daily increasing their electrical demands. As the public acquired more and more the electrical sense, the demand would continue to increase until finally we should find that the "all-electric" house would be the rule and not the exception.

We were still looking for a complete solution of the domestic hot-water problem. Electrical engineers had given this matter considerable attention for some years past, and, although considerable advance had been made, it is unusual to find electricity used for domestic hot water, except perhaps during the summer or for topping up during the night in the winter.

It was evident that this anticipated expansion would bring with it added responsibilities. The general adoption of 230 V a.c. in Great Britain and 220 V a.c. in Ireland made it necessary that definite minimum requirements for the prevention of injury from shock and risk of fire should be strictly enforced.

Manufacturers must see that domestic appliances, no matter what kind, were so designed and constructed as to provide the contractor with adequate means for ensuring protection to the user. The contractor must see that these means were efficiently utilised, and the supply authorities should be effectively empowered to refuse to connect a supply to any premises where unsafe apparatus had been installed.

Mr. Rawlings, in a paper read at the E.C.A. Conference last year, dealt with the necessity of earthing the metallic covering of electrical apparatus for the protection of the public from shock. An examination of most of the domestic appliances at present on the market revealed the fact that a very small proportion of these had been designed with any efficient means for protecting the public.

If contractors were serious about this question, they had it very largely in their own hands to rectify it by refusing to permit in any installation for which they were responsible any apparatus not made, so far as was humanly possible, danger proof.

This association of responsible contractors realising the dangers of unsound workmanship and apparatus, and appreciating the responsibilities devolving upon them, had for many years pressed for compulsory regulations for electrical installations, but without success. Who could doubt that this reform is long overdue? What hope was there of securing it? In the author's opinion, very little, unless contractors had the wholehearted support of the other sections of the industry. Some would say this was hopeless. He hardly thought so. After all, what were the objections to such compulsory regulations? Was it that the manufacturers had failed to provide apparatus that would satisfy the requirements of the Institution of Electrical Engineers' regulations, and that consequently compulsion would be absurd? This objection could quite easily be met by fixing a day after which all installations would have to comply. Was it the fear of the supply authorities that a higher proportion of sound installations would increase the cost and slow down expansion? Whatever the objections they should be made known, and efforts made to meet them. Was it not possible for this Association to enlist the assistance of organised manufacturers and supply authorities, and with united strength press in the proper quarter for appropriate action? The whole industry should be identified with this reform.

Another matter of combined interest to the industry and its relations with the public was that of the training of labour. Training of the skilled men of the future was a subject that should rouse a very lively interest, as into the hands of the workmen must be left the final touches that would make or mar carefully designed installations.

The author would like to see some attempt made to increase the usefulness of the present apprenticeship schemes by the interchange of apprentices between manufacturers, supply authorities, and contractors. This interchange would be of very considerable value not only to trainees but to the industry as a whole.

There was one direction in which combined effort had rendered excellent service to the industry and to the public. He referred to the National Register of Electrical Installation Contractors. On this authority, which conferred a status upon responsible contractors, were representatives of every branch of electrical enterprise. It seemed to him that the success which had attended this co-operative effort should encourage us to further efforts along similar lines, seeking for means to correlate the interests, and generally to ensure smooth running of the wheels.

In conclusion, Mr. Bruty ventured to suggest to the conference that if they were in deadly earnest—as he most certainly believed they were—in the matters of service to and safety of the public, they should invite the other sections of the electrical industry to co-operate with them in the pursuit of compulsory wiring rules, compulsory registration of contractors, danger-proof electrical appliances, etc., where intersection goodwill or united pressure on outside bodies was necessary to secure the end they had in view.

THE DISCUSSION.

Mr. W. R. RAWLINGS said he was convinced that the electrical industry's greatest need to-day was a closer co-operation and understanding between its component sections, and this theme was the real keynote of Mr. Bruty's valuable and thoughtful paper. The quarrels of the early days of the industry were fortunately only a memory. In the early years of this century the presence of a lawyer had been indispensable in negotiations between the opposing companies, nowadays the lawyer was rarely needed on such occasions. He had great hopes that Mr. Bruty's paper would still further cement these friendly relationships.

Some fifteen years ago he had put forward the then revolutionary suggestion that all the electrical organisations should combine as one. The time for the achievement of this desirable reform seemed now within measurable distance. All sections of the electrical community were represented on such organisations as the B.E.A.M.A., the E.L.M.A., the B.E.S.A., and the I.E.E. It surely required but little effort to translate Mr. Bruty's proposals into action.

The author's reference to apathy recalled a personal ex-

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perience of the early days which might serve to show that the apathy was not always on the contractors' side. In the case in question he had been obliged to guarantee the cost of bringing a cable to a domestic consumer who would not otherwise have been able to obtain a supply.

Mr. H. H. BERRY thought it was particularly significant that a gesture such as that which Mr. Bruty had made should come from the other side of the Channel, when we, over here, were so accustomed to believe that the people of Ireland preferred to fight if only for its own sake. There was no doubt that all sections of the electrical industry would wholeheartedly sympathise with this wonderful idea of fuller co-operation. He noticed, however, that Mr. Bruty had entirely overlooked the wholesalers in his chain of distribution; though this was probably because he had grouped them with the manufacturers as part of the necessary machinery of distribution.

An idea for which he was not personally responsible had a most important bearing on the situation. It was put forward by Dr. Ferranti to an executive meeting of the Council of the Electrical Development Association, representative of nearly all the electrical associations. Dr. Ferranti had realised the real importance of the domestic electrical development which would arise when the supply industry was able to give a cheap supply of electricity in rural and suburban areas where a cheap supply is not now existent. He therefore made the suggestion that the industry should formulate a uniform tariff which should apply throughout the country. There would be one rate for power and another for lighting. Whatever unit charge might seem satisfactory would obtain universally, and the varying costs of distribution in different areas would be compensated for by a variable fixed charge. The adoption of such a scheme would clear the way for phenomenal progress and would dispose of all existing anomalies.

Work for the E.D.A.

Mr. H. C. HAZEL said the value of Mr. Bruty's appeal to the different sections to work more together lay in his insistence that such a move was desirable not only for their own pecuniary advantage, but also as the industry's duty to the public. While there would be general agreement that the author's sentiments were entirely desirable there must be many who wondered how they were to be put into practice. He thought the E.D.A. was the ideal instrument for this purpose. It was a body which had no particular axe to grind, and with its area and circle committees, representative of supply authorities, manufacturers and contractors, it was particularly well fitted to deal helpfully with tariffs, the cost of services and other questions of direct interest to the general public.

Service Charges.

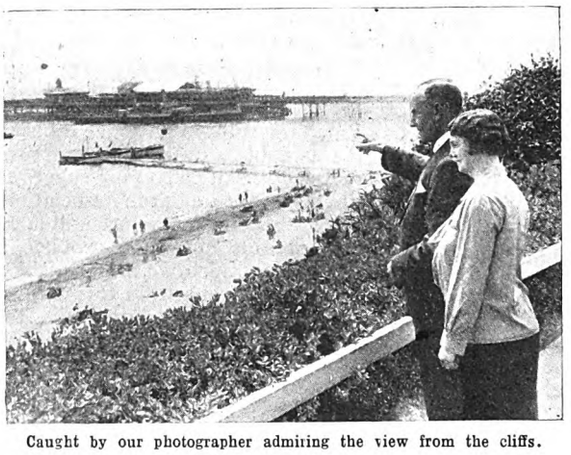
He agreed with the author in complaining of the charges sometimes made by supply authorities for giving service connections. This should certainly be free if the distance was reasonable. It was indubitably true that many potential consumers of electricity had become gas consumers simply and entirely because of the high price demanded for bringing a supply of electricity to the consumers' terminals. The policy was entirely wrong.

As to the consulting of contractors by manufacturers, Mr. Hazel thought it would be distinctly advantageous to manufacturers to seek such advice. Contractors more than any other section of the industry were in direct touch with the requirements of the user of apparatus, and there had been many instances of a product being entirely re-designed in accordance with suggestions obtained in this way.

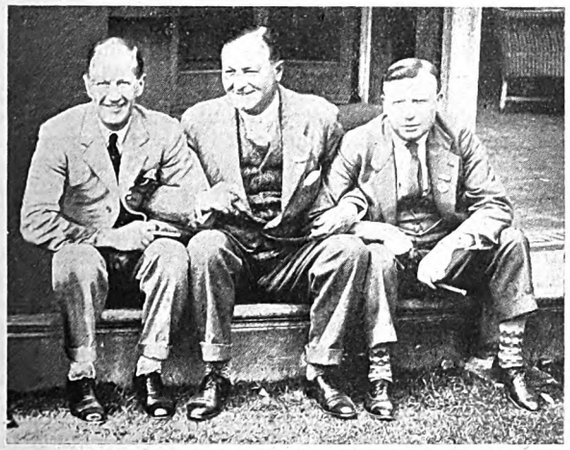
Mr. R. GRIERSON suggested that in seeking the path of progress along the lines indicated by Mr. Bruty, contractors should find out three facts regarding the electrical position in their own area, i.e., population, units sold per head of population, and the price per unit. Tariffs, he thought, formed the one remaining obstacle standing between the public and the universal adoption of electrical energy.

Measured by the "yardstick" of population, units sold and tariff, Mr. J. Christie's recent defence of the flat rate system of charging at Brighton was soon seen to be indefensible. Mr. Christie had stated at the I.M.E.A. Convention at Torquay, that Brighton had abandoned two part tariffs 21 years ago in favour of a flat rate, and he claimed to trace a phenomenal increase in consumption during the last year or two to the existence of these simple rates of charge.

A happy group waiting for the proceedings to begin.



Caught by our photographer admiring the view from the cliffs.



A merry trio, consisting of Mr. A. G. Beaver, Mr. P. F. Crinks, and another, enjoying their big cigars.

Three members engaged in private conference surprised by "The Electrician" camera man.

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Looking up a few comparable places in the "Blue Book" Mr. Grierson said he had found the following significant figures:

Place.	Population.	Units sold approx.	Per head of population.
Brighton	168,000	23 535 000	140
Hampstead	86 000	17 487 000	202
Wimbledon	100 000	19 755 000	197
Chester (inner area only) ..	41 000	7 675 000	187
Bedford	40 000	15 800 000	394
Watford	52 580	16 500 000	315

Mr. Christie held that the financial results at Brighton justified the methods adopted, but his own view was that the success or otherwise of an undertaking could not be gauged entirely on financial results; the units sold per head of the population should also be taken into account. Electricity was not a luxury, but a public service which the public would have to have. Those standing in the way of its development would have to be brushed aside.

A Personal Experience.

Mr. Grierson quoted an instance in his own experience with a panel heating installation of some size. It represented a connected load of about 5 000 kW, the maximum load—a large number of thermostats being a feature of the system—being about 3 250 kW. This apparatus would have had a consumption of 1 750 kWh per kW installed, and the annual consumption, a good deal of which would occur during the night hours, was estimated at about 8 750 000 kWh. For this desirable proposition the supply authority concerned could quote nothing better than £5 per kW plus ¼d. per kWh for all consumption. The result was naturally the loss to the electrical industry of 3 250 kW of plant, and all that this entailed. Mr. Grierson thought that on a strictly competitive cost basis electricity for heating of the kind envisaged should cost not more than 0·18d. per kWh. This was not to say that nothing over that figure was practicable, but merely that the difference between it and the actual price in any particular case must be weighed against the luxury or convenience aspect. There were many current examples, as, for instance, in first class railway travelling, of people being prepared to pay for luxury service.

Mr. H. W. Roberts said Mr. Bruty had omitted to say that the great sin of the electrical industry in the past had been that it had concentrated on cheapness rather than on quality and service. Supply authorities had clamoured for cheaper wiring installations, and everyone else had replied by asking for cheaper units.

Naturally manufacturers would gladly receive suggestions from contractors, but as a manufacturer might have thousands of them as his customers it was a little difficult in practice to consult them all. One practical way of conveying suggestions lay through the British Engineering Standards Association.

Referring to Mr. Bruty's conclusion that we are still lacking a complete solution of the domestic hot water problem, Mr. Roberts said he felt that, however much we might dislike it, the registered plumber was a necessary help in this direction, and that it would be necessary to co-operate with him. As for the point about the design and construction of appliances that might be used with perfect safety, the manufacturers were also willing to produce anything for which there was a demand.

Mr. Bruty had stated that the remuneration offered by the electrical installation industry was poor. He thought this was because the contractors had neglected the counter trade. Quick turnover and counter trade provided the solution of this problem.

Mr. J. H. Asdell mentioned that there had been much criticism of the Electrical Development Association among the ranks of the contractors, and he appealed to such critics to help to strengthen its activities in every way possible. Similarly in matters connected with their own Association many contractors were too ready to leave others to do the constructive work for them. By giving active rather than merely lip service they would strengthen their own organisation and facilitate effective linking up with other bodies.

Mr. Ll. B. Atkinson regretted that Mr. Bruty should have thought it necessary to refer to an incident in which certain manufacturers were alleged to have played a somewhat unworthy part, but as it had been mentioned, and as the Cable Makers' Association was a party to some of the negotiations in that case, he thought it desirable that a statement should be made. The starting point, so far as the C.M.A. was concerned, was when the Irish Electricity Board appealed to the C.M.A. to organise a scheme and wire many thousands of houses in the Irish Free State within a few months. The C.M.A. replied that wiring was no business of theirs, and referred the Board to the N.E.C.T.A., who, in turn, said that contracting was no business of theirs, though they would be willing to help from the financial viewpoint. Then followed long and prolonged negotiations with a group of contractors who were interested in the scheme, but the C.M.A. took no part in these further negotiations. Eventually the C.M.A. was asked by the Irish Electricity Board to supply them with cables of a class not standard in this country, and consequently not suitable for the purpose for which they were required in Ireland. This the cable makers were averse to do, but eventually they agreed to supply a special cable without a guarantee of any kind, and with the proviso that if it were supplied, it must be available to any Irish contractor for use in connection with the new wiring schemes. Some of this cable was supplied, and then the questions Mr. Bruty had referred to were raised, and it was reported that no electrical contractors were being employed in connection with the scheme. He went over to Ireland, and on investigation found that the Board had, as alleged, decided to do their own wiring, and also that they were not willing to supply the special cable to contractors. In view of these circumstances, the C.M.A. decided to decline to supply any more of this class of cable. If they had acted in any way against the interests of the Irish contractors, it was quite unintentional.

Mr. B. Gill thought the most practical way to increase co-operation lay in local branch work. The organisation of small local committees on which supply authorities would be represented would lead to a fuller realisation of the difficulties of the installation industry and would facilitate progress along the lines of Mr. Bruty's paper. These committees could also do useful service in reporting cases of shoddy wiring to the proper authorities.

Mr. C. W. Sully, referring to the author's suggestion that manufacturers should consult the contractors, said he thought the president had given clear indication that the E.C.A. was in very close consultation with the E.L.M.A., and that during the past year they had obtained results which were considered more satisfactory than in any previous year. He agreed that such co-operation was necessary and desirable, but he must remind members that in endeavouring to co-operate with any other body they must exercise patience.

He shared the author's hope that the E.C.A. would represent the men of the retail side of the electrical industry, and so far as E.L.M.A. members were concerned this was recognised, though they hoped that before long it would represent the whole of the retail side.

Standard Voltages.

He was glad to hear the reference to standardisation of voltages, as the E.L.M.A. had this year taken a small but very definite step in this direction. While standardisation was important to the manufacturer, it was still more important to the distributor, for the greatest expense to-day was in the distribution of a product during its progress from factory to consumer.

Mr. Sully desired to stress the importance of Mr. Hazel's reference to the value of E.D.A. Circles. They were an ideal means for getting together all sections of the industry in a locality. The one unsatisfactory feature at the moment was that there were not sufficient Circles in existence. There were, at the most, about 100 Circles now in operation, but as the intention was that they should be very localised, there should be more like 700 Circles in this country.

Mr. Bruty, in a brief reply to the points raised in the discussion, regretted that Mr. Atkinson should have referred to the Irish cable case, as he had been careful to put his reference to it in the paper into very general terms. It was not realised in this country that the Irish contractors were faced with State-financed competition, and were not having a fair show. He could only say of the cable incident that he was not satisfied that any firm of standing should supply any cable without a guarantee. Much had been said in this country about the Irish preference for foreign goods. This was quite mistaken, and there was a keen desire, at least among the Irish contractors, for British material. It seemed curious that while in England the manufacturers and contractors seemed to live on the most cordial terms, those same manufacturers forgot their cordiality when dealing with contractors in the Irish Free State.

Mr. Roberts's short cut to wealth was interesting. In his own town, however, he had noticed that several of the people who had had shops and showrooms closed them and carried on just as well by letting the shop and carrying on upstairs.

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THE CONTRACTOR'S PART IN RURAL ELECTRIFICATION.

Educating the Farmer—The Manufacturers' Position—Publicity Methods—Hire Purchase a Solution to the Problem.

By H. R. TAUNTON.

ON Friday morning Mr. H. R. Taunton read his paper on "The Contractor's Part in Rural Electrification." Electrical contractors, he said, were a not unimportant section of the electrical industry, and they had an essential part to play in its development, and they might reasonably hope to have their share of the benefits which would accrue to it if rural electrification came to its anticipated success.

To ensure their share, however, they must bestir themselves. They must not wait for the success of these first experiments. They must work with the rest of the industry to make them a success. As members of the general community, they should hope for the success of an enterprise which meant so much to the agricultural industry, still the most important in the commonwealth, even if to them personally it brought nothing. At the same time, as a section of the electrical industry, the industry on whose co-operation the Government relied for the practical working of the scheme, they had a special interest in it; and so, like the other sections of the industry, they might fairly look for a reward for their special labour.

One must at the moment admit ignorance of what rural electrification in Great Britain would eventually mean to all of us. Until we had definite data of the demand to cater for, plans could only be general, and organisation tentative. Meanwhile, we had no other guide but knowledge of similar schemes in other countries: in America, for instance, and in Sweden and Denmark. What had been achieved there might be repeated here; but we had to remember that conditions were different. In America farm holdings were enormous compared with the average in England, and were run on the lines of big business corporations. In Scandinavia the farmer had the benefit of highly organised co-operation, of which we had as yet only the beginnings. In both cases rural electrification had had the vast advantage of cheap supply from water power, distributed by methods more elastic and less costly than was advisable in so densely populated a country as ours. We could not be sure, therefore, that our demand would be large enough to ensure an economic success.

The whole question hinged on the probable demand, and in considering it we had to take account of several adverse factors. One of them was the intense conservatism of the small farmer. Anyone who had had experience of canvassing him for such modest instalments of rural electrification as lighting and pumping, would agree that the difficulty was not of making him see the advantages of them, but of persuading him to so definite a departure from the ways of his fathers. Talk of labour-saving usually made no appeal to him. He would admit it readily, and counter it by the argument that if the maid were not cleaning and filling oil lamps, or the labourer were not working the pump, they would simply be idling for part of the time for which they were paid a fixed amount.

Another objection was the initial expense. In days before the "grid," anything in the way of rural electrification meant a comparatively expensive generating plant. But the same objection would still have to be met in another form, for the success of the scheme depended on a large demand for power, with a corresponding initial outlay on equipment.

Mr. H. R. Taunton.

The question of initial expense had to be considered again from the supply authorities' point of view. The cost of an h.t. tapping was about £350, which meant that the authorities must recover £18 to £20 per annum from the consumer before they could write off the interest on the tapping, to say nothing of the service line. £18 to £20, on any reasonable tariff, was a fairly large consumption for a small farm up to, say, 200 acres.

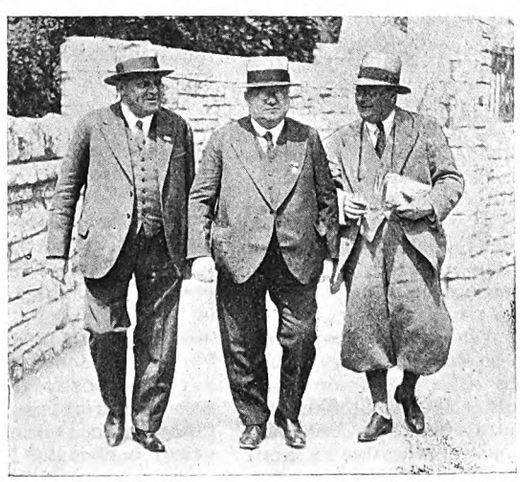
We had to remember that its power conditions would be very different from those in a small factory. Much of the heavy work, such as threshing and ploughing, was only seasonal; and most of the smaller machines were only used intermittently during the day or the week.

The problems, in which contractors were interested, boiled down practically to two. One was, to educate the farmer and the country dweller to the advantages of electricity; and the other—more difficult—was to persuade him to the necessary outlay on it.

Taking the easier first, it was a problem with which contractors were as well able to deal as any other section of the industry; and their interest lay in dealing with it so energetically that the others would be content to leave it in their hands.

If, through any real or fancied neglect of theirs, the suppliers were disappointed of their expected load, they would be forced in their own defence to undertake their own canvassing. That meant their own selling organisation, and eventually their own installation department. Always the lethargy of the contractors had been made the excuse for similar developments in urban areas. There must not be afforded a shadow of an excuse for it in the rural areas; on the contrary they must so work that they not only secured their position there, but regained the lost ground in the towns. If contractors allowed the companies to get into the habit of doing their work in the country, they would carry the practice

Out for a stroll along the front during one of the "rest hours."



Mr. W. F. Moir (left), Mr. R. Wilson Smith, with hat worn in Brighton fashion, and (right) Mr. H. A. Deacon.

Mr. R. C. Soanes and Cupid in the Royal Bath Hotel gardens.

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in the towns further than they do now, and ever further, until there would be no place left for the contractors.

So far as the suppliers were concerned, they could reasonably expect they would at least give the contractors an opportunity of doing all the hard preliminary work of securing customers for them, and while they did it to the suppliers' satisfaction, would leave to them the profit—or loss—on the installation contracts.

The Attitude of Manufacturers.

The case was otherwise with manufacturers. A maker of electric motors was not going to sit back and leave selling to an electrical contractor who might send what orders he secured to any of a score of competitors. And so with the makers of heating apparatus, and of fittings, and of lamps: each would want to fight for his own hand, and all at the expense of the contractor, who would soon find his profitable activities cut down to the bare wiring. However, the E.C.A. Trading Committee had waged a fairly successful fight against them in the past, and was doubtless fully alive to the dangerous possibilities in the future of rural electrification.

At the worst, if he found himself forced to meet such unfair competition, the contractor had certain initial advantages. To begin with, he had that of local knowledge, and he was always on the spot, as a manufacturer's travelling representative could not be.

As the important point was that what orders were going should go to some member of the contracting industry, rather than be split up among competing manufacturers and suppliers, it seemed to the author that the advertising and canvassing of local men should be supplemented by an organised sales effort on the part of the Electrical Contractors' Association, as their central body.

Mr. Taunton did not suggest a national newspaper advertising campaign, because funds would not allow of that being done on an effective scale; but they could prepare a range of pamphlets—on the lines of the B.E.D.A. publications, such as Mr. Riggs's E.D.A. 720—and of folders and leaflets, not merely proclaiming the advantages of ultra-violet rays for cows, but also stressing the importance of employing only responsible contractors, such as members of the E.C.A., on rural installation work. This literature could be either broadcast from headquarters or sold at cost to members, for overprinting and local distribution.

Another economical form of propaganda would be the equipment of an E.C.A stand at the many agricultural shows up and down the country. As dates rarely clashed, one equipment would serve a number of shows; and after the initial expense, the only other serious ones would be rent and salaries. An independent staff responsible only to headquarters would be necessary. If the staff were supplied by the local contractors, competition for a likely visitor to the stand of the Electrical Contractors' Association would probably savour more of "electrical" than of "association." Assuming impartiality in the attendants, visitors would simply be given a card with the names of local members, and it would not be difficult to devise a scheme, based on the production of the card, by which the member ultimately benefiting would pay some small commission to the E.C.A. towards the expenses of the stand. Apart from inquiries, stands at agricultural shows often paid for themselves by direct sales; and if such a selling policy were adopted, the proceeds, after a deduction towards the running costs, could be divided among local Association members.

A Demonstration Van.

A substitute for the stand, and one which could be usefully kept in commission all the year round, would be a travelling demonstration, in the shape of a van or lorry equipped with suitable apparatus, and with motors of various sizes, fed by trailing cables from a generator run off the car engine.

Here again, after the initial cost, the expenses of running one or more demonstration vans would not be so great that it might not be met, wholly or in large part, from income. A van might be either hired for a limited period by a particular contractor, who would then supply the demonstrators; or it might be worked, like the suggested show stand, on a co-operative basis, touring a district, either at the joint request of the local members, who would defray the expenses of the independent staff between them, or on the initiative of headquarters, as part of their national propaganda. In either case, any definite results, whether in direct sales or inquiries maturing into orders, could be dealt with on the lines already suggested for the show stand.

Assuming that by some such means the farmer had been so far interested that the only thing holding him back was the initial cost of the installation and motors and apparatus, hire-purchase was the key of the whole problem. Every day it was becoming more and more the financial basis of popular business and, judging by results, a sound basis—in spite of the arguments of the old thrift school. When anything and everything from a gas cooker to a country house could today be bought on the hire-purchase system, we could not expect any popular expansion of electrical equipment on a spot cash basis.

This presented to contractors as a body a grave and pressing problem. To supply companies and corporations with rates or Government loans at their command, and to manufacturing firms with large capital resources, the financing of a wide scheme of assisted wiring and hire-purchase of apparatus was a simple matter. It was very certain that unless contractors could follow their example and offer the farmer the same facilities, they would be shouldered to one side; and they could not reasonably complain. They could not expect suppliers to wait for consumers, and manufacturers for purchasers, until the farmers could pay for what contractors were unwilling or unable to give them without immediate payment. All they could hope for in that case—and not, the author thought, for long—would be the bare wiring at closely cut schedule rates.

Contractors had, unfortunately, to face peculiar difficulties in organising any scheme of hire-purchase. They were a strong and flourishing industry, it was true; but its individual members were, generally speaking, of small capital resources; small compared with those which were arrayed to take advantage of any failure on their part to meet the problem. The average contractor in rural areas, called upon to finance, on the slender resources of the capital not employed on his general contracts, an increasing number of fairly large installations, would soon find himself in such a position as to be unable to meet his current wages bill.

Without assistance of some sort, the hire-purchase inseparable from rural electrification was utterly beyond the capacity of 95% of E.C.A. members.

A Common Fund.

Their only hope, as a body, was in some scheme of co-operation, by which individual members would be assisted by a central organisation with a common fund. The E.C.A. was the obvious central organisation; the common fund was, unhappily, less obvious. Mr. Taunton suggested, however, that it was not beyond the wit of man, still less beyond the able wits of the Finance Committee, to devise means for the raising of an adequate fund. An issue of shares to members, or possibly to the general public, was a feasible solution; or, under certain conditions, a Government loan might be obtainable. The return on the capital would be in the shape of the interest charged to the purchaser for the accommodation, and the interest on the accumulation of instalments, on the lines familiar in building societies and other organisations financing general hire-purchase schemes. The security would be exceptionally good; and if the E.C.A., or the new finance company it would control, collected direct from the purchaser, little loss from bad debts need be feared. If it were found advisable to work the scheme entirely through the contractor concerned, no doubt suitable safeguards could be arranged to secure the same result.

So wide an extension of the Association's activities might, at first sight, seem alarming; but something like it, or some better alternative, must be quickly planned and quickly carried through if contractors were to take any serious part in rural electrification. The situation was novel and unprecedented, and called for novel and unprecedented measures; and since they were beyond the capacity of individual enterprise they could only be initiated and carried to success by joint action. In short, if contractors wanted to secure the farmer's orders they must offer him hire-purchase facilities; otherwise they must stand aside in favour of those who were ready to do both.

The author said he would like to see the E.C.A. prepare suitable wiring specifications for farm installations and work for acceptance not only by its own members, but by the authorities concerned. He did not propose to discuss the most suitable wiring system to use for that class of work.

In short, they must strive, not only to secure the farmer's order, but also, and as a means thereto, to secure and retain his confidence. Electrical contractors could and should play

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a big part in rural electrification. They must let it also be a worthy part, and they need not fear that their virtues would not be modestly rewarded.

THE DISCUSSION.

Mr. W. RIGGS said the question of rural electrification should be considered under two headings, (a) as it affects the farmer, and (b) as concerning the villages and village industries. In cultivating the farmer they should find out his mentality in order properly to estimate his requirements. They must first rid themselves of the prevalent idea that the farmer was not a business man and was averse to taking advantage of up-to-date methods of working. The farmer's labour costs were enormous; they formed quite 75% of his total expenses. On the other hand, the prices he received for his produce were in most cases lower than before the war. He must therefore exercise the utmost economy in working, or go out of business.

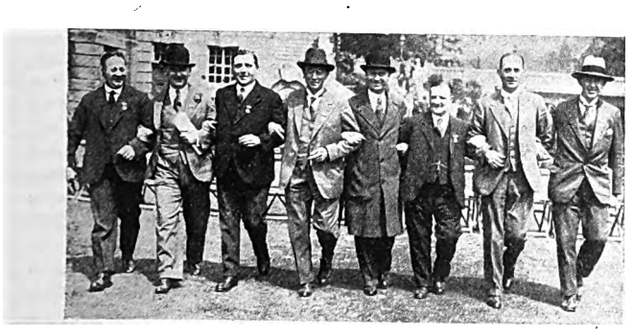
On the financial side, Mr. Taunton had suggested that hire-purchase was the only way in which business could be done in rural electrification. So far as the farmer was concerned it should be remembered that with farmers, as a rule, credit was neither asked nor given, and it was a rare thing for a farmer to owe anything on quarter day. If it were shown to him that it would be to his advantage to use a different type of machine he would somehow find the money.

To day there was hardly a farm without an engine of some sort. The barn was generally a workshop full of machinery, usually driven through a line of shafting by one engine. This was a very economical method, and electrical business could only result from our showing him a still better way. The electric motors which would replace the existing engines would provide a desirable load for the supply authorities, as some form of machinery was in fairly regular use.

Difficulties from the supply authorities' point of view should not be overlooked. The cost of tapping, even on low tension lines of 11 000 V and under, was no small matter unless there happened to be several farms situated near together. Usually our farmsteads were isolated in their own acreage, with the next farm rarely less than half a mile away.

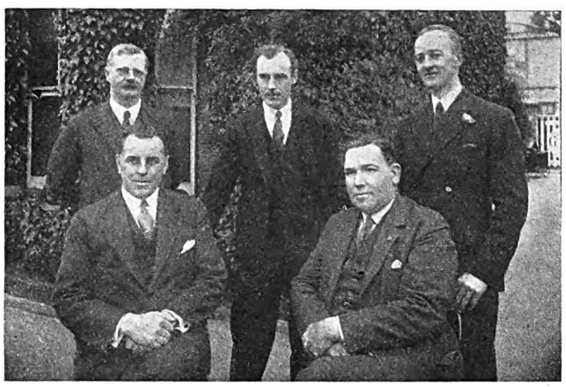
On the whole Mr. Riggs thought that, in spite of considerable difficulties, progress in rural electrification was possible in the near future. Long vision was needed, however, and supply authorities must not look for a profitable return at the outset. The country people had practical acquaintance with the benefits of radio, and the taste for electricity in the villages was already surprisingly well developed through the activities of the Women's Institutes and other organisations. Another advantage was that there was very rarely any competition from gas, so that there was here a virgin field for electrical contractors. The larger villages and hamlets should be tackled first, and the outlying farms and smaller villages next.

Mr. W. F. FURSE said he was glad to hear the author's reference to Mr. Riggs's farming paper, as this was an effort



Another group of contractors caught in playful mood.

which reflected great credit, not only on Mr. Riggs, but also on the E.C.A. Rural electrification provided a very big field for cultivation, but he feared that crops would not be very large at first. To go out for this business at present was an expensive proposition and would largely be a step in the dark. Contractors would have no sort of monopoly, and they certainly had no defined territory to work in. The possible activities of the kerbstoner further complicated the position. As showing how progress could be made without much capital expenditure Mr. Furse told of a country squire, who, at the instance of an electrical contractor, became interested in electrical possibilities. His house was lighted by a private plant, and when the time arrived for the replacing of his 200 Ah battery to be a matter of some urgency, the contractor showed him how he could save money by taking a public supply. The contractor approached the supply company, which was under statutory obligation to supply in the district, and explained how, by a slight diversion of its mains, it could pick up a useful load. This it was willing to do if a minimum revenue of £250 a year could be guaranteed. The squire's share was about £100, and he canvassed the neighbouring farmers and quickly made up the required sum. The church installation was paid for by a rummage sale, and the money for the installation for the manor house and most of the other tenants was obtained by an addition of 7% to the rents.



The local Committee of the E.C.A. (Bournemouth), showing in the back row, left to right: Messrs. S. T. Weggitt, H. H. Shears (local Secretary), H. S. Rogers (Chairman of Bournemouth Branch), and in the front row, Mr. A. R. Wilson (local Conference Secretary), and Mr. N. Aish (Conference Chairman).

In developing electricity in rural districts it seemed to him that the contractor's first move was to find out the obligations of the supply authority. The next thing was to get the biggest consumer, and work gradually down to the smaller ones.

Mr. H. T. YOUNG said that while the subject bristled with difficulties, most of which had been omitted by the author, he thought that such optimism was preferable to too much "safety first," a frame of mind which was getting dangerous for many people to-day. Having seen rural electrification in practice in many different countries of the world—even the Arabs had it—he had been led to inquire why we were backward here. He found that the conditions here were vastly different from those obtaining elsewhere, and the post-war necessity for re-settling large numbers of men on the land on small holdings had definitely held up rural electrical progress.

Even where there were villages to tackle he thought the best procedure was to begin with lighting and small domestic appliances, and gradually spread out into the farmyard, and then to the isolated farms and districts.

For the larger applications he did not think they would go far without use of the hire-purchase system, and this was a direction in which there was a possibility that the Government would take a hand.

With regard to the cost of current he thought too much insistence was placed upon the desirability of having a low unit price. In his view the convenience of the service was such that a little more on the unit was unimportant so long as people got a supply. The E.D.A. was doing extremely valuable work on agricultural development, and contractors would be well advised to co-operate closely in these activities. The farmer's wife was a very important factor in assisting electrical development, and the Electrical Association for Women could render valuable help in this direction.

Mr. E. A. REYNOLDS spoke of the remarkable rural progress made in the area of the Shropshire, Worcestershire and Staffordshire Co. In its 2 000 sq. mile area it had in overhead lines 33 miles of 66 000 V, 27 miles of 33 000 V, 160 miles of 11 000 V, some 200 miles of low tension mains, and gave a bulk supply to several towns. Some 84 villages and hamlets were connected to the company's mains, so he thought they could claim that in this area at least rural electrification had definitely passed the experimental stage. Electric cookers were used in many of the villages, a large number of radiators was also used, and electric irons were almost universally employed. The load was quite up to the expectations of the company when the development was planned, and quite sufficient to justify considerable extensions each year.

The author's figures for the cost of tapping seemed unduly high. Some costs supplied by the S.W.S. Co. were: 50 kVA,

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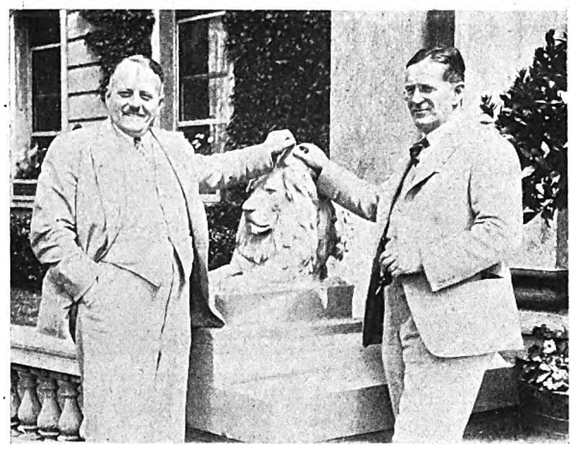
11 000 V, £155; 20 kVA, single-phase, £90; 10 kVA, single-phase, £65.

In cultivating the rural business he thought it highly important that contractors should have as representative a man who lived in the district and was well known and trusted by the country dwellers. Such a man would be in a much better position for business getting than any supply authority's representative, and could hold his own against any traveller. The greatest competition would come from local ironmongers, who often had sons who had dabbled in wireless and had acquired an unwarranted local reputation as men of science capable of dealing with all electrical matters. The



Messrs. A. B. Wishart and H. A. Lingard, both of the B.T.H. Co.

work done by such people was often appalling, and contractors should work to counter its results by pressing for recognition of the E.C.A. and the National Register. Members of these organisations should recognise the necessity of taking drastic action if one of their own members was found to have been responsible for unsound work. Such action deserved the fullest support of all who valued the reputation of the industry.

Valuable propaganda work was being done by the S.W.S. Co. They had a demonstration van and held exhibitions in conjunction with the local contractors in many of the towns and villages of the area. Last year they organised over 40 electrical exhibitions, some being held in village halls and others in a large portable marquee. These efforts were remarkably successful. The local contractors were always asked to co-operate, and the company did not sell any apparatus, all orders going to the contractors.

The company was now equipping a large scale experimental farm, where all rural applications of electricity could be seen by anyone who was interested. Here they would deal not only with power applications but also with intensive culture, light treatments for fungi, and insect pests. Attention would also be given to experiments on high tension discharges to the ground; anything appertaining to agricultural work in which electricity might be employed would be fully exploited.

The relations between the company and the contractors were on a very friendly basis. An assisted wiring scheme was worked by the contractors on behalf of the company, and a very active Electric Circle was in existence. Its meetings were always fully attended, some members travelling from 40 to 50 miles to attend meetings.

Mr. Ll. B. Atkinson congratulated Mr. Taunton and the E.C.A. on the selection of a very live topic. He agreed that at some stage, either sooner or later, hire or hire-purchase methods would be necessary. Whether or not the E.C.A. could usefully plunge into the complex financial arrangements which it would entail was not for him to decide, but however this was approached, it seemed to him that it would be necessary to deal separately with wiring and with the apparatus conected thereto. While the appliances could be taken away in the event of failure to pay the instalments, such a remedy was impossible in the case of a wiring installation. Most farmers nowadays were tenants, and satisfactory arrangements for wiring called for the consent of a third party, who would be regarded as the proprietor of the installation. With regard to the apparatus, one could follow the lines adopted in the furnishing and other trades—i.e., through special financing companies. Long experience of this class of business, both here and in the U.S.A., showed that the proportion of failures to pay was very low and could be represented by a fraction of 1 %. It had been proved as a sound business system in which there were few losses, and if the financing were carried out by those who had specialised in that business difficulties would be few.

Coming to instalment payments for the actual installations, Mr. Atkinson thought it desirable to arrange for the collection to be placed in the hands of the supply authority, for although it could not take the wiring out of a house, it could cut off the supply failing payment. He referred to the work of the Electricity Commissioners' committee which was investigating means whereby such schemes could best be carried out by the smaller undertakings without resources like those of the S.W.S. Co. Before very long a report would be published containing suggestions capable of application on a small scale.

Mr. F. H. Starling thought it would be helpful if supply authorities contemplating rural development would give early indication of their intentions to the E.C.A., so that local contractors might have early knowledge of forthcoming possibilities. While the financing of the business seemed a fairly easy matter, he foresaw difficulties if the supply authorities were asked to collect installation rents from farmers. In any case the actual wiring did not represent a large sum.

Mr. A. G. Bruty thought that as most Irish farms were small and there was but little tillage, the prospects for rural electrification there were not very promising. One aspect which appeared to have immediate possibilities was the electrical incubation of eggs. He had recently put in an installation in which there was an almost continuous incubation of about 15 000 eggs. This represented a good and constant load, and he thought there was a fair amount of work to be done in this direction.

Mr. H. Moss maintained that shoddy wiring was one of the greatest problems that would have to be dealt with in rural electrification, and the problem was how to prevent cycle dealers and garages from doing wiring work. Contractors in the towns and cities now had the greatest difficulty in coping with the jerry-wiring contractor, and he felt that the danger would be intensified in the rural areas unless some protective measures were developed to stop this blight on the industry. Compulsory registration of contractors would, in his opinion, be the only cure. It, therefore, behoved the E.C.A. to do its utmost to enrol every eligible contractor in the country on the National Register, with a view to getting Government recognition and closing the ranks of the electrical contracting business to all except duly qualified men.

Mr. Taunton's Reply.

Mr. H. R. Taunton, in his reply, said that Mr. Reynolds's account of the progress of the S.W.S. Co. was particularly interesting, and this achievement gave great promise of repetition elsewhere. It seemed, however, that in this case the supply company did most of the work. Mr. Reynolds was very lucky to have such a helpful supply undertaking, but such a happy relationship was not universal. In some places the supply authority allowed contractors to do wiring but sold appliances themselves. It was this sale of appliances that put the plums in the contractors' pudding, and if they had to rely on wiring alone they would not grow very fat. It was up to the contractors to persuade the public to come to them for their requirements, and once they had knowledge of rural districts that were about to be developed electrically the E.C.A. should start some central propaganda work. The speakers had discounted most of the difficulties in the way of rural electrification, and there seemed to be fairly general agreement that the contractors would be able to do the work with the aid of the finance companies. In this connection the E.C.A. already had a hire-purchase scheme which could doubtless be developed for the purpose.

METER AND INSTRUMENT SECTION, I.E.E.

As no nominations have been received from the general body of members of the Section to fill the vacancies which will occur on the Section Committee on September 30th, those members nominated by the committee are, under the Section's Rules, duly elected. The committee for 1929-30 will therefore be:—Chairman: Mr. E. W. Hill. Ordinary members of Committee: Messrs. W. E. C. Alliss, E. Fawssett, C. H. W. Gerhardi, A. J. Gibbons, J. T. Haynes, F. C. Knowles, C. W. Marshall, A. Middleton, E. H. Miller, William Phillips, G. F. Shotter, R. S. J. Spilsbury. A member of Council (to be selected by Section Committee); President, I.E.E. (*ex-officio*); chairman of the I.E.E. Papers Committee (*ex-officio*).

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THE NATIONAL REGISTER.

Encouraging Steady Growth—The Annual Report of the Register—Tightening the Grip on Qualifications—How Cheap Work is Done—Tube Jobs Without Fittings.

By HARRY MOSS, A.M.I.E.E.

AS I sit and write this article I have in front of me a letter from one of my esteemed friends in the contracting trade, who is a real "Die-hard," and one who is very disappointed that compulsory registration has not yet become an accomplished fact. I do, however, think that he will begin to waver very soon.

He quotes the following couplet :—

> "Convince a man against his will,
> He's of the same opinion still."

And although this applies to him at the moment, he says "I am now encouraging Voluntary Registration."

To show that registration is getting the upper hand, I extract the following from a further document from his pen. "It has been said that 'A wise man occasionally changes his mind, but a fool never does.' If you are prepared to allow a slight transposition and make it "If a man changes his mind he is wise, but if he does not he is a fool,' then I claim that your Chairman has recently graduated from a fool to a wise man. For years I have strongly maintained, in season and out of season, that voluntary registration was no good, and not worth the paper the certificate was written on. At the risk of being considered inconsistent I wish to state here that my opinion has been considerably modified. I am still all out for compulsory registration of contractors, but I now realise that the voluntary register will have to form a nucleus of compulsory registration. We shall have to satisfy the powers that be that there are sufficient competent contractors in the country to allow fair competition and to safeguard the public from a few monopolists. This is not an original idea of mine, but has been very forcibly put to me by a number of better men than myself. Their studied opinion is that every member of the E.C.A. should register, and I have, perhaps very reluctantly, gradually, but surely, been compelled to admit they are right. I now look upon the voluntary register, not as to the end to which we are aiming, but rather as a means to achieve that end."

The man, whose thoughts are given in the above quotation, is a very much respected member of the E.C.A., and I trust his words will be taken note of and acted upon by all other members of the E.C.A. who have not yet enrolled on the register.

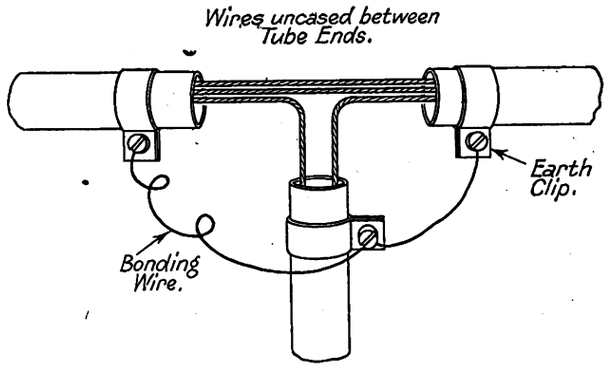
An Important Document.

The annual report of the Registration Authority recently issued was a document of intense interest, and one well worthy of perusal by all contractors, and if any of my readers have not yet read the report through very carefully I would ask them to do so. The general tightening up of qualifications and the insistence of the authority of certain wiring rules will do much to create a more favourable impression among those firms who are still outside the register. Personally, I should like to see an official request from the headquarters of the E.C.A. for all its members to enrol on the National Register immediately. A stronger register will be all for the good of our industry, and will, in due time, help us to overcome the unfair competition of the "shoddy" man and protect the public from the "incompetents."

A gentleman, well known as a maker's representative in the electrical trade, told me of a job he saw a few weeks ago, where a "screwed tube" job had been let for 17s. 6d. per joint, the lowest tender, and when the light had been put on in this bungalow he went inside the roof and found that beyond the ends of the rising tubes up the walls not a single fitting or piece of tube had been used in the roof, all the wires being run loose without any protection, and this was supposed to be done to an inquiry asking for a screwed conduit installation.

Another instance of cheap work recently heard of, and which has been connected to one of the large power company's mains, was a so-called conduit installation, but which had been carried out without any tees or bends under the floors or in the roof. The contractor responsible for this had, however, aimed to get an earthed system, inasmuch as he had bonded across tube ends as shown in sketch, with an earth wire and clips, but tube ends were not bushed and no tees used where branches were taken off.

As an instance of what the local plumber-electrician will do in carrying out a job, the following, which occurred in a small Yorkshire town a few weeks ago, is of interest. The house which was being fitted was about 150 yards from the plumber's shop, and it was being wired by a plumber on a



A "conduit installation," without tees or bends, designed as an "earthed system."

tube system. For several days the plumber was regularly seen walking down the street with a piece of tube in his hand, with his thumb tightly clenched at a certain point, and every time he was seen returning he was carrying two pieces of tube quite leisurely in one hand. After inquiries were made it was found that this plumber-electrician did not know how he could cut a piece of tube on the job, so took every piece down to his own shop to cut it at the bench, and then returned with the two pieces. One wonders how much this job cost the customer.

It is only reasonable to suppose that this sort of thing would not be tolerated if compulsory registration was put into operation, and the public would be protected against such incompetents.

The National Register is making headway. A voluntary register of the majority of the best electrical contractors, and the gradual education of the buying public through advertising, will, in the end, bring about that public feeling which will, in its turn, demand that compulsory registration of electrical contractors is the only safeguard against the hordes of "shoddy" wiring firms who are thrusting themselves on the unsuspecting public of to-day, and, I hope, will also lead to a further development, which will be the registration of electrical wiremen, so that the skilled operatives will be protected against those who have only a smattering of the knowledge that is required for the efficient carrying out of electrical installations that should be given to the consumers of the present day. Closer co-operation between all parties interested in the trade and a spirit of mutual help and protection will do much to hasten the long desired day. Personally, I see signs in the distance, and hope the clouds will be dispelled at no very distant date.

ILLUMINATION GLASSWARE AND CARRIERS.

THE B.S.S. No. 364-1929, for neck and flange dimensions of illumination glassware and carriers, which has just been issued by the B.E.S.A., ensures that the glassware and carriers shall be interchangeable. Dimensions are given for the necks and galleries for electric light fittings and for the flanges and supporting rings for bowl fittings. The diameter of the clearance hole in shades, reflectors or their appropriate galleries for the British standard bayonet lampholder is also included. These dimensions have been arrived at after due consideration of the dimensions of electric lamps and of the British standard bayonet lampholder, and for convenience of reference extracts from the appropriate B.S.S. Nos. 161 and 52 are given in appendices. Copies of the new specification No. 164-1929, may be obtained from the Publications Department, British Engineering Standards Association, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

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I.E.E. SUMMER MEETING.

Visit to Lannemezan Chemical Works—Four Sources of 20 000 kVA Supply.

(*Concluded from Vol. CII, page 784.*)

ON June 20th the party made a run by road through Bagnerès de Bigorre, through the foot-hills of the Pyrenees to Lannemezan. On the way some light deep-flange H steel posts were to be seen, supporting h.t. distribution lines in some cases, and with both h.t. and l.t. in others. At some points the l.t. was single-phase, but generally 3-phase circuits were visible. The sub-station points, which looked very neat, were supported on two steel H posts, each with a 3-phase transformer, fuses and surge-dispersers, made by Messrs. D. Soulé, of Bagnerès de Bigorre.

At Lannemezan the works of the Société des Produits Azotés (Nitrate Products) were visited. This company was founded to manufacture nitrogenous chemical manures, more especially calcium cyanamide; it has two works in France and one in Switzerland. The company has two power stations situated on the river Neste de Louron, at Loudenville and at Arreau respectively. Each of these stations contains two 4 000 kW generators, with step-up transformers to 60 000 V. This company, like other co-operating electro-chemical works in the water power group, operate their stations on to the network, and draw from it in accordance with a seasonal programme on special terms, handing over their surplus or taking surplus from others. The step-down station at the works is connected with the above power stations and with a further line feeding the step-up 60/150 kV transformer station of the Midi Railway, which is situated about a mile from the chemical works; this line is arranged so that the surplus from the Saint Lary power station of the Penarroya Mining and Metallurgical Company can be fed into the local co-operative system. A further line connects up with the Midi Company's sub-station. The works, therefore, have four sources of supply, each line having a capacity of 20 000 kVA. These lines can be put into parallel with one another when required, through the works sub-station, and switchgear telephone communication is made with neighbouring power stations by means of alternative telephone connecting lines. There are two groups of three single-phase transformers of a combined output of 20 000 kVA 60/12·5 kV; each group feeds eight furnaces, each of a capacity of 2 500 kVA; these two groups can be put into parallel, although to diminish the inconvenience which would arise if one furnace was short-circuited, the groups are usually kept separate. For the supply of current to the cyanamide and nitrate departments there are two transformers, each 3 000 kVA 60/12·5 kV. The apparatus at 60 and 12·5 kV is controlled by desk-type switch-operating panels with the aid of direct current opening and closing gear, the current being furnished by a battery of accumulators at 120 V. The transformers for the furnaces are of the single-phase type, 2 500 kVA each; they draw from the 12 500 V furnace-group busbars, and by alteration of tapping connections can supply at 85, 90, 95, 100, or 105 V; the transformers are placed close to the furnaces, each one supplying one furnace, the normal output being 25 000 A at 100 V. The furnaces are of the series type, with two electrodes each, operated by electric hoisting gear; they can be used to make ferro-silicon as an alternative to carbide if required. The smaller pair of transformers, each of 3 000 kVA, supplies power which is stepped down in 1 000 kVA units to 500 V to give current to motors of 375, 200 and 120 H.P. for driving air compressors, carbide and cyanamide breakers respectively. There are two 12 500/200-115 V transformers each, for operating pumps, cranes, travellers, breakers and machine tools; these are placed in a special sub-station. Two further sub-stations contain 12 500/200-115 V transformers; the first, of 100 kVA., supplies three 50 H.P. general water service centrifugal pumps, and the second, of 50 kVA, supplies light to a model colony for workmen.

The party rejoined the Midi Railway special train at Lannemezan Station, passing the 60/150 kV transformer station at which point the dispatcher of the Co-operative Power Company operates the power supply stations of the members.

After lunch the party arrived at Toulouse, and in the afternoon a new hydraulic testing weir belonging to the Toulouse Technical College was inspected. This is alongside a main weir on the river Gironde, close to a low-head water power station. Arrangements are made so that not merely can students study questions relating to water flow, but also detailed research work can be carried out. Later, the Toulouse technical school was visited. In the evening the party was received by the Mayor of Toulouse in the capitol (town hall), a modern building celebrated for its mural and ceiling decorations by local artists.

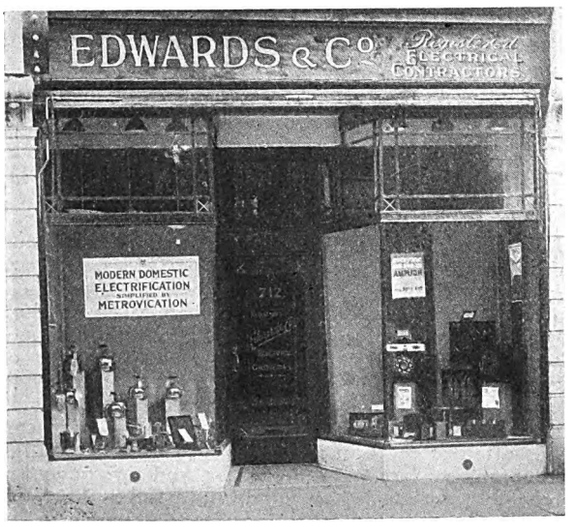
On the following day, June 21st, the town of Carcassonne was visited, a place noted for its wonderfully restored citadel; the town shows signs of building work and activities by Romans, Visigoths, Southern Gauls, Simon de Montfort, and others. Lunch was held at the Terminus Hotel, and a little presentation was made to Madame Bunet, the wife of the President of the Société Française des Electriciens, as a recognition of the efforts she had made with regard to the tour.

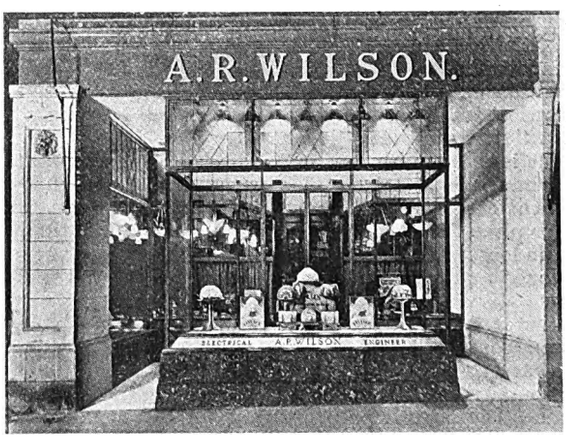
The party returned to Toulouse, and on the morning of Saturday, June 22nd, left for Paris and home.

Rural Supply in Bedford.

In regard to Bedford Corporation's scheme for the development of supply in rural areas near Bedford, the Development Commissioners recommend to the Treasury that, for a period not exceeding ten years, advances, free of interest, be made from the development fund to Bedford T.C. within a total of £6 000, of such sums as may be required to meet 75% of the actual annual deficits (if any) as certified by the Electricity Commissioners, on the working of the scheme; the repayment of advances from the development fund to be a first charge on the surpluses arising from the working of the scheme.

BOURNEMOUTH WINDOWS.





AMONGST the attractions at Bournemouth last week were the windows of the local electrical contractors. That of Messrs. Edwards & Co., is seen on the left, with that of Mr. A. R. Wilson on the right. Another Bournemouth window may be seen on page 23.

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THE HIGH TENSION CONFERENCE.

The Use of Wood for Transmission Poles—Finnish Practice—The Calculation of Lines with Fixed and Chain Insulators—The B.E.A.M.A. and Overhead Transmission.

By THEODORE RICH, A.M.I.E.E.

(*Concluded from Vol. CII, page 781.*)

TOWERS AND CONSTRUCTION OF WOOD FOR LINES AT HIGH TENSION. By KARL STROMBURG, of Helsingfors, Finland.—The author described the use which has been made of wood with lines at 50 and 70 kV in Finland; most of the lines in that country at 35, 70 and 120 kV are made with steel supports. In 1920, during the financial crisis after the war, it was difficult to get firm offers for steel supports.

Finland itself has but little resources regarding iron and steel, such materials having to be imported, but it is very rich in wood and granite. The engineers of a power company, the Société Sydfinska Kraftaktiebolaget, designed supports not merely for normal runs, but also for long spans with high supports for crossing the Gulf of Perna. Fig. 1 shows a normal line support for 70 000 V put up in 1924. The main posts are 15 metres long (about 49 ft.) and about 8 in. diameter at the top; they rest on blocks of granite on solid ground and on timber frames covered with moss on wet bogs. The structure is cross-braced, and stayed on each side with wire stays with four-tons breaking strain; the cross-iron is of profile steel, well tarred. At angles the posts are stouter and extra stays are used; they are earthed and fixed to cement blocks, the posts are creosoted, and the tops of the posts are protected with plate metal. At a point about fifty miles from Helsingfors some long spans have to be tackled, in two cases across a navigable channel where the clearances in summer have to be 30 and 26 metres respectively. In winter, when the channels are blocked with ice, 8 metres is allowable. The construction used for some intermediate towers is shown in Fig. 2, counterweights being used to keep the tension to the amount desired. Fig. 3 shows a wood tower 46 metres high, for six conductors, 70 mm² and one earth wire, the maximum span being 522 metres. To make vertical joints a pole has its head driven into the bored out base of the one above it and bolted. The joints and cut ends are creosoted; the feet of the supports are on concrete foundations, the iron-work is tarred. Every three years the supports are inspected and covered with preservative.

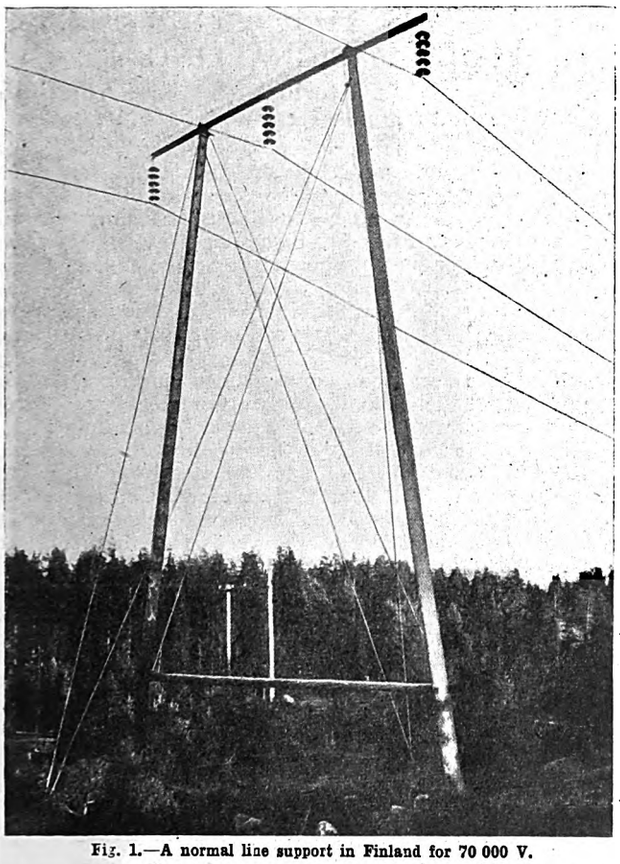

Fig. 1.—A normal line support in Finland for 70 000 V.

CALCULATION AND CONSTRUCTION OF LINES.—Senor SILVA, of Turin, contributed a study of the calculation of transmission lines with fixed and chain insulators, with special attention to supports at different levels and of cases where there is a breakage of a conductor on a line supported by chain insulators.

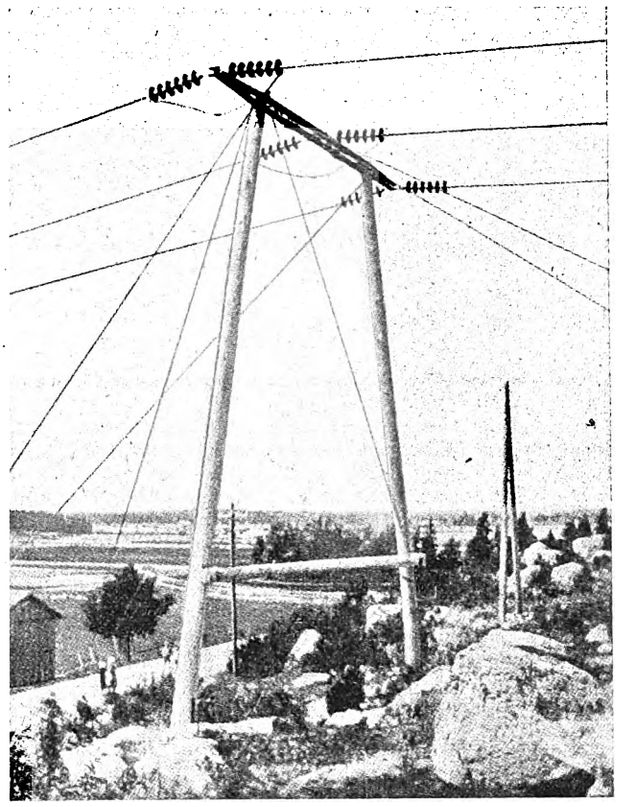

Fig. 2.—One of the intermediate towers used in Finland.

M. MATEESCU, of Bucharest, gave a report on the unification in different countries of the calculation of supports and conductors for overhead lines. He contended that the proper way to deal with the varying diameters under assumed atmospheric conditions was to calculate for the breaking strength with exceptional conditions, and not to use factors of safety with calculations that gave widely different stresses for conductors of different diameters. It is curious that in England and Sweden, both countries situated in Northern Europe, 50° C. (122° F.) is taken as the upper limit of temperature, whereas in Belgium, Germany, Russia, and Poland +40° C. (104° F.) is found to be sufficient. There are great variations regarding minimum temperatures. Switzerland and Germany have —20° C., without ice or wind, Austria —25° C., Poland —30° C., and Sweden —50° C., also without ice or wind. Norway has —25° and ice, Denmark —20° C. and a strong wind, Belgium —15° C. and moderate wind.

Factors are also given comparing wind pressures. The question of ice loadings is of interest. In Roumania experience shows that in that country ice is more likely to be found with a cold wind on the plains and in the form of soft adherent soft sleet in situations protected from wind. Some notes on ice thicknesses are given, and arguments regarding the chances of simultaneous ice and wind are discussed.

Messrs. W. B. WOODHOUSE and E. B. WEDMORE presented a report on the work of the B.E.A.M.A. on overhead lines, tests being based on the paper read before the Institution of Electrical Engineers on the same subject.

In the discussion on a group of reports, M. Van COWENBERGH pointed out that with chain insulators if a line breaks, then on swinging back the minimum distance to ground is materially lowered, and if the slip is taken into consideration, the matter may become very much worse. The question is,

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should the towers be raised so as to keep within their rules under such circumstances. It was an important matter to keep costs within reasonable limits.

Senor SILVA said that on one occasion when crossing another power line with a line at 240 000 V, as a means to comply

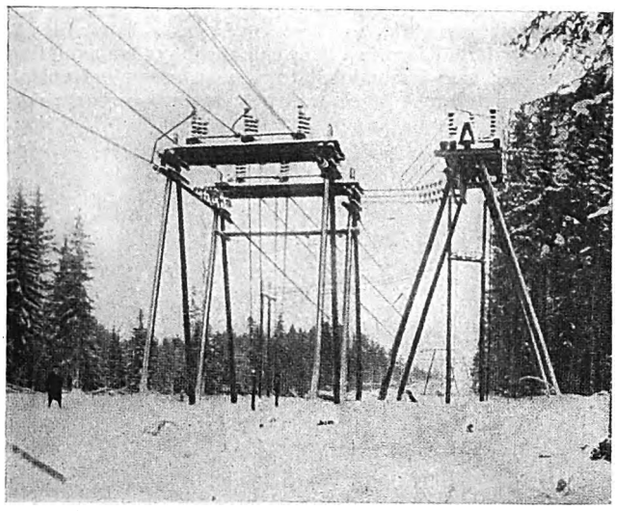

Fig. 3.—A wood tower for six conductors, with a maximum span of 522 metres.

with stipulations, he had arranged an extra insulated and suspension span to keep the line up should it break.

M. SULZBERGER (Switzerland) said that instead of stipulating a factor of safety, it was best to stipulate that after a certain point the strain should not exceed certain quantities for certain sections. Regarding strengths of post, the Postal and Telegraph Authorities had carried out tests on matters relating to pole strengths and foundations. It had not been found advantageous to couple poles. With all the artifices and bolts which had been tried, the results in strength were not nearly as much as those anticipated originally. It was a difficult matter to calculate the factor of safety of pole foundations.

Mr. WEDMORE said that further researches are taking place regarding the strength of foundations in clayey and sandy soil.

A provisional general report on the work of the Cables Commission was given by J. G. BELLAAR-SPRUYT. At the 1923 High Tension Conference Messrs. Smit Kleine, Proos and Van Staveren dealt with the dielectric loss tests of cables, and this paper with others resulted in a very animated discussion.

The 1925 Conference asked the Dutch National Committee to make an international inquiry on the subjects on the tests in vogue in different countries regarding high tension cables. In 1926 a circular was sent to the official delegates of the 1925 Conference concerning current tests and proposed modifications. Among the new methods proposed were the examination of dielectric losses as customary in Holland; the raising of the test voltages; an examination under continuous current at a multiple of the normal pressure, and the determination of the curve of duration before puncture was suggested by Signor Soleri. The replies coming from fifteen countries showed that, in general, existing tests were considered to be insufficient, most authorities considering that it would be best to combine the loss test with that of the duration for puncture.

At the 1927 Congress it was decided to have a Commission on the subject, and thirty-seven gentlemen agreed to take part, coming from a number of countries, Mr. B. L. Goodlet (of the Metropolitan-Vickers Electrical Co.), Mr. L. C. Grant (of Messrs. Merz and Maclellan), and Mr. T. N. Riley (of Standard Telephones and Cables Ltd.) being British members of such Commission.

A small preparatory committee was first nominated. A sessional meeting took place in January, 1928, at which time M. Van Staveren gave particulars of investigations carried out by the Association of Directors of Power Enterprises in Holland during 1927. Some of the cables forming subject-matter referred to in the report were some that had given trouble in service, although they had been able to support tests of triple voltage for a quarter of an hour. It was precisely the insufficiency of the tension tests which had led the Dutch Association to develop the system of dielectric losses tests; not only had those which had given trouble given evidence of ionisation, but those which had been satisfactory had given no evidence of ionisation, thus showing the value of such tests.

TENSION TESTS.—The international prescriptions in this direction commenced by a project of M. Van Staveren, making the tension test 2·5 times the service tension for a quarter of an hour; for each method of connection this value being proposed to cover the over tensions of two to three times normal with neutral earthed and three to four times this value without earthing. The preparatory committee declared itself in accord with this starting with 10 000 V, below this value the proportion being raised in accordance with the proposals of Signor Soleri.

DIELECTRIC LOSS TESTS.—There were variations of opinion on the subject of loss tests, but, as proposed to the I.E.C. by the Italian National Committee, it was decided to use only two tensions corresponding to a potential gradient of 800 and 4 000 V per mm thickness; although M. Delon proposed a test on a short length of cable, during a long time, for example, fifty hours, and also at a high tension of, say, three times normal.

Experiences in Holland showed that the behaviour at higher tensions did not give a satisfactory indication of service value, that is why the dielectric losses tests as a function of tension and temperature were proposed. The question of puncture tests as related to the test time was discussed, but the matter is still under consideration.

Regarding bending tests, five times normal voltage for two minutes was proposed, the length of the sample and the temperature during test was discussed; the question of capacity and insulation resistance tests at low tension was looked into, tests made by the Dutch Electrical Managers' Association showed that above 45° C. (113° F.) the dielectric properties of cables change. The activities of the preparatory committee of the International Cables Commission are still concentrated on arriving at a satisfactory conclusion

RAILWAY SIGNALLING.

Discussion at I.E.E. Informal Meeting—Abolition of Manual Signals Retarded by Cost.

AT the final informal meeting of a session notable for excellent attendances and discussions upon a very wide range of subjects, held at the Institution of Electrical Engineers, Mr. M. G. Tweedie opened a discussion on "Power Supply and Railway Electrical Signalling."

Mr. TWEEDIE confined his remarks to the control of the movements of steam trains on the main lines, for there the problems were peculiar and formidable; on electric railways there was unlimited current and transmission presented no difficulty.

He exhibited a number of lantern slides showing diagrams of connections of the elaborate relays, signal locks and lamps which have the responsibility of directing or holding trains. This vital apparatus must be of the finest quality and reliability, and it was the cost of this apparatus, together with that of the connections and transmission wiring which retarded the abolition of manual signalling. The current required for signalling services was very small, was not an important load for a supply authority, and the cost of transmitting current to the site was often more than the cost of wet cells, though these occasionally amounted to 1 000 Ah or more at 6 V.

In the discussion Mr. G. H. CROOK said the principle and practice of electric signalling was established and he looked forward to the time when supply would be more general, so that its use where wanted would be less expensive.

Mr. W. E. LANG observed that the signalling load was inconsiderable, while the cost of the apparatus was high. That railways have adopted electric signalling must have the justification of efficiency or ease of maintenance.

Mr. A. MORGAN pointed out that the fundamental principle of railway signalling was that a failure of the controls produced a stop warning and means safety. With industrial apparatus the push button and ordinary control gear was on the opposing principle and was surely wrong. He felt that the relative immunity of Britain from railway accidents had retarded the adoption of electric signalling because the cost factor operated.

Messrs. J. Coxon, W. A. Erlebach, H. W. Gregory, S. B. Jackson, E. S. Ritter, J. F. Shipley and W. L. Wreford also spoke.

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BONAR LAW MEMORIAL.

Interesting Equipment at Training College of Conservative Party.

THE property at Ashridge, presented last year to the Conservative Party by the late Mr. U. H. Broughton, M.P., to be used as a training college, has been converted by Messrs. Trollopes under the direction of the architect, Mr. Clough Williams-Ellis, and the electrical work, with which we are mainly concerned, was designed and carried out by Messrs. TYLER AND FREEMAN, of 40, Chancery Lane, London, W.C.2.

The supply is taken from the Chesham Supply Co., whose 6 000 V mains are brought into a special sub-station in the outbuildings, where 200 kVA three-phase transformers have been fixed, with suitable h.t. switchgear. A loop main has been brought in, so that eventually the supply can be taken from either side of the ring main. The internal distribution is at 230/400 V, 3 phase, the neutral point being earthed in the sub-station. On the l.t. side each transformer is controlled by a 300 A t.p. isolating switch of Johnson and Phillips' make, arranged so that the transformers can be run in parallel if desired. Although the connected load is nearly 400 kW it is not expected that the actual load will exceed 200 kW, and normally only one transformer will be in use. Connections run from the isolating switches to the meters and on to a 500 A t.p. main circuit breaker to control the entire installation with overload, no voltage and leakage trips and leakage indicator. This also is of Messrs. Johnson and Phillips' make, of their standard oil immersed pedestal type. The main distribution board is of Messrs. Parmiter, Hope and Sugden's make, of standard iron-clad unit construction. Three-phase circuits are run to the house for the lighting, cooking and heating loads, and d.p. circuits run to supply the local lighting and power and heating loads in the adjacent cottages, laundry, garages, etc. All these outgoing cables are 2, 3 or 4 core paper insulated, lead covered and armoured, of Henley's make, and range in size from 37/·072 downwards. In the house three main distribution points have been arranged for lighting, heating and cooking respectively. At each the 3-phase supply is divided up into 3 d.p. systems, each controlled by a main switch and main fuse board, with sub-mains and sub-fuse boards as required to suit the varying loads. All these main switches and boards are of William White make, of their standard ironclad H.O. type. The main cables are run in screwed tubing with 600 megohm C.M.A. cable, but from the boards most of the circuit wiring is Henley lead-covered.

The lighting installation provides for about 800 lamps, and there is an extensive system of two-way and intermediate switch control necessary, due to the various separate staircases and connecting corridors. The special fittings made up largely to designs of the architect have been supplied by Messrs. Gillman and Jones. The whole of the cooking (except a small reserve coal range in the house and two small coal ranges in cottages) is carried out electrically, the apparatus being of the General Electric Co.'s manufacture. The main kitchen equipment includes a large 4-oven island range; a 2-unit grill; a 2-unit fish fryer; a 2-oven pastry cooker; an 8-plate boiling table and various large tea urns, water boilers, etc. There is also an extensive range of auxiliary apparatus supplied mainly by the Washing-up Machine Co.

Heating points are also wired in most of the principal rooms, and a large number of electric fires of various sizes and types have been fixed. These also are of G.E.C. make. The main heating installation, carried out by Messrs. Beaven and Co., is oil fired, and the entire automatic control of this is electrically operated. The laundry has been equipped by Messrs. Manlove, Alliott and Co. An automatic telephone system has been installed. The exchange instruments were supplied by the Relay Automatic Telephone Co. Gillett and Johnston electric clocks and a mains operated Metro-Vick wireless installation, with an Amplion loud speaker, are also comprised in the equipment.

THESE pictures show the equipment installed at Ashridge House, by Messrs. Tyler & Freeman. The two top photographs show part of the main wiring and switchgear, whilst the lower views are of the kitchen, showing (left), the 4-oven island range, alongside the old-fashioned spit, and (right), the boiling table, fish fryer and double grill.

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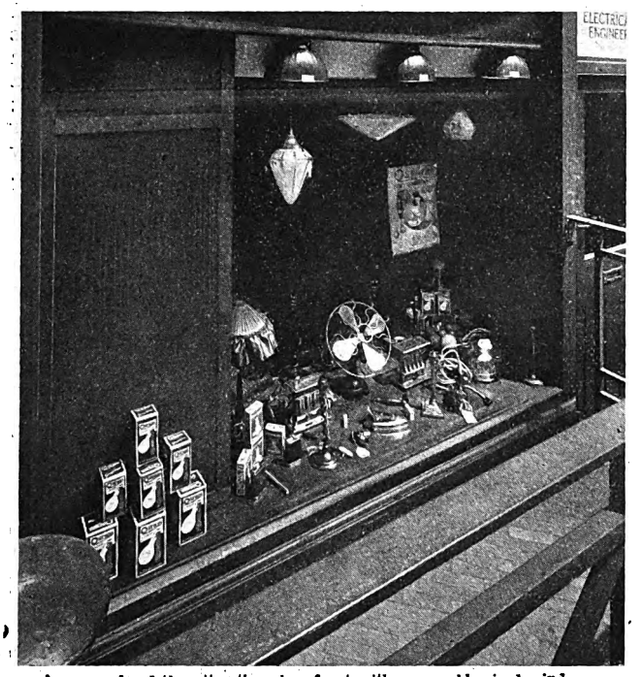
THE SHOP-FRONT AS AN AID TO INCREASED TRADE.

Points Specially Studied from the Aspect of Supply Authorities and Electrical Contractors—Opportunities in New Building Areas—The Employment of Specialists—Shop Fronts and Their Surroundings.

By A. EDWARD HAMMOND (Author of "Shopfitting and Display" and "Practical Aids to Retail Selling").

MANY electrical contractors adopt a policy of *laissez-faire* in regard to their shop-fronts. Their business provides them with a living—perhaps an indifferent, or possibly a very "comfortable" one. They are well known in the district, probably actively interested in local affairs. They give good service, and sell just the class of electrical fittings that the local people seem to want. What more could they ask for?



An example of the attractive shop front with reasonably-sized windows. (Mr. Alfred F. Roffey).

A new shop-front would, of course, be very nice if they could afford it; but, in present circumstances, it would be a luxury beyond their needs. Besides a new shop-front, however striking and attractive, would not bring more trade if it were not there to be brought. The man with a small lock-up shop, either in a populous thoroughfare or in a side street, who has no local reputation upon which to rely, takes up an equally sceptical viewpoint; but an inspection of his windows, in which the same dust-covered shades and fittings appear sometimes for a month on end, gives one the impression that it is more through indifference than from a studied policy on the matter that he neglects the appearance of his shop exterior.

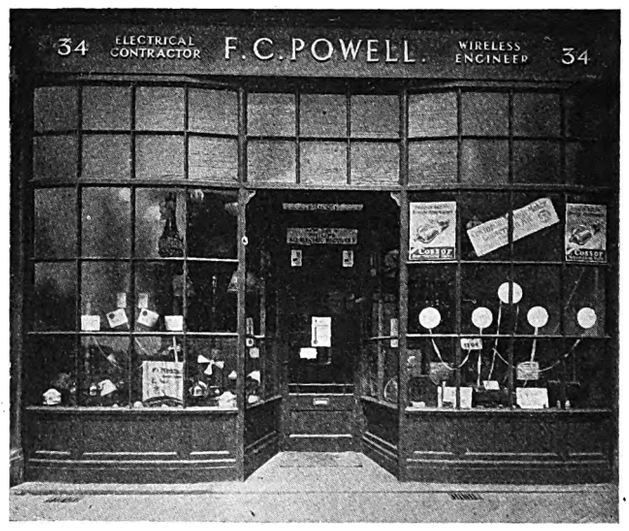
Thus these good people argue. Some contractors, while realising the shortcomings of their present premises, plead an inability to effect any improvements, on financial or other grounds. For them half-way measures may have to suffice, but that is better than doing nothing. Others regard their inconveniently arranged shop-front, with its small windows and its two steps leading up into a narrow doorway, as a definite factor in attracting trade. They point out that local people are used to it, and would not like to see a change because it would break one of the old associations of the district. Perhaps they take the local residents' affection too much for granted.

Now it must be admitted that there are shops with a definitely old-style atmosphere which forms a part of the sales policy of the business. People—and particularly visitors—do visit them because of, and not in spite of, the fact that they are old-fashioned; but these shops must have a character of their own, which will enable them to withstand the competition of the new and essentially modern premises which spring up around them, and the electrical contractor must not overlook the fact that many premises which are visited because of their antiquity are kept in a perfect state of repair, a process which often costs more than the straight-forward scrapping and modernisation method, for the renovation of ancient buildings is a specialised work to which experts have devoted considerable attention during the last year or so.

One realises that there are many influencing factors which attract customers besides the shop-front and window display. It will not be necessary to emphasise to small contractors the advantages in the shape of modern premises which many local electricity supply undertakings can offer—improved facilities for customers and so on; but the fact remains that those large concerns which are drawing customers by the aid of improved service are, almost without exception, employing modern shop-fronts. They realise that even the customers who are anxious to save a few shillings, or a few pence, as the case may be, generally exercise a certain amount of discrimination as to the nature of the surroundings in which they make their purchases.

The small contractor who feels disposed to clasp his hands and say: "What's the use?" might well look to his own shop exterior to see if he is doing his utmost to impress passers-by with the attractiveness of the retail side of his premises. There are ways and means of brightening a shop exterior without necessarily going to the expense of an entirely new frontage. If the fascia is of the out-of-date glass-fronted, incised variety, the whole shop-front might be smartened up by its replacement with one of the neat opal glass name-plates, with bronze or dark oak lettering. If the window has a straight run of plate glass from stall-riser to fascia, the contractor would considerably improve its appearance by the introduction of an imitation transome in the form of a strip of the specially glazed paper which so realistically represents leaded lights, or, alternately, by employing a fairly deep pelmet.

There are still many electrical contractors in a small way of business who seem to think that the renovation of the shop-front or the erection of a new one, is merely a job for the local decorator; but a close study of the needs of the one-man business has been made by many of the firms specialising in shop design, and the small contractor, no less than his bigger competitors, has ample opportunity for consulting the specialist as to the most economic and attractive treatment for his shop-front.



The bow-fronted, square-paned windows of Mr. F. C. Powell.

The tremendous building activities, and the rapid growth of the residential districts has brought about an increase in the need for electrical supplies, and, in spite of the activities of the local electrical authorities, it is interesting to note that the number of contractors with small shops continues to increase in many districts.

"Competition is good for trade," is a truism to which, applied in moderation, there is no exception even in the electrical trade, and the practice of the electrical authorities

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in employing specialists to design and erect their shop premises should have the effect of waking up many of their smaller contemporaries to the possibilities of, or, rather, the necessity for, keeping their premises both up-to-date and attractive in appearance.

One difference between employing a specialist on the job and in calling in a builder and decorator who carries on shop-fitting as a side-line is that the specialist, by long training and experience, has an intuitive knowledge of the value of space. He will probably take longer in measuring up and planning, but the result will reveal the skill which has been applied in avoiding unnecessary angles and corners, and in ensuring that the maximum amount of room is available for display purposes.

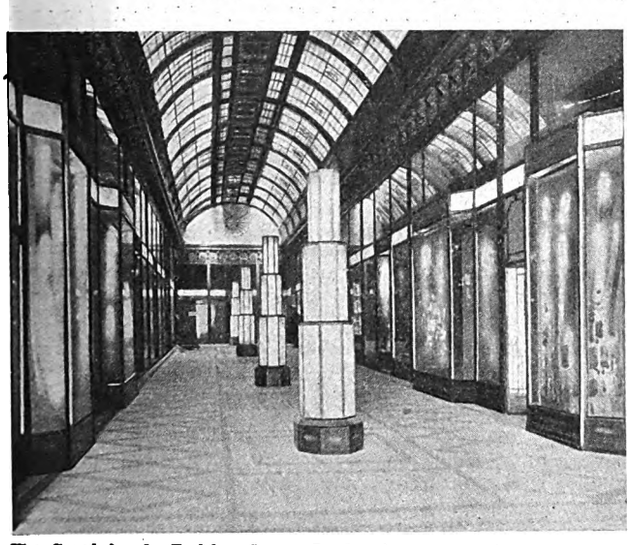
The architect is becoming more and more a vital factor in shop-front design and construction, and it is essential that he should work in close touch with the shopfitters, the metalwork producers, and the ventilating and flooring specialists. The construction of a modern shop calls, indeed, for the employment of specialists in all directions, but, fortunately for the contractor, he is not under the painful necessity of consulting each of them in turn. It is for the shopfitter to carry out this part of the business.

Although it should blend with its surroundings, it is not always advisable that the shop-front should be erected on lines which show a too close adhesion to the design of the remaining parts of the façade, especially if a bold, wide architrave is employed with pilasters in the same material, and in similar proportions. Such a treatment enables the shop-front itself to be carried out on modern lines, more or less corresponding to the building to which it is attached, without necessarily conforming to the architectural style and design in all its details.

A shop-front to be successful to-day must be entirely in keeping with its surroundings. The cathedral city hardly calls for modernist façades, nor is the period frontage generally suited to a shop in juxtaposition to entirely or even partially modern buildings.

In certain districts neither the modernist nor the period shop-front would harmonise with its environment. In a side street away from a shopping centre, or in a run of shops surrounded by stereotyped villas, a medium type of shop-front architecture, with no outstanding characteristics in design, would generally be more in keeping with immediate surrounding buildings.

At the present time public interest is being aroused in the efforts of bodies which aim at the preservation of both historical architecture and rural beauty to check the growth of inharmonious building, and to control outdoor advertising

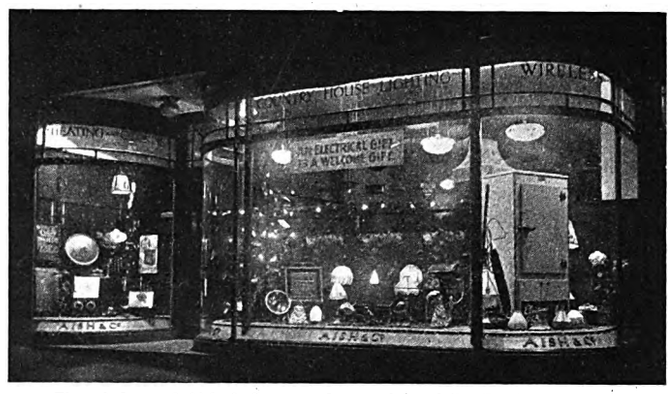


The Grand Arcade, Trafalgar Square, London, is a permanent advertisement of the value of light.

and commercial developments in the æsthetic interests of the nation as a whole.

Shop-fronts have received their share of criticism as well as posters and petrol pumps; but the electrical contractor is fortunately in a position to remedy the situation by placing his shop construction and renovation in the hands of specialists whose object it is to produce worthy exteriors for retail premises.

Arcades are becoming increasingly popular in shopping centres. Such sites provide many advantages for the electrical contractor, not only from the point of view of prominent position, but also in that, being well lighted, they give him excellent facilities for display. Both the new arcade in the municipal buildings at Nottingham and the Grand Arcade, Trafalgar Square, London, are permanent advertisements of the value of light, and would enable the electrical contractor who opened a shop in such surroundings to practise what he preached by showing his sales articles under the most modern lighting conditions.



The windows of Aish & Co., seen by members of the E.C.A. Conference during their stay in Bournemouth.

Light forms a prominent feature of the decorative part of both these arcades. In the Grand Arcade in London, a series of "Pillars of Light" occupy prominent central positions for the full length of the arcade. Both these and the illuminated surrounds of the shop-fronts are of translucent glass panelling lighted from the back. The effect of the lighting, however, is slightly marred by the fact that the actual sources of the light can be seen through the glass. A slightly thicker or more obscured glass would probably have prevented this and produced a softer illumination.

The new shopping way in Nottingham is "T" shaped in form, of ample width and unusually lofty dimensions; the barrel roofs are 60 ft. high, and at their intersection form the main dome feature, with an inner dome rising 90 feet above the pavement. This arcade contains on either side a series of high-class shops, which are faced in Bath stone with black marble bases, the shop-fronts being skilfully treated in bronze.

The illumination of the shops, the designing of which is left in the hands of their respective tenants, will supplement the arrangement of floodlighting by sixty-eight reflectors concealed behind the tall Greek vases arranged on each side of the arcade along the projecting masonry above the shop fascias. These reflectors are intentionally fitted with lamps of only a moderate wattage, in order to give a more subdued tone, thereby obviating any suggestion of competition with the necessarily greater degree of brilliancy required in the lighting of the shop windows.

Two interesting examples of contractors' shop-fronts are shown among the accompanying illustrations. That of Mr. Alfred F. Roffey (268, Vauxhall Bridge Road, London, S.W.1) is an excellent demonstration of how an attractive shop-front with a reasonably-sized window may be constructed on a building not originally intended for trade purposes. The shop entrance and the display window are partially below the level of the pavement, yet everything in the window can be seen clearly by passers-by. The window itself has an essentially up-to-date setting, comprising panelled backgrounds and a parquetry base, and the displays arranged in this window with its quaint green shop-front and green railings in front might be taken as an example by many contractors with larger and more conveniently built premises.

The shop-front of Mr. F. C. Powell (34, Church Road, London, S.E. 19), is a relatively new one, and has several old-style characteristics which give it a certain touch of intimacy not unsuitable for premises in which electrical household equipment is sold.

The windows are bow-fronted, and, instead of the usual unrelieved expanse of plate-glass, are divided into square panes set in wooden frames. The whole front is in wood with a grained finish. The lettering on the fascia is of gilt shaded red, and the section above the transome rail is glazed in semi-transparent fluted glass.

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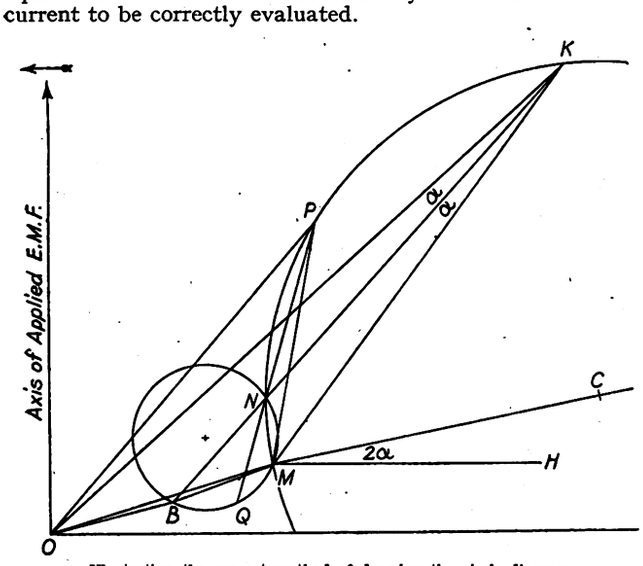
THE CIRCLE DIAGRAM OF THE INDUCTION MOTOR.

An Improved Graphical Proof of the Circle Diagram of Polyphase Induction Motors—A Simple Description of the Method Used—Motors Operating with Phase Advancers.

By LAURENCE H. A. CARR, M.Sc.Tech., M.I.E.E.

AN improved graphical proof of the circle diagram of the polyphase induction motor has recently been published by the author ("Journal I.E.E.", Vol. 66, p. 1174, November, 1928), its principal feature being that it enables the rotor equivalent current line to be correctly drawn and the rotor current to be correctly evaluated.



Illustrating the correct method of drawing the circle diagram.

It is therefore thought that a simple description of the method, omitting the somewhat lengthy proofs, will be of service to many of those who wish to use this correct method of drawing the diagram.

The proof states that if OM and OK be the magnetisation and short circuit currents respectively, there is a vector OB giving the magnetising current at short circuit, *i.e.*, the component of OK driving flux across the air gap at short circuit, which is of the order of half OM, and a vector BK the rotor equivalent current at short circuit.

The values of OB and BK may be determined by symbolic calculation if all the constants of the motor be known, but if not, as is usually the case when dealing with test results where only OM and OK are known, the point B may be found by bisecting the angle OKM and cutting off the length $BK = \sqrt{OK.\ MK}$.

Although this method is only approximate, the position of the point B found in this manner is usually almost indistinguishable from its position if determined by the full symbolic method.

The centre of the circle C, lies on a line MC, making an angle CMH with the horizontal MH, which is equal to the angle OKM.

Alternatively, the old rule of bisecting the vertical intercept between the point M and the line OK, and using the bisecting line as the horizontal axis of the circle, may be used, since it gives identically the same result.

If then any point P be selected on the circle with stator current OP, the rotor equivalent current is not MP, an approximation made by some writers, but is a line QP, which bears exactly the same relation to MP both for direction and magnitude as BK does to MK.

Hence, in order to determine rotor equivalent currents, it is only necessary to measure MP and to multiply this value by the ratio BK/MK.

It may be noted that with low values of short circuit power factor, the ratio BK/MK is approximately equal to

$$(OK - OM/2) \ / \ (OK - OM)$$

while if the short circuit power factor is higher than, say, 0·25 the same equation may again be used as an approximation, provided that the subtraction is done vectorially.

The line QP, therefore, need not be drawn for its value to be determined, but if a series of lines QP be drawn for information it is found that they have the two following properties:

(i) All lines QP (or QP produced) cut the circle in the same point N, which is the point where BK cuts the circle, and which also forms one end of the horizontal diameter of the circle.

(ii) The locus of the point Q is the circle which passes through N, M and B, in which the arc MQB is found to be similar to the arc MPK on the main circle.

The principal other point which arises from the proof quoted is that for any stator current OP the equivalent slip ring voltage at standstill is KP, where KB is the slip ring voltage calculated from the transformation ratio corresponding to the numbers of turns, winding factors, etc.

This enables starter volts to be correctly determined, while inherent in the above statement is also the fact that with open circuited rotor the slip ring voltage measured will be KM/KB times the theoretical "transformation ratio" voltage.

It also follows from the proof that where the point P is not on the circle, as for instance, in the case of a motor operating with phase advancer, the same law with regard to rotor current is true, that is to say, the rotor equivalent current is still BK/MK times the line MP.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

The Menace of the Amateur.

[To the Editor.]

SIR,—Your correspondent "Experto Crede" pays me a compliment in your issue of June 21st in reference to my efforts for "the elimination of the unfit in contracting," but, in his opinion, not enough attention has been given to what he terms "the menace of the amateur."

First of all, let me say how much I welcome the contribution of "Experto Crede," because it is a direct and valuable help to my efforts in connection with "the need for compulsory registration," "the elimination of the unfit in contracting," etc., etc., that I have been writing about in your columns for some considerable time.

Several of the photographs that have illustrated my articles have been of work carried out by amateurs, although the majority of them are of work executed by so-called electrical engineers.

I have pointed out the terrific risks that will be run, when the "grid" gets in operation, if wiring work is going to be carried out by anyone who cares to style himself an electrical engineer, irrespective of his qualifications, training, etc.

If "Experto Crede" has read all my articles and studied all the photographs illustrating same, he should have seen how I have repeatedly pointed out the dangers that exist when house wiring or any other wiring is carried out by the "amateur," "kerbstoner," and all other such incompetents, posing as electrical contractors and electrical engineers.

I am convinced that it ought to be a punishable crime for anyone to style or call himself an "electrical engineer" who has not got the necessary qualifications, as this class of person is an imposter of the worst kind.

I fully realise that the "menace of the amateur" is real, and I have realised this for some time, just as much as I realise that the unfair competition of the "kerbstoner" and other incompetents is real.

Having, however, realised these dangers, what are *we* to do about the matter? Under existing conditions at the present time, we, as contractors, cannot do much as an individual organisation, but with a National Register fully representative of *all* the best that exists in the contracting section of the industry, can do a great deal.

Nor is this all, as I am more convinced than ever that a more representative register will receive the hearty co-operation of other sections of the industry and particularly the supply and manufacturing sections.

"Call in an electrician" is not a proper slogan to use at the present time, for the simple reason that thousands of

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nincompoops are posing as and calling themselves electricians, who have no right to such a name or title.

If the name I coined some time ago in connection with the competition in your paper, and for which competition, by the way, I won the prize, was adopted, and the name "Registrician" be registered and only allowed to be used by registered electrical contractors, then the slogan "Call in a Registrician," would be of some value.

This is where safeguarding would come in, and goodness knows, we in the contracting trade want some measure of safeguarding, either by means of a protectionist name such as I have mentioned, or a government measure to confine electrical wiring work to those firms who are recognised members of such an organisation as the E.C.A., or are members of the National Register.

The sooner the "trade" is protected, the sooner will the public be protected against "the menace of the amateur," against "the danger of the unfit in the contracting business," and in general against all the incompetents and imposters that are a blight and a positive danger in the electrical world of to-day.

One further word, "Experto Crede," let me have your help —don't let your pen go rusty. I am "all out" for anything and everything that will protect our section of the industry, because I fully realise that a healthier contracting section will be beneficial, not only to the trade as a whole, but to the public who are our customers, and livelihood.—I am, etc.,

HARRY MOSS.

Bradford.
June 24th.

The Boiling Plate of Today.

[TO THE EDITOR.]

SIR,—The article in your issue of June 7th, by Mr. Stanley F. Bickell, entitled "The Boiling Plate of To-day," omitted to state that the "Superspeed" plate was my invention and is patented. I am, etc.,

ARCH. J. HOWARD,
Borough Electrical Engineer.

Taunton,
June 28th.

ILFORD EXTENSIONS.

New Plant at Ley Street and Goodmayes — Automatic Power Factor Regulation.

AN inspection of new plant and apparatus at the Electricity Works, Ley Street, Ilford, was made by the Mayor, Ald. G. Gunary, and members of the Electricity Committee, on Thursday. The occasion was also marked by the starting up of a new 1 500 kW auto-synchronous motor-generator and automatic power factor regulator, and the putting into operation of a 1 000 kW rotary convertor at Goodmayes sub-station by remote control.

The plant was designed and installed by Messrs. Crompton Parkinson, Ltd., and with respect to the automatic power factor regulator it is interesting to note that the increased number of induction motors installed (due to the development of supply undertakings) necessitates the careful consideration of low power factor and its unprofitable wattless current circulating in the mains. Messrs. Crompton Parkinson point out that each of these machines requires a magnetising current that lags 90 deg. behind the supply voltage so that a greater kVA input is demanded than is really justified by the kW or the mechanical effort of the motor.

The actual value of the magnetising current depends, to a certain extent, on the pole pitch and the radial air gap; it may be as small as 25% of the normal full load current, or (on machines having a very large number of poles of small pitch) it may be as large as 60% of the normal full load current. As the number of poles of an induction motor is equal to twice the frequency divided by the synchronous speed, high speed machines have a relatively small magnetising current.

When the power factor is low, the voltage regulation is adversely affected and the efficiency is impaired, affecting not only the generating plant but the entire system to which it is connected. E.g., if the power factor of a system is raised from 0·6 to 0·8 by the use of a Crompton Parkinson auto-synchronous motor, an existing feeder carrying a full load of 600 kW will, it is claimed, transmit an additional 200 kW without any increase in the size of the feeder or the generating plant, and, at the same time, the system will be relieved of idle currents or wattless magnetising currents due to the existing induction motors.

ELECTRICAL RESEARCH.

National Co-operative Investigation for the Electrical Industry.

RECOGNISING the national importance of the work of the British Electrical and Allied Industries Research Association representatives of all sections of the electrical industry have been in conference during the past few months and have prepared proposals to secure the future finances of the Association and extend its activities. These proposals will be submitted shortly to the industry and are strongly supported by a letter signed by leading representatives of electrical manufacturers, of authorised electricity supply undertakings, and others.

A copy of the letter has been sent to us, the contents of which are quoted below :—

"The British Electrical and Allied Industries Research Association has for the past eight years carried out a series of far-reaching investigations with results of great value to the country in general and in particular to all interested in the production, supply and use of electricity.

"The importance of this work is our justification for asking your attention at the present time to the Association and its prospects.

Objects of the Association.

"The main objects of the Electrical Research Association may be briefly summarised thus :—

"(A) To investigate matters affecting the proper utilisation of plant, apparatus and materials, with a view to greater reliability in operation and extension of useful life of such plant, leading to a reduction in the cost of electricity.

"(B) To investigate materials and methods used in the manufacture of electrical plant and apparatus, to develop improved and simplified methods of test for ensuring that materials reach a proper standard, and so secure the establishment of standards for performance which can be relied on by the manufacturers and users of plant and apparatus.

"Such investigations, it will be realised, benefit not only the makers of electrical machinery but all who use it, and not least those who supply electricity to the public.

"The Research Association was originally founded under the scheme of Research Associations developed by the Department of Scientific and Industrial Research, and has received from the Government financial support without which its work would have been impossible. This support has in accordance with the approved policy for Research Associations been on a diminishing scale and, under the present scheme, terminates next year.

"Meanwhile the demands on the Association by the industry are steadily increasing, and it is urgently necessary that it receive help on a more liberal scale than hitherto.

"While the Association has in the past derived its main support from the manufacturers, they alone cannot be expected to accept the responsibility of replacing the assistance hitherto accorded by the Government; hence we appeal to the manufacturers, the authorised undertakers throughout the country, both local authority and company, and consumers of electricity, who directly benefit in reduced expenditure from the work of the Research Association, to take their part in this necessary effort to obtain further financial support.

"Proposals as to a reorganisation to enable the work to be carried on and, if possible, extended, will reach you shortly. These have been drawn up by a representative Conference, and it is in connection with them that we ask, in your own interests as well as in the interests of the industry generally, that you will give their appeal your careful and sympathetic consideration."

The letter is signed by Sir John Snell, Chief Electricity Commissioner; Sir Andrew R. Duncan, Chairman of Central Electricity Board; Lt.-Col. K. Edgcumbe, President of the Institution of Electrical Engineers; Mr. A. Nichols Moore, President of the Incorporated Municipal Electrical Association; Mr. W. B. Woodhouse, President of the Incorporated Association of Electric Power Companies; Sir Harry Renwick, Chairman of the Provincial Electric Supply Association; Mr. J. Bailey, Chairman of Conference of Chief Officials of the London Electric Supply Companies; Dr. S. Z. de Ferranti, President of the British Electrical Development Association; Mr. V. Watlington, Chairman of the British Electrical and Allied Manufacturers' Association; Mr. Maurice Solomon, Chairman of the Cable Makers Association; Sir R. T. Glazebrook, Chairman of Representative Conference.

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NEWS IN BRIEF.

An Electrical Beauty—Engineering Wages—British Association Members Sail for South Africa—Rural Electrification—Electrical Training in Schools.

EALING T.C. has agreed to appoint an assistant mains engineer at a commencing salary of £250 per annum.

Paignton Electric Light and Power Co. is to provide strip lighting by means of 500 lamps on the Paignton sea front bandstand at a cost of £120.

The winner of the first prize, of £1 000, in the "Sunday News" beauty competition was Miss Dorothy Hustwitt, employed in the Sterling Telephone and Electric Co.'s works at Dagenham.

The proprietor of British letters patent No. 111 089, dated October 23rd, 1916, for "Electric welding machines," desires to dispose of the patent rights or negotiate for the grant of licences to work thereunder. Inquiries to Messrs. Mewburn, Ellis and Co., 70–72, Chancery Lane, London, W.C.2.

Wigan T.C. is to provide electricity showrooms in Standishgate, at an estimated cost of £5 500.

It is reported that electric light is to be installed in the Bodleian Library, Oxford, and that the work will begin during the vacation.

Hull Corporation Telephones Committee has accepted a German tender for 4 000 insulators at £83, which was £34 less than the lowest British tender.

The Science Sixth Form of Wellington College visited London on Tuesday to inspect the Holborn automatic telephone exchange, and were entertained at luncheon by the Telephone Development Association.

Mr. J. Farndale, chief constable of Bradford, informed the Bradford Rotary Club recently that the Corporation had now accepted his police box scheme, and the dozen police stations would be superseded by 100 police boxes.

At the annual conference of the Association of Teachers of Domestic Subjects, at Birmingham recently, Miss Hilda Shaw (staff lecturer, National Training School of Cookery), speaking on the subject of "Electricity in the Schools," said economy had too often been neglected in the past. Electricity saved time, labour and drudgery, but if the use of electrical appliances was not taught to children then the best use of the appliances would not be attained.

Lieut.-Col. E. P. Anderson says, in his report to the Ministry of Transport on the collision which occurred on the L. and N.E. Railway at Darlington on March 9th, "the accident is one which could have been prevented by suitably arranged track circuiting. A scheme for resignalling this station, which would embody this feature, had already been under consideration by the company before this accident, and will, it is hoped, be proceeded with. But I understand that arrangements are being made to instal at once track circuiting, which would prevent a recurrence of this accident, without waiting for the rest of the scheme."

The Summer Meeting of the Whitworth Society was held in Manchester during the Summer Meeting of the Institution of Mechanical Engineers. A donation from the Whitworth Society in the form of a cheque for £25, drawn in favour of the Manchester College of Technology, was handed to the Lord Mayor of Manchester, to be disbursed in the form of prizes to students who intend to compete for Whitworth Scholarships. The dinner was held at the Engineers' Club, Manchester, the chair being taken by the President, Mr. Fred H. Livens, Wh.Sc., who inducted into office the new President, Mr. William H. Fowler, Wh.Sc. The address of the hon. secretary of the Whitworth Society is: c/o Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *of July 5th, 1879:*

The electric lighting experiment at the Salon made portraits "look well," but with landscapes with grass and water the effect was "unpleasing."

When an electrical machine is in activity and giving strong sparks, the machine may be made to lose all tension if the red vapour of peroxide of nitrogen (N_2O_4) is allowed to escape into the space traversed by the sparks. This phenomenon was observed by M. Hempel.

* * *

Twenty-five years ago, THE ELECTRICIAN, *of July 8th, 1904, recorded that:*

The Bristol Electricity Department was using an electric launch for conveying passengers and goods between the Temple Bank and Avonbank generating stations.

* * *

Fifteen years ago, THE ELECTRICIAN *of July 3rd, 1914, announced that:*

The action between Marconi's Wireless Telegraph Co. and the Helsby Wireless Telegraph Co., with respect to infringement of the well-known letters patent No. 7777 of 1900, was being heard before Mr. Justice Eve.

An exhibition of electric lighting and cooking is open at the Old English Fair of the Hackney Rotary Club, and will close to-morrow (July 6th).

Ilford Electricity Committee has obtained sanction to borrow £5 000 for domestic apparatus to be let on hire. The borough Electrical Engineer and the Borough Engineer and Surveyor are to submit sketch plans of proposed new offices and showrooms at the junction of High Road and Clark's Road.

The first contingent of 170 men and women scientists who are taking part in the British Association's South Africa meeting at Table Bay left Tilbury for Cape Town on June 27th. The last contingent, including the president, Sir Thomas Holland, will leave to-day (Friday). Sir Oliver Lodge and Sir William Bragg are unable to go.

Herne Bay U.D.C. is considering a proposal to floodlight the grand pier pavilion and King's Hall.

A proposal to lay an additional telephone cable between Great Britain and France is under consideration.

A representative of Plymouth electricity department has been in attendance at Messrs. Spooner's departmental store for a week and has given cooking demonstrations in the store theatre and lectures showing the advantages of cooking by electricity.

An electrical exhibition organised by the Western Electricity Supply Co., Ltd., was held last week at Streatley. Mr. A. J. Bridge, development manager of the Company, explained the system whereby electricity was being extended throughout its area. He added that the new branch at Goring was under the management of Mr. E. Feltham.

Mr. F. M. Long, city electrical engineer, Norwich, said, in a paper read by him at the luncheon of the Norwich Rotary Club last week, on all farms a certain amount of power is required, and for this electric motors are especially suitable, not only on account of low first cost and economy in running, but because most of the operations are intermittent and with motors there was no time lost in starting up or in shutting down. Motors, too, could be put anywhere.

The Governing Body of Manchester Municipal College of Technology offers research scholarships under which research may be undertaken in the mechanical engineering, electrical engineering, chemistry (including electro-chemistry) and other departments. A limited number of such scholarships, tenable during 1929-30 and each of a value not exceeding £100, will be awarded in July, 1929.

Captain C. B. Platt, superintending testing officer, and Mr. G. A. Cutler, analyst, have reported to the Mines Department on an investigation made by them at the mines' testing station, Sheffield, of the safety of miners' electric cap lamps when the battery is short-circuited. They state that the danger to be apprehended from a short-circuited cap lamp battery is probably very remote, but an adequately designed fuse would eliminate an accident due to this cause.

On June 19th the Central Council of the Engineering and Allied Employers' National Federation were in negotiation with the representatives of over thirty trade unions having members employed in that industry on the subject of the claim of the unions for a wage advance of 8s. weekly all round to time workers and an equivalent advance in piece rates. The proposal on behalf of the employers to adjourn the matter till the end of the year was found unacceptable by the union representatives, and they agreed to report to their executives, and to reassemble on July 25th.

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PERSONAL.

SOUTHEND-ON-SEA T.C. has granted the borough electrical engineer, Mr. Robert Birkett, a further three months' leave of absence.

Sir John Gatti, who was chairman of the London County Council in 1927/28, has been presented with a portrait of himself by his former colleagues on the Council.

Ald. H. Lazarus has resigned from the London and Home Counties Joint Electricity Authority, and Coun. G. Groves has been appointed in his place, as representing Stepney B.C.

Basingstoke T.C. has granted an honorarium of £75 to the borough electrical engineer, Mr. F. Swarbrick, and one of £40 to Mr. Castle, for additional services in connection with extensions in the rural area.

Mr. C. W. Charlesworth, of Marconi's Wireless Telegraph Co., Ltd., has accepted an appointment with the Gramophone Co., Ltd. Mr. Charlesworth is a director of the Sterling Telephone and Electric Co., Ltd.

Mr. S. E. Fedden has been presented with an antique table and a pair of sportsman's field glasses by the employees of the Sheffield Electricity Department. Mr. Fedden presented the department's sports and social club with a pair of silver cups for competition in the tennis section.

Mr. Alexander D. D. M'Kay has been appointed head of the mathematical department of Dundee Technical College, in succession to Mr. W. Cooper, who recently received an appointment at Leeds Technical College. In 1921 Mr. M'Kay was appointed lecturer in pure and applied mathematics at the Royal Technical College, Salford.

West Ham T.C., in accepting the resignation of Mr. F. W. Purse, borough electrical engineer and manager, on his appointment as chief engineer to the London and Home Counties Joint Electricity Authority, has decided to present to him an illuminated testimonial on vellum, expressing the Council's high appreciation of his valuable services.

Mr. T. E. Eachus, superintendent of the Northern area of the North Metropolitan Electric Power Supply Co., who is leaving to become managing director of the Young Battery Co., Ltd., was recently presented by the staff at St. Albans with a walnut card table and a leather bound album containing the names of the subscribers from the company's undertakings at Harpenden, Hertford, Royston, Stevenage, and Welwyn, and the Overhead Line Department. Mr. Eachus has been with the company 24 years, 21 of which he has spent at St. Albans.

Prof. R. Stanfield retires at the end of this session from the professional chair which he has filled at the Heriot-Watt College with conspicuous success for thirty years. A desire has been widely expressed that this occasion should not be allowed to pass without some demonstration to the Professor of the high esteem in which he is held by the thousands of students and others who have benefited from his instruction and friendship during the long period of his connection with the Heriot-Watt College. A committee has been formed to carry this wish into effect, and the honorary treasurer will be very glad to receive and acknowledge subscriptions from present and former students and colleagues, and any others who would care to be associated with the testimonial. The exact nature of the testimonial will be decided later in consultation with Professor Stanfield, but it has been decided to make the presentation in October. It is, therefore, essential that all subscriptions should reach the honorary treasurer, Mr. Wm. Watson, Heriot-Watt College, not later than September 15th.

Obituary.

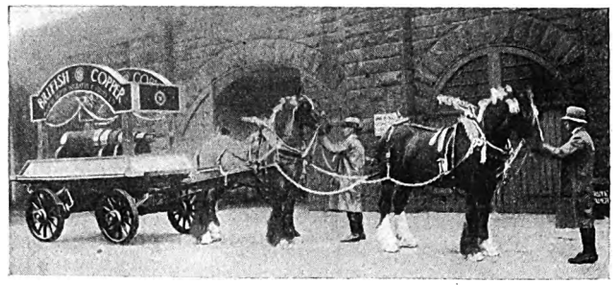
MR. RONALD MARSHALL, aged 56 years, formerly chief electrical engineer to Ayr Corporation. He was appointed burgh electrical engineer in 1903, in succession to Mr. A. Fuller, and he retired in 1923, when the undertaking was taken over by the Ayrshire Electricity Board.

MR. FRANCIS KENNEDY CASSELS, on June 18th, in his 70th year. Mr. Francis Kennedy Cassels was a pioneer of electrical industry in the Argentine, and was connected with that country for a great part of his life. He was educated at Percival House, Blackheath, Repton, and King's College, London. Between 1883 and 1900 he erected the first supply stations in the Argentine, at Buenos Ayres, La Plata and other cities. In 1908 he presented a scheme for the utilisation of the Iguasu Falls, and the transmission of power to Buenos Ayres, a distance of 750 miles. This scheme was not carried out, but it has recently come before the Congress again.

BUSINESS ITEMS.

THE address of the NORTH WALES POWER CO., LTD., has been changed to Artillery House, Victoria Street, London, S.W.1.

At a Horse Show and Parade of Tradesmen's Turnouts,



This team, entered by British Insulated Cables Ltd., in the St. Helens Horse Show and Parade of Tradesmen's Turnouts, was awarded a number of prizes.

recently held in St. Helens, BRITISH INSULATED CABLES LTD., who had entered a pair of horses and a decorated wagon, carried off four first prizes and one second, as well as winning the Shire Horse Society's Premium and Silver Medal.

The address of the HYDRONYL SYNDICATE, LTD., has been changed to Medway House, Horseferry Road, Westminster, London, S.W.1.

The address of the INDIVIDUALIST BOOKSHOP, LTD., has been changed from 84, Charing Cross Road to 53, Victoria Street, London, S.W.1 (Victoria 0850).

The CONCORDIA ELECTRIC WIRE CO., LTD., announces that new offices and stores will shortly be opened at 81, Milton Street, Sydney Avenue, London, E.C.2.

BRITISH INSULATED CABLES LTD., of Prescot, Lancs., have recently received orders for approximately 10 miles of supertension cable for overseas and 500 miles of steel cored aluminium strand for use on the English grid schemes.

The number of exhibitors at the Lyons International Fair, was 3 427, an increase of 65 over 1928, but a decrease in the number of foreign exhibitors. Amongst the principal industries represented were: metal manufacturers, 533 stands, and electrical trades, 126 stands.

DRAKE AND GORHAM, LTD., Rockingham Works, Newington Causeway, London, S.E.1, announce that Messrs. POOLEY AND AUSTIN, of 34, Broadway, Westminster, London, S.W.1, are their agents for the sale of e.h.t. and l.t. switchgear in London and the South Eastern counties.

BRUCE PEEBLES AND CO., LTD., Edinburgh, advise us they have appointed Mr. George E. Whitehead, of 102, St. Mary Street, Cardiff, as their representative for South Wales and the counties of Gloucester, Somerset, Devon and Cornwall, and that all arrangements have been made with regard to service in connection with existing plant, installations, etc.

TUNGSRAM ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., announce that the Manchester and district office, trade counter and warehouses, under the management of Mr. E. C. Thurley, are now at 9, South Street, and the Bristol branch, under the management of Mr. W. Weeks, has removed to 54/56, Victoria Street.

In conjunction with the Air Ministry, WIRELESS PICTURES (1928), LTD., are carrying out an interesting series of experiments. On Tuesday and Thursday between 2 p.m. and 2.25 p.m. synoptic weather charts are sent out from 5XX, and reports on the reception of these charts from as many different places as possible would be of value to those conducting the test. Any reader who possesses a "Fultograph" and is willing to co-operate can obtain a supply of prepared paper and envelopes, as well as full particulars of the reports required, by writing to Wireless Pictures (1928), Ltd., Dorland House, 14-16, Regent Street, London, S.W.1.

One of the season's most popular events is the R.A.F. Pageant at Hendon, this year to be held on July 13th. For the fifth successive year "Marconiphones" are being installed, and there will be nearly 60 loud speakers, 180 amplifiers, the last stage of which will employ five 32-power valve banks. The energy for the system is being provided by a motor generator giving 350 V and "Exide" accumulators aggregating 2 000 V, the total h.t. current being 6 000 mA at 350 V. The l.t. consumption will be over 350 A at six V. Twelve miles of heavy armoured cable will be buried for connecting thirty loud speaker positions round the aerodrome.

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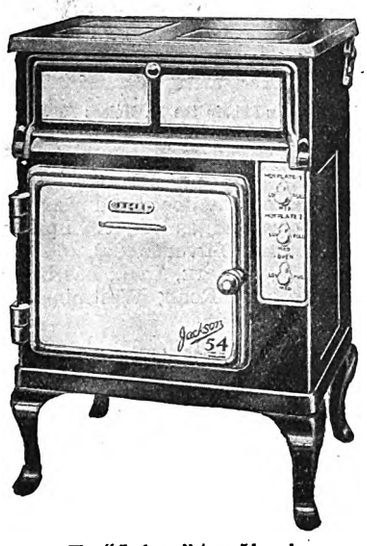
THE ELECTRIC COOKER TRADE.

Particulars of Some of the New and Improved Models—Designs to Suit Both Large and Small Requirements.

WHEN hot weather makes its re-appearance many will wish it were possible to get far away from their hot kitchens. If, however, the kitchen can be made cool, all is well, and in order to assist contractors in showing the public how easily this may be done, we give this week particulars of various electric cookers and allied apparatus.

Among newest cookers, the series of five recently put on the market by LANE AND GIRVAN, LTD., are worthy of notice. This firm, whose address is Caledonia Stove and Electrical Works, Bonnybridge, near Glasgow, have just added to their plant a "model" electrical factory, which is stated to be built and equipped on the most modern lines, so that standardisation and uniformity in design may be fully realised. Appearance is an important feature in the design of cooking appliances, and in "Caledonia" cookers porcelain enamel finishes predominate both inside and out. Lightness of outline is also studied, without strength being impaired. All parts are easily accessible and removable, and, where possible, corners, crevices and ledges have been avoided and rounded parts substituted. The oven interiors are provided with nickelled wire runners and can be automatically locked in position without fixing screws. Standard practice is for the inside of the oven to be porcelain enamelled, but plain finish can be obtained when price reduction is of paramount importance. Side and bottom heat is arranged for in the ovens, control and regulation being through one switch. The cool-grip door handle is stated to be the only handle that automatically takes up wear and ensures an adequately sealed door at all times. It is simple—comprising one casting only. Circular boiling plates, with pin and socket connection, are used. Earthing pins are included, and it is possible to adjust the level accurately by means of three adjustable screw pins. All boiling plates in Caledonia cookers are at present of the solid "Sadia" type, but Lane and Girvan, Ltd., are developing another solid type to interchange with the "Sadia." In these plates the resistance wires are welded into Monel metal pins, and the sockets consist of phosphor bronze laminated pieces.



The "Jackson" type 54 cooker.

The following are included among other electrical features to which the firm seek to draw special attention. All wiring is carried on porcelain insulators. The main terminal block is built on the unit principle to allow of wiring to any supply system. Switches are of the flush type, housed in a box at the side of the cooker. Either "Zed" or "Arctic" fuses are supplied, as specified. The grill element is arranged for heat regulation; for the radiant coils the reinforced type is chosen, to give long life. The oven elements contain coils working at low current density, and are said to be of specially simple design. It is stated all "Caledonia" cookers are tested on a 1 500 V flash test, as well as being heated up before leaving the works.

The Caledonia model 1554 is designed for households of six to eight persons. The overall size is 31 in. wide by 37 in. high by 22 in. deep, while the oven cooking space is 16 in. by 18 in. by 16 in. The total weight is 348 lbs. Total watts are 8 250, divided as follows: oven, 3 000; grill, 1 500; boiling plates, 2 000, 1 200, and 550 respectively. Two similar cookers are provided: one for households of four to six, and the other for smaller families, such as those living in the modern dwelling of housing schemes. The smaller of these two has only one three-heat boiling plate on the hob; the three-heat grill acts as top element in the oven, which in this model is not removable. The "Caledonia" domestic baking plate appears to be a most useful cooking appliance. It has been designed for the home baking of scones and similar table delicacies. The smaller plate, it is said, will bake half a gross of scones within an hour, with a consumption of less than a unit. This baking plate is finished in black enamel and has a bright polished top. The "Caledonia" breakfast cooker is designed so that grilling and boiling are possible simultaneously. When it is required for boiling only, an asbestos mat is inserted beneath the element to deflect the heat to the base of the utensil on the hob. For grilling only, the mat is placed on top of the hob.

A new cooker just brought out by THE JACKSON ELECTRIC STOVE CO., LTD., of 143, Sloane Street, London, S.W.1, is known as the "Overseas" model. It has been designed specially for export, and the firm hopes it will have a large sale in most of the Dominions. This cooker has an oven with cooking space 13½ in. high by 13½ in. wide by 15½ in. deep, loaded to 1 650 W and fitted with a drop-down door. The hob has a grill-boiling plate measuring 9 in. by 7½ in., loaded to 1 800 W, and two hotplates of the firm's latest pattern (No. 86). The hotplates are each size 8½ in. by 6 in., loaded to 1 500 W. All units are arranged for three-heat control, switches and fuses being fitted in the control space on the side of the cooker. A door of the drop-down type is fitted to the space between the hob and the top of the oven; the oven and the hot cupboard are both fitted with white panels, mottled grey, inside. The switch direction plate is finished in white vitreous enamel with black lettering. The Jackson No. 52 cooker supersedes model 19A. The oven has cooking space for three to four persons, and is loaded to attain a cooking temperature in about 20 minutes from switching on; the interior is of steel plate, finished in mottled-grey vitreous enamel. Special features of the No. 52 include rounding of all oven corners, improved lagging and protected free-spiral boiling plates of what is claimed to be an improved design. Various similar cookers in larger sizes are available, and there is also the No. 46 cooking cabinet de luxe, which can be obtained with "Marblon" mottled-enamel hob and front. The total watts are 7 850: under normal conditions the maximum load does not exceed 60%.

Another well-known cooker is the "Met-Vick Standard," with splash plate and rack.

SADIA, LTD., 22, Newman Street, Oxford Street, London, W.1, manufacture electric ranges for large kitchens—in hotels, restaurants, etc. The ten models offered have total consumptions between the limits of 19 000 and 41 000 W; the hotplates are 11¾ in. in diameter, and are loaded to 2 000 W. The smallest model is 57½ in. by 44¼ in. by 31½ in.; the largest, 110 in. by 52½ in. by 31½ in. Some of the ranges can be supplied for use from both sides. To each hotplate 8 deg. of heating can be given, while the ovens have 16-heat control. The two outside ovens can be opened from each end. Panel construction is used in the interior of the ranges, so that any element can be withdrawn. The elements are of michrome on mica blades. The boiling table is built in sections.

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These cookers are wired in three sections, and each section is wired in three parts, in order to facilitate the use of a cooker with three-phase supply. For example, assuming the loading to be 30 kW, it can be split into two sections of 15 kW each, or six sections of 5 kW each, so that the system may be properly balanced. A tray for catching drips is fitted under each section of the boiling table. In the standard construction the top is of black cast-iron, the lower part of fire-blacked wrought iron, and the fittings nickel plated. The ranges can also be obtained in white enamel. A point particularly emphasised by the makers is the efficient lagging of the ovens.

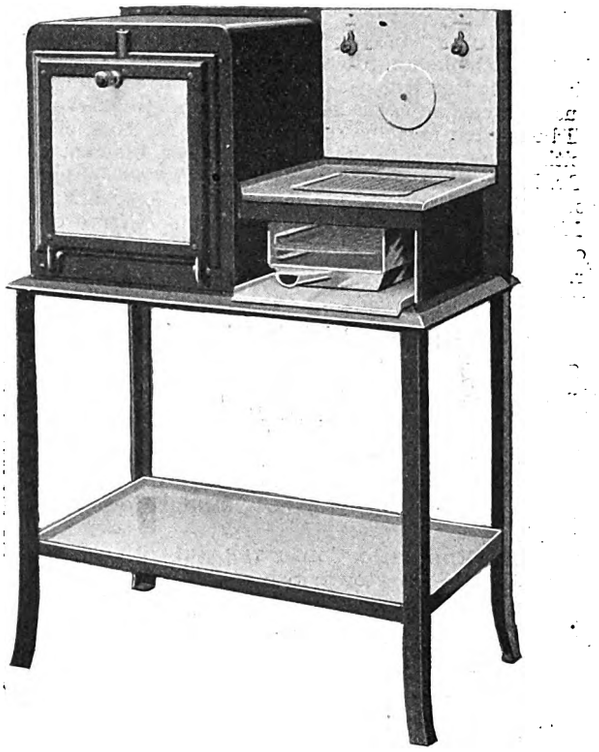
A new series of "Hotpoint Falco" cookers has recently been introduced by THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., of 24, Newman Street, London, W.1. Unit construction of electrical parts is one feature of these cookers. The oven element assembly is in one unit, and can be removed from the oven by undoing two wing nuts and three terminal wires. Similarly, the switch assembly is made in one complete unit: it can be easily removed after detaching the right hand portion of the hob and disconnecting the leads from the boiling plates, grill and oven. The wiring of the cookers is simple. Where a long run of conductor is necessary, as under the hob to the boiling plate on the extreme left, the wiring is carried in a channel of cast iron, vitreous enamelled. This coating of enamel is made to withstand a voltage of 1 500 R.M.S. to earth. The unit switch assembly is common to several sizes of cooker, and many individual parts required in the mechanical assembly of the various cookers are interchangeable. The simple construction enables the cookers to be stripped in a few minutes. A cast iron crown plate with protecting rim is provided. The standard finish is as follows: Hob, oven and door pad—porcelain enamelled in mottled grey. Inner oven—mass coat vitreous enamelled. Doors to oven and grill chamber—porcelain enamelled panels in white. Other parts (with exception of the switch-indicating plate) stove enamelled in black.

Among the latest cookers put on the market by THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is the "Magnet Minor," for families of three to four persons—or for the breakfasts of larger families. This cooker is provided with separate self-contained units for boiling and grilling, and the grill element, although part of the oven heater, is separately regulated. An additional switch is fitted to control the bottom heat when required. The 7 in. circular hotplate is totally enclosed, has three-heat control and is guaranteed for two years. Switches are of the reciprocating type; the separate Home Office pattern fuses for hotplate and grill-oven are provided with protection against accidental removal. The total wattage is 3 500.

A popular cooker by Lane and Girvan Ltd.

The "Magnet" electric cooker No. DC 5 765 is slightly larger, and side-heating is employed for its oven. A more completely equipped cooker is DC 5 760, which has oven, grill, and two enclosed hotplates, each arranged for three-heat independent control. In the standard finish the exterior, including facings and legs, is black stove-enamelled, the hob is porcelain enamelled mottled grey and door and switch panels are enamelled white. The de-luxe finish includes mottled grey porcelain enamelling of the hob and other exterior parts, with the front legs nickel-plated and polished.

A new cooker manufactured by THE MANOR ELECTRIC OVEN AND FIRE CO., 303, High Road, Chiswick, London, W.4, is known as the "Manorette." This inexpensive model is sold complete with or without stand, and has vitreous enamelled oven interior and door panel. The door and front frame are constructed of steel. The body is of 20 gauge mild steel, the base plate and back of 18 gauge and the stand of $\frac{1}{8}$ in. angle steel. All steel parts are treated with a rust-preventing compound, stoved on, and the exterior is finished in black stove-enamel. The space between the inner and outer walls of the oven is lagged with slag wool—$1\frac{1}{2}$ in. at sides and back,



The "Manorette" cooker, with stand, by the Manor Electric Oven and Fire Co.

and $2\frac{1}{4}$ in. at top and bottom. The interior dimensions of the oven are 12 in. by 12 in. by 11 in., and its loading is 1 200 W. The boiling plate and grill are of the standard plug-in type, loaded to 1 800 W. The oven and boiling plate are each controlled by a three-heat switch fitted at the back of the hob. All wiring, switches, fuses, main terminals, etc. (with the exception of the oven elements) are accessible from the front of the cooker. A vitreous enamelled crown plate is supplied, and a similarly finished pot shelf and a thermometer can be obtained as extras.

THE REVO ELECTRIC CO., LTD., of Britannia Works, Tividale, Tipton, Staffs, and 30, Great Queen Street, Kingsway, London, W.C.2, are makers of cookers in several shapes and sizes. One of the most notable features of these cookers is the vitreous enamelling on both sides of the sheet metal work. The exterior of the sides and back and the interior of the oven, door panels, and hot cupboard containing grid are all vitreous enamelled in mottled grey. This enamel has been chosen as standard on account of its hard wearing qualities, and because it does not show surface scratches readily, but it might well have been decided upon on grounds of appearance alone, as the cookers are most attractive objects. This double-side enamelling is claimed to add five years to the life of these models. Much has been done to improve the general finish of Revo cookers. All cast parts, except the hob, are now stove enamelled black after polishing. An improved door catch is fitted; it is said to be unique, and our representative gives a very good account of its effectiveness. The oven door will close firmly on a gentle push from the hand or foot, and by pressing down on the handle an almost hermetic joint can be obtained. The catch has no spring, but is operated by gravity on a new system, and its simplicity should ensure freedom from mechanical disorder.

METRO-VICK SUPPLIES, Trafford Park, Manchester, produce, among others, two electric cookers, known as the "small model" and the "standard model." The former has been designed for use in bungalows, flats and small houses where space is limited. The oven is double cased, effectively lagged and fitted with collapsible interior. In both models "Met-Vick" patent "trouble-proof" elements are fitted.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BRACEBRIDGE MENTAL HOSPITAL.—Electrical installation (lighting, telephones, fire alarms, etc.) for two new villas now being erected at Bracebridge Heath, near Lincoln. Applications for inclusion in the list of contractors from whom tenders will be invited must be sent to Mr. H. E. Page, clerk to the Visiting Committee, 5 and 6, Bank Street, Lincoln.

ST. MARY'S SCHOOLS, LOWER INCE, WIGAN.—Electric light installation. Particulars from the vicar, Rev. S. Bryson.

MANCHESTER CORPORATION, July 5th.—Supply of 500 and 1 000 kVA static transformers. Specification (No. 254) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

Electric Lighting Installation.

STOKE-ON-TRENT CORPORATION, July 6th.—Electric lighting of new cubicle block and garage at Infectious Diseases Hospital. Names to be sent to Mr. E. B. Sharpley, town clerk, by July 6th.

BELFAST ASYLUM COMMITTEE, July 8th.—Supply and erection of electric lighting equipment for main avenues. Specifications, etc., from the Secretary, Mental Hospital, Saintfield Road, Belfast.

CARLISLE EDUCATION COMMITTEE, July 8th.—Electric light installation in Newtown Schools. Particulars from the surveyor, Mr. Percy Dalton, 18, Fisher Street, Carlisle.

EDINBURGH CORPORATION, July 8th.—Automatic electric elevator, for Portobello power station. Specification (No. 101) from Mr. E. Seddon, engineer and manager, Electricity Department; deposit £1 1s.

LONDON COUNTY COUNCIL, July 8th.—Manufacture, supply and maintenance of (*a*) 150 electric tramcar bodies; (*b*) 150 sets of swing bolster bogie trucks; (*c*) 150 sets of electrical equipment for tramcars, with assembly of bodies, trucks, electrical equipment, etc., into complete tramcars; and (*d*) 150 sets of magnetic track and wheel brake equipments. Specifications, etc., from the Clerk, County Hall, Westminster Bridge, S.E.1; deposit £2 for each section, or £7 for the four.

RHONDDA URBAN DISTRICT COUNCIL, July 8th.—Three centrifugal pumps, with two electric motors and a crude oil or gas engine. Specification, etc., from the Engineer, Council Offices, Pentre, Rhondda.

SUNDERLAND CORPORATION, July 8th.—Manufacture and supply of 12 months' requirements of (*a*) paper insulated, lead sheathed cable, (*b*) rubber insulated wire, (*c*) consumers' meters, and (*d*) gasfilled and vacuum lamps. Specifications from the General Manager, Electricity Offices, Dunning Street, Sunderland; 10s. deposit for each section. Applications must state the classes of goods for which specifications are desired.

WARKWORTH PARISH COUNCIL, July 9th.—Installation of 19 electric street lighting lamps. Specifications can be seen at the office of the clerk, Mr. M. Weddell, Mill Bank, Warkworth, Morpeth.

DUNDEE CORPORATION, July 10th.—Supply of seven panel, e.h.t. compound filled sub-station switchboard, for 6 600 V, three-phase, 50-cycle system. Specifications from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee.

ENNISKILLEN URBAN DISTRICT COUNCIL, July 10th.—Electric light installation in town hall. Specification can be seen at the office of the Borough Surveyor.

METROPOLITAN ASYLUMS BOARD, July 10th.—Supply and fixing of a wireless installation at Princess Mary's Hospital, Cliftonville, Margate. Specification, etc., from the Board's Office, Victoria Embankment, London, E.C.4; deposit £1.

NEWPORT EDUCATION COMMITTEE, July 10th.—Electric light installations at Alexandra and Eveswell Schools. Particulars from the Borough Architect, Town Hall, Newport, Mon.; £1 1s. deposit in respect of each contract.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 10th.—Supply and erection of Ironbridge power station of three boilers, each having normal rating of 225 000 lb. of steam per hour, with economisers, air heaters, fans, ironwork, pipework, coal pulverising plant, ash handling plant, etc. Specification (No. 3), etc., from Mr. E. F. Hetherington, chief engineer and manager, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £2 2s.

WEST RIDING EDUCATION COMMITTEE, July 11th.—Electric lighting installation in Penistone Grammar School. Specifications, etc., from the Education Officer, County Hall, Wakefield.

BIRMINGHAM GUARDIANS, July 12th.—Electric light installation at the Quinton Hall Institution. Specification from the Clerk, Union Offices, Edmund Street, Birmingham; deposit £2 2s.

CARLISLE CORPORATION, July 12th.—Supply and erection of switchgear for use in 11 000 V, three-phase, 50 cycle substation. Specification, etc., from Mr. C. W. Salt, city electrical engineer; deposit £2 2s.

ILKLEY URBAN DISTRICT COUNCIL, July 12th.—Supply and erection of 11 000 V combined cubicle and truck type switchgear, transformer kiosk, 300 kVA and l.t. feeder gear; and 11 000 V feeder and l.t. distributors. Specifications from Mr. S. H. Fowles, Electricity Offices, Chantry Drive, Ilkley; deposit £1 1s. for each.

RIVER AVON JOINT COMMITTEE, July 15th.—Electrically-operated and controlled sluice gates at Tewkesbury. Specification, etc., from Mr. T. Hindmarsh, land drainage officer, Shire Hall, Gloucester; deposit £1 1s.

HULL CORPORATION, July 16th.—Installation of electric lift at Central Public Library. Specification from the City Architect, Guildhall, Hull.

CENTRAL ELECTRICITY BOARD, July 22nd.—Supply and erection of central indicators and telephones in connection with the Central Scotland Electricity Scheme. Specification (C.S.-S.S. 15) and form of tender from Mr. R. H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

GAINSBOROUGH URBAN DISTRICT COUNCIL, July 24th.—Electric motors and pumps. Further particulars from Mr. S. W. Parker, waterworks engineer, Council Offices, Gainsborough; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, July 27th.—Supply and erection of 132 000 V overhead transmission lines, in connection with the Mid-East England Electricity Scheme. Specification (No. M.E.E.-P.L. 1), etc., from Mr. R. H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, W.C.2; deposit £2 2s.

CARDIFF RURAL DISTRICT COUNCIL, July 29th.—Sub-station equipment, underground cables, overhead lines, etc., in parish of Radyr, near Cardiff. Forms of tender from Mr. R. Howard Fletcher, 3, Park Place, Cardiff.

NEWCASTLE ENDOWED SCHOOLS, August 24th.—Electric light installation in a new wing to be erected at each of two schools, viz.: Newcastle-under-Lyme High School, and Newcastle-under-Lyme Orme Girls' School. Specifications, etc., from Messrs. Cramp and Frith, 1, Dickinson Street, Manchester; deposit £3 3s. in respect of one contract, or £6 6s. in respect of both contracts. Tenders are invited only from firms on the National Register of Electrical Installation Contractors.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

IXELLES COMMUNAL ADMINISTRATION, July 5th.—Supply of a.c. meters. (Reference B.X. 5 400.)

INDIA STORE DEPARTMENT, July 5th.—Telephone cords, two, three, four and six conductor. Forms and tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

NEW ZEALAND POSTS AND TELEGRAPHS, July 6th.—Supply of v.i.r. wire (No. P. and T. 151/1 576). (Reference B.X. 5 411.)

NEW ZEALAND POSTS AND TELEGRAPHS, July 10th.—Supply of enamelled and cotton core, lead sheathed cable. (No. P. and T. 151/1 577). (Reference B.X. 5 413.)

INDIAN STORES DEPARTMENT, July 8th.—Supply of 30 kW oil-engine-driven generating set for Military Engineering Services, St. Thomas Mount, Madras. (Reference B.X. 5 364.)

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LOURENÇO MARQUES PORT AND RAILWAYS BOARD, July 8th.—Supply of two 5-ton electric portal cranes (Circular No. 60). (Reference A.X. 7 994.)

STATE ELECTRICITY WORKS, MONTEVIDEO, July 8th.—Construction and equipment of 50 000 kW power station.

NEW ZEALAND POSTS AND TELEGRAPHS, July 9th.—Supply of dial cords (No. P. and T. 151/1 557). (Reference B.X. 5 412.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 9th.—Resistances and reactances. (Reference B.X. 5 281.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, July 10th.—One 750 kW turbo-alternator; 2 200 V ironclad switchgear; two switch operating batteries; and two motor generator sets. Specifications from the Chief Electrical Engineer, 61, Hunter Street, Sydney.

PORT ELIZABETH MUNICIPALITY, July 11th.—Transformers, overhead line equipment, etc. (Reference B.X. 5 375.)

CHILEAN MINISTRY OF MARINE, July 12th.—Supply and erection of two aerial towers for new wireless station at Arica, the aerial to consist of 8 phosphor bronze cables, 200 metres in length. (Reference A.X. 8 134.)

INDIA STORE DEPARTMENT, July 12th.—Supply of three continuous wave wireless transmitting sets (580 to 3 000 metres). Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

EGYPTIAN STATE RAILWAYS, July 13th.—Supply of underground, lead-covered, paper core telephone cables (approximate value £E.25 000.)

AUCKLAND ELECTRIC POWER BOARD, July 15th.—Supply of 22 000 V cable and accessories. (Reference B.X. 5 414.)

EGYPTIAN MINISTRY OF THE INTERIOR, July 15th.—Supply and erection at Mena power station of one Diesel engine driven a.c. generating set of 250 kVA. (Reference B.X 5 331.)

VICTORIAN ELECTRICITY COMMISSION, July 15th.—Two 750 kVA transformers and spares (No. 29/42). (Reference B.X. 5 325.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 16th.—Supply of 250 galvanised steel transmission line towers to carry copper conductors, or 190 towers to carry steel-core aluminium conductors. (Reference A.X. 7 735.)

POSTMASTER-GENERAL'S DEPARTMENT, Melbourne, July 23rd.—Telegraph instruments (schedule C. 436). (Reference B.X. 5 323.)

VICTORIAN RAILWAY COMMISSION, July 24th.—Electric overhead travelling cranes, spare motors, and down shop trolley wires (contract No. 42 672). (Reference A.X. 8 092.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 25th.—Supply of two 2-ton electrically-driven hoist blocks (tender No. 1 471). (Reference A.X. 8 072.)

Electric Pumping Plant.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 30th.—Motor driven centrifugal pump, to deliver 400 gallons per minute against total head of 50 feet, the motor to be wound for 230 V d.c. (Reference A.X. 8 150).

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 1st.—One 10-ton electrically-driven overhead travelling crane, for Maritzburg workshops (tender No. 1 487). (Reference A.X. 8 105.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 1st.—Supply of telephone cable (tender No. 160). (Reference B.X. 5 345.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 6th.—Supply of 120-ton, four-motor, overhead travelling crane and runway (specification No. S.M. 358). (Reference A.X. 7 810.)

NEW ZEALAND POSTS AND TELEGRAPHS, August 7th.—Enamelled and silk-covered resistance wire (No. P. and T. 151/1 497). (Reference B.X. 5 322.)

Telegraph Material for South Africa.

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 8th.—Telegraph material, including g.i. tubular side-arms, insulators, paper sleeves, insulator spindles, etc. (tender No. 161). (Reference A.X. 8 112.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, August 12th.—Supply and erection at Burrinjuck of auxiliary hydro-electric generating plant. (Reference B.X. 5 365.)

EGYPTIAN MINISTRY OF THE INTERIOR, August 13th.—Supply of electric power plant, with underground and overhead network, for the town of Maghagha, Minieh Province. (Reference B.X. 5 318.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 13th.—Water turbine driven generating sets and switchgear, for Waitaki power development (section 2). (Reference B.X. 5 278.)

PIETERSBURG (TRANSVAAL) MUNICIPALITY, August 13th.—Supply of h.t and l.t. cable, lamps and sundries, in connection with extensions of the electricity undertaking. (Reference B.X. 5 312.)

PIETERSBURG (TRANSVAAL) MUNICIPALITY, August 13th.—Supply and erection of steam raising plant, engine, alternator and switchgear (contract A). (Reference A.X. 7 983.)

EGYPTIAN MINISTRY OF THE INTERIOR, August 15th.—Supply and erection of additional Diesel engine and alternator at Zagazig power station. (Reference B.X. 5 393.)

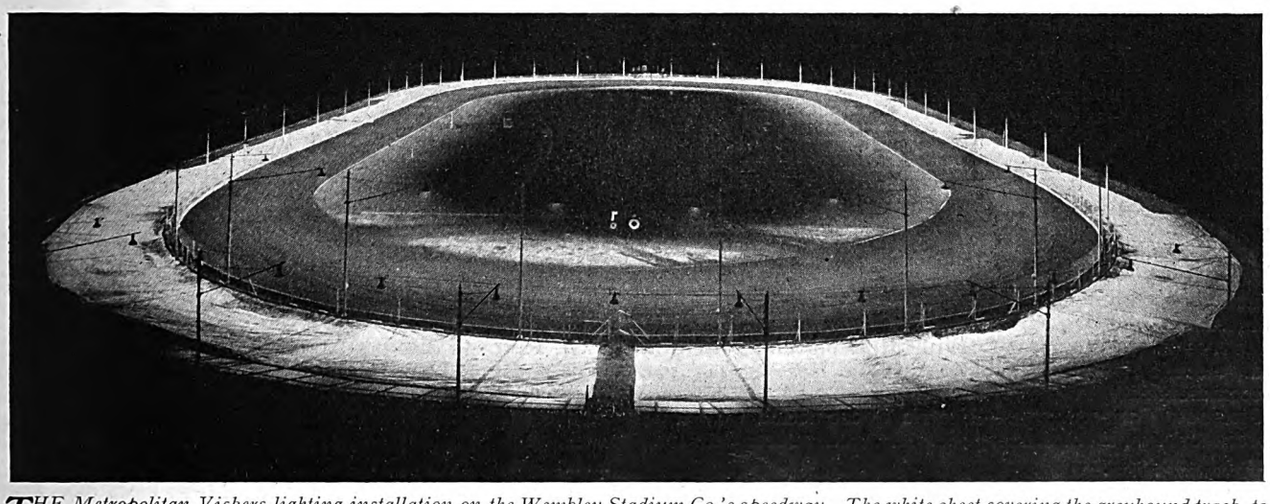
SOUTH AFRICAN RAILWAYS AND HARBOURS, August 15th.—Electrically driven plate bending and flattening machine (tender No. 1 498). (Reference A.X. 8 164.)

CHILEAN STATE RAILWAYS, August 16th.—Material for overhead lines, underground cable and cable boxes (Group 41); and material for lighting of locomotives and carriages (Group 43). (Reference C. 3 069*.)

CHILEAN STATE RAILWAYS, August 16th.—Telegraph and telephone materials, including copper wire and cable, switches, table telephones (Ericsson type), telephone cords, etc. (Reference C. 3 070*.)

CHILEAN STATE RAILWAYS, August 16th.—Supply of instruments of staff or tablet type, for installation at 36 stations between Alameda and Talca, locking apparatus for switches, batteries and telephone combinations. (Specification C. 3 070*.)

AUCKLAND ELECTRIC POWER BOARD, August 19th.—Single-phase transformers. (Reference B.X. 5 324.)



THE Metropolitan-Vickers lighting installation on the Wembley Stadium Co.'s speedway. The white sheet covering the greyhound track, to prevent cinders getting on the grass, rather detracts from the photograph, as it has the tendency of making the track look less brilliantly illuminated than it really is. The centre of the field, however, affords the real contrast.

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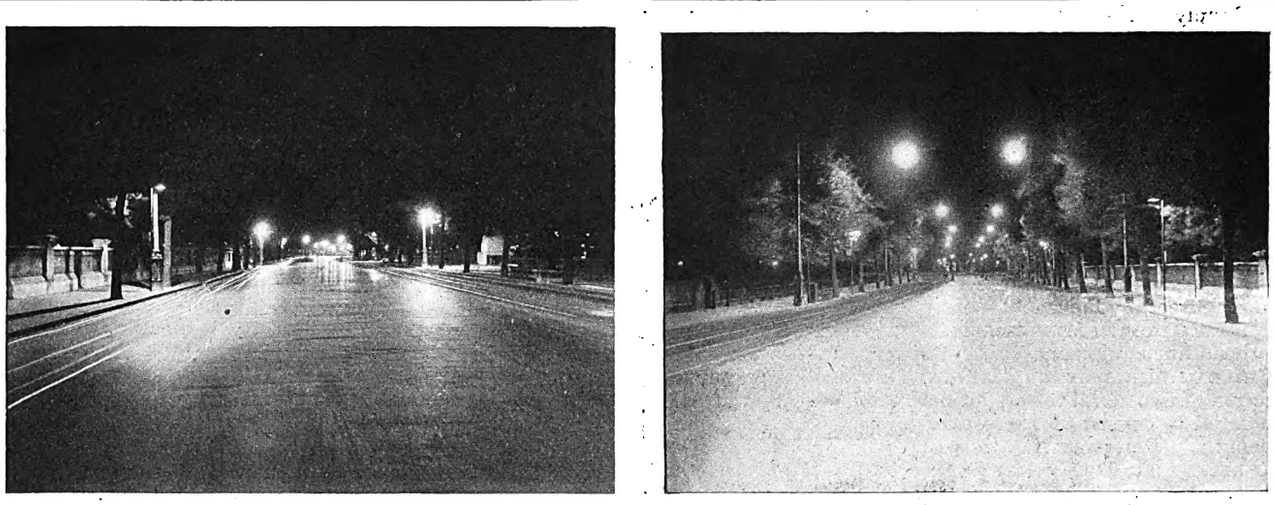

THE first five spans of the new Thames Embankment lighting at Westminster were completed by the General Electric Co., Ltd., on Saturday, June 29th. The new installation consists of five spans of twin overhead units comprising "Wembley" lanterns equipped with 1 500 W gasfilled lamps. These are suspended in pairs at 140 ft. intervals along the roadway, 30 ft. from ground level. The right-hand illustration, reproduced from a photograph taken at midnight, shows the intense lighting given by these new lanterns, while the left-hand picture shows the old lighting seen from the same position in the opposite direction. (See page 35.)

GREY ELECTRIC POWER BOARD, August 27th.—Supply and erection of generating plant, for the Arnold river hydro-electric scheme. (Reference B.X. 5 422).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 27th.—Supply of cord type switchboards (schedule C. 448). (Reference B.X. 5 428).

NEW ZEALAND GOVERNMENT RAILWAYS, September 4th.—Supply of motor generator (specification 287). (Reference B.X. 5 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 7th.—Supply of v.i.r. wire. (No. P. and T. 151/1 573). (Reference B.X. 5 416).

LOURENCO MARQUES PORT AND RAILWAYS, September 11th.—Battery tractors and trailers. (Reference A.X. 8 172).

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General, Victoria House, Strand, London, W.C.; deposit, £2 2s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th. Seven 5 500 kVA single phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417).

Tenders Accepted.

NEWARK URBAN DISTRICT COUNCIL.—Macintosh Cable Co., Ltd., supply of cable, £507.

MACCLESFIELD GUARDIANS.—V. Brees, electric light and bell installation at casual wards, £58 16s.

BEWDLEY CORPORATION.—Hawkins Bros., installation of electric fittings at the Town Hall, £14 18s. 6d.

HULL MATERNITY HOME AND INFANTS' HOSPITAL.—A. Shaw and Son, electric light and bell installation, £2 079.

REIGATE JOINT HOSPITAL BOARD.—Tamplin and Makovski, Ltd., for extension of electric light system, £24 12s. 6d.

SOUTHPORT EDUCATION COMMITTEE.—McGoff and Vickers, Ltd., electric light re-wiring at Holy Trinity Schools, £169.

WATCHET URBAN DISTRICT COUNCIL.—Minehead Electric Light Co., public lighting, £3 per lamp per season, for five years.

CHERTSEY GUARDIANS.—Electric Supply Co., Ltd., electric light installation at the institution, £525 (36 tenders received; highest £1 600).

READING GUARDIANS.—S. E. Bradley, supplying and fixing eight Philips all-mains wireless receivers, £142, and yearly maintenance, £5.

METROPOLITAN ASYLUMS BOARD.—Holbrook and Tattersall, Ltd., electric lighting installation at The Hostel, £243 10s. (Recommended.)

GLASGOW CORPORATION.—Electric Construction Co., Ltd., motors for saw mill machinery; Tudor Accumulator Co., Ltd., renewal of battery.

LARNE GUARDIANS.—J. S. Loughnan, electric light installation in connection with conversion of workhouse buildings into a district hospital, £382.

WEST LANCASHIRE RURAL DISTRICT COUNCIL.—Electric lighting scheme for parish of Aughton: W. T. Henley's Telegraph Works Co., Ltd., cables, £13 350; British Insulated Cables, Ltd., meters, as per schedule.

HULL CORPORATION.—Clarke and Graham, standard electric lamps at list prices less 25%; General Electric Co., Ltd., bus lamps at list prices less 27%; Clarke and Graham, wiring pavilion at Tilworth Grange, £118.

LIVERPOOL CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply and erection at Clarence Dock power station of 50 000 kW maximum continuous rating, turbo alternator, with accessories, £193 370. (Recommended.)

SWANAGE URBAN DISTRICT COUNCIL.—Swanage Gas and Electric Co., electric light installation in the town hall, £75. Also tendered: Aish and Co., £84; Wright and Pull, £68; J. Parsons and Son, £91; E. H. Vivian, £98; S. T. Meggitt, £100.

MIDDLESBROUGH CORPORATION.—Supply of cables, for 12 months: British Insulated Cables, Ltd., and Macintosh Cable Co., Ltd. Meters, for 12 months: Ferranti, Ltd., Chamberlain and Hookham, Ltd., and Metropolitan-Vickers Electrical Co., Ltd.

SPALDING URBAN DISTRICT COUNCIL.—Crompton Parkinson, Ltd., 500 kVA step-up transformer, £278 18s., and kiosks, £402 and £425; Pirelli-General Cable Works, Ltd., 0·01 cable, £258; 0·06 cable, £221; W. T. Henley's Telegraph Works Co., Ltd., boxes, £41 0s. 8d.; Overhead, Ltd., pole line, £60.

REIGATE RURAL DISTRICT COUNCIL.—County of London Electric Supply Co., Ltd., underground main and accessories for supply of electricity for power to the Merstham outfall works, £51 2s. 9d.; Gwynnes Pumps, Ltd., supply of pump, 8½ H.P. motor, and air brake star-delta starter, £88 3s., and valves, £9 0s. 6d.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Hackbridge Cable Co., Ltd., supply of l.t. cables, £4 359. (Recommended.) Also tendered: Siemens Bros. and Co., Ltd., £4 442; Standard Telephones and Cables, Ltd., £4 552; Pirelli General Cable Works, Ltd., £4 597; British Insulated Cables, Ltd., £4 602; Croydon Cable Works, Ltd., £4 915.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., 1 000 kW motor-convertor, for Grafton Road sub-station, speed 1 000 r.p.m., three plain bearings, £2 543; 750 r.p.m., three plain, £2 740; 750 r.p.m., two plain, £7 740; 750 r.p.m., two roller, £2 740 (Recommended); 600 r.p.m., two plain, £2 950; 600 r.p.m., two roller, £2 950.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—W. H. Allen, Sons and Co., Ltd., supply of electrically driven condensing water pump to deal with 1 500 000 gallons of water per hour, £2 050. (Recommended.) Other tenders: Gwynnes Pumps, Ltd., £2 124; English Steel Corporation, Ltd., £2 144; Brush Electrical Engineering Co., Ltd., £2 145; Escher, Wyss and Co., £2 188; Rees Roturbo, Ltd., £2 206; General Electric Co., Ltd., £2 223; Drysdale and Co., Ltd., £2 273; Tangye's, Ltd., £2 430; Mirrlees, Watson Co., Ltd., £2 480; Mather and Platt, Ltd., £2 594; Worthington-Simpson, Ltd., £2 728; Lilleshall Co., Ltd., £2 980.

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WORK IN PROSPECT.

ASHTON-UPON-MERSEY.—Houses, Green Lane. Particulars, the architects, Matley, Brotherton and Mills, Court Chambers' Old Millgate, Manchester.

BATLEY.—Sunday schools. Particulars, Messrs. C. H. Marriott, Son and Shaw, Church Street Chambers, Dewsbury.

BEDFORD.—Houses. Particulars, Mr. F. R. Chapman.

BEWDLEY.—Houses. Particulars, from Messrs. Gething and Rolley, Kingsley Hall, Kidderminster.

BEXLEY.—Additional 50 houses, Brampton Estate, for the Urban Council. Particulars, the Surveyor.

BIRKENHEAD.—School. Particulars, Tyson's, Ltd., Liverpool.

BOURNE.—Picture house. Particulars, Mr. A. J. Thraves, 12, Victoria Street, Nottingham.

BRIGHTON.—Extensions, Brighton College, to cost £12 000. Particulars, Messrs. Longley, Crawley.

BUCKHURST HILL (ESSEX).—Extensions to Forest Hospital. Particulars, the Secretary.

CHIGWELL (ESSEX).—School extensions. Particulars, the Clerk to the Governors.

CHIPPING NORTON.—Maternity ward. Particulars, Mr. Fred E. Openshaw, 65, St. Giles' Street, Oxford.

COOKHAM.—Houses. Particulars, Messrs. Canning and Sargeant, Wokingham.

COVENTRY.—Works, Stoke Heath, for the National Cork Industries, Ltd.

DARLINGTON.—Chapel. Particulars, the Borough Surveyor.

DEWSBURY.—Girls' secondary school. Particulars, from Borough Surveyor.

DONCASTER.—Housing scheme (36). Particulars, Mr. W. R. Crabtree, Nether Hall.—Extensions, Girls' school. Particulars, Mr. J. B. Richardson, 26, Printing Office Street.

DORKING.—Secondary school. Particulars, Mr. W. W. Finny, Kingston-on-Thames.

EASTLEIGH (HANTS). — Club, for Usher's Brewery, Trowbridge.

EWELL. — Houses, for the Allied Building Corporation, Newport, Mon.

FRESHWATER (ISLE OF WIGHT).—Re-erection of the Palace Theatre. Particulars, Mr. W. B. Barnard.

GRAYS. — Intermediate schools to cost £28 000. Particulars Mr. J. Stuart, Chelmsford.

GRETTON.—Houses. Particulars, Mr. George Dolphin, North Street, Uppingham.

HOVE.—Ice rink, to cost £67 500. Particulars from the Secretary, Ice Rinks, Ltd.

LUMLEY.—School (216 places). Particulars, Mr. F. Willey, 34, Old Elvet, Durham.

MIDDLESTOWN.—Shops and village Hall. Particulars, Mr. S. P. Fairhurst, East Thorpe House, Mirfield.

NORTHAMPTON.—Houses (45). Particulars, A. Glenn and Son, Ltd.

NORTHENDEN. — Housing scheme (34). Particulars, Mr. R. C. Cordon, 24-26, Station Buildings, Altrincham.

PRESTON.—Sunday schools to cost £16 000. Particulars, G. Hill and Son, Ltd.

READING.—Casual wards. Particulars from the Clerk to the Board of Guardians.—Housing scheme. Particulars from the Borough Surveyor.

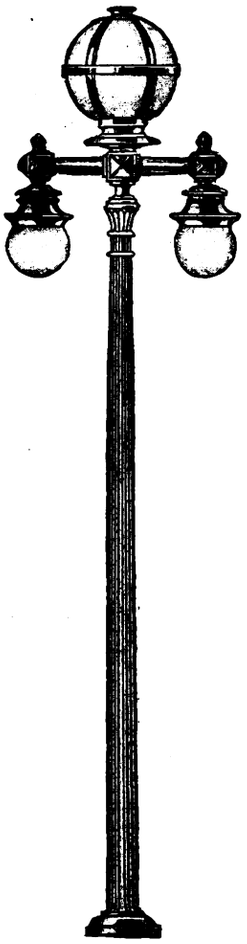
REDHILL. — 28 houses. Particulars, the Borough Surveyor, Reigate.

RYDE. — Reconstruction, Royal Isle of Wight County Hospital. Particulars, Messrs. John Seely and Paul Paget, 3, Queens Square Place, Queen Anne's Gate, London, S.W.

SIDMOUTH. — Market buildings to cost £3 300, for the Urban Council. Particulars, Mr. R. G. Spiller, Chard.

SMETHWICK.—Extensions, Holly Lane Hospital. Particulars, the borough engineer, Mr. R. Fletcher.

SUTTON (SURREY). — Houses (41), Green Lane, Worcester Park, for Messrs. Shuttleworth.—Houses (15), Westfield Road, for Mr. C. H. Runnalls. — Houses (22), Morden Way, for Braddy and Randall.



AN example of the lighting standards used in the grounds at the North-East Coast Exhibition. They are of B.T.-H. design and manufacture.

TRADE PUBLICATIONS.

BRITISH INSULATED CABLES, LTD., Prescot, have issued a new wire list in pocket form, complete with voltage drop calculator.

List No. X. 64/283, dealing with ironclad distribution fuse boards, has been received from the HARLAND ENGINEERING CO., LTD., of Manchester.

The JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1, has published a leaflet describing a model luncheon club with an electric cooker.

The TUNGSTEN ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., 72, Oxford Street, London, W.1, have issued two leaflets relative to automobile and "D" gasfilled lamps respectively.

CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, London, E.C.4, has issued a revised price list dealing with rubber insulated wires and cables.

The DRAYTON REGULATOR AND INSTRUMENT CO., LTD., of West Drayton, Middlesex, has published L. 113 dealing with liquid level regulators, and L. 122 describing the double relay pressure regulator.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has issued an illustrated brochure entitled "G.E.C. Street Lighting Practice," and an illustrated leaflet, "Illumination of Laundries."

BRITISH INSULATED CABLES, LTD., Prescot, have issued C. 101 entitled "Copper Weld," which describes a product consisting of a core of tough steel on to which is welded a heavy layer of electrolytic copper.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, have published a new automobile lamp price list, reference No. 213. Leaflet No. 173 relating to "Duo-Tanclite" lamps has also been issued.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C., has issued leaflet No. 1 701, relative to solenoid operated brakes for a.c. and d.c., type R.M.

An additional sheet for attaching to Section K of the catalogue recently issued and dealing with lighting accessories has been published by JULIUS SAX AND CO., LTD., West Lodge, 27, Lower Mall, London, W.6.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs, have published a special circular dealing with pliable armoured cables, booklet P. 245, relative to electric resistance welders, spot welder section, and P.244, dealing with the seam welder section. P.245 replaces P.235.

List N.T.L. No. 8, giving nett prices and data of "Enfield" C.M.A. and Nonazo v.i.r. cable and wire, and list T.P.L. No. 7, dealing with "Enfield" v.i.r. and pure rubber flexibles have been published by the ENFIELD CABLE WORKS, LTD., Lincoln House, 296/302, High Holborn, London, W.C.1.

J. H. TUCKER AND CO., LTD., King's Road, Tyseley, Birmingham, has issued folder S. 9, dealing with ironclad gear; C. 2, describing flush tumbler switches, bell pushes and boxes; A. 5, concerning "Telacite" lampholders and switch-lampholders; and B. 10, devoted to a description of 15 A 250 V 3-pin switch socket.

J. J. EASTICK AND SONS, of Eelex House, 118, Bunhill Row, London, E.C., have published a new general catalogue of wireless and electrical specialities, which comprises some 250 pages. The list is arranged in alphabetical order under main headings and represents a ready reference to practically every type of component and accessory on the market.

A catalogue containing 25 pages of information relative to lampholders has been published by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. The catalogue shows in many instances substantial price reductions and includes details of a range of porcelain and bakelite lampholders. The former are made in B.C., E.S. and G.E.S. types in various patterns to cover all requirements, including the equipment of lanterns and reflectors for modern lighting conditions.

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ELECTRICITY SUPPLY.

Bulk Supply for Walton-on-the-Naze—Newry's New Generating Station—Wandsworth to Press for Reduction of Flat Rate—Hire and Hire-purchase Scheme for Hull—Switchgear Required at Eastbourne.

CHELTENHAM Electricity Committee seeks sanction to borrow £10 000 for mains and services.

Manchester Electricity Committee recommends that sanction be sought for a loan of £7 000 for h.t. mains.

Walton-on-the-Naze U.D.C. has intimated that it is prepared to accept the terms submitted by Colchester T.C. for a bulk supply.

Beckenham U.D.C. has decided to have the battery of accumulators used in connection with the tramway supply renewed, at an estimated cost of £3 060.

Maidstone Electricity Committee is to apply to the Electricity Commissioners for sanction to borrow £11 683 for the purpose of supplying electrical energy to Malling district.

Acting on the advice of Mr. E. G. Phillips, consulting engineer, Leicester Health Committee proposes to instal two 75 kW generating sets, with the necessary switchgear, etc., at the isolation hospital and sanatorium, at a cost of £1 982.

Westminster Works Committee reports that it is proposed to control the sixteen 500 W lamps at Grosvenor Wharf with a selenium cell and a meter, which will register any hours of lighting above those agreed, viz., 3 949 hours per annum.

Halifax Electricity Committee is extending the heating and cooking tariff to embrace the heating of buildings used for commercial purposes. The charge for the first 160 kWh per quarter per kW of maximum demand, supplied through a separate meter, is 1½d. per kWh and any further consumption ½d. per kWh.

Chelmsford Electricity Committee recommends approval of a suggestion that the Electric Supply Corporation should carry out the conversion of the electricity supply in the town from 100 to 50 cycles at its own cost, such cost being put to a special account and reduced by a sinking fund, based on 5% contributions and 5% interest.

Brighton Electricity Committee has obtained sanction to borrow £7 608 for works in connection with the installation of a new 1 500 kW convertor and accessories at North Road sub-station. The borough electrical engineer (Mr. John Christie) and the borough accountant are to report fully upon the question of introducing a two-part tariff.

Viscount Craigavon, Prime Minister of Northern Ireland, formally opened Newry Urban District Council's new electricity works on June 26th. The generating plant comprises two 80 B.H.P. twin-cylinder vertical type oil engines, each coupled direct to a 44 kW three-phase alternator. There is also a four-cylinder 160 B.H.P. oil engine of the same make and design, direct-coupled to an 88 kW alternator.

Walton U.D.C. is applying to the Electricity Commissioners for sanction to loans of £4 000 for mains and services and £1 000 for meters, and the engineer and manager, Mr. E. A. Anderson, and the consulting engineer, Mr. A. H. Dykes, are to interview representatives of the Commissioners with regard to the borrowing of the balance of the £20 000 originally applied for in connection with the development scheme.

The scheme for supplying electricity to Chieveley was explained by Mr. A. J. Bridge, development manager, Wessex Electricity Co., at a recent public meeting in the schoolrooms, Chieveley. Mr. Bridge gave some details of the national electricity scheme, and an explanation of the uses of, and the charges for, electricity in the home, factory and farm. The meeting gave unanimous support to the scheme.

Wandsworth (London) B.C. Special Electricity Committee reports that in view of the very moderate proportion of the consumers of the borough who have elected to take advantage of the County of London Co.'s new tariffs, and in view of the fact that the company has given no assurance that it will consider any modification of its flat rate charge, the Committee feels that there is no alternative but to recommend the Council to press for the reduction to 4d. per kWh at the resumption of the adjourned inquiry.

Barking U.D.C. is to ask London County Council to bear the cost of erecting 114 lamp standards and fittings for street lighting of the Barking Section of the Becontree Estate, at an estimated cost of £8 12s. 6d. per column.—The L.C.C. has agreed to undertake the wiring of the houses now being erected by it in Barking.—Barking Electricity Committee recommends the scheme of the Fixed Price Light Co. for wiring and lighting small houses at a fixed price per lamp per week, the company taking a bulk supply from the Council at £5 5s. per kW connected, plus 0·8d. per kWh in selected areas of the town.

Newbury Corporation recently accepted a tender by Messrs. Hathorn, Davey and Co. for an electric pumping set to deal with the storm water at the sewage pumping station. The Committee has since favourably considered a report by Messrs. Howard Humphreys and Sons upon the question of the conversion to electric drive of the whole of the plant, and recommends that application be made for sanction to the borrowing of £1 800, the estimated cost of the work of conversion. The Committee also recommends a five years' agreement with the Urban Electric Supply Co. for a supply. The company agreed to supply electricity for driving the storm pumping set at 2d. per kWh, but for the whole of the pumping the charge would be 1½d. per kWh.

Mr. J. N. Waite, city electrical engineer, Hull, has reported that he desires to introduce a scheme of hire and hire-purchase of cookers and other domestic apparatus. The preliminaries are being completed, and tests of various types of cookers and other apparatus are taking place. The cooker scheme would include free maintenance and repair during the period of hire, and the necessary wiring and installation. The majority of the installations would be carried out to the department's specification at an agreed rate by approved contractors, and the repair and maintenance by the department's own staff. Mr. Waite recommends that, as a commencement, £25,000 of the reserve fund should be allocated for this purpose. The Electricity Committee has adopted the scheme.

Southwark (London) General Purposes Committee has reported on the question of increasing the charges for the administration of the electricity supply undertaking. At the present time the undertaking contributes £750 per annum for administrative expenses, in addition to an annual sum of £988 9s. 9d. for salaries of officers at the town hall engaged on accountancy work. The Committee is of opinion that any special services rendered by the borough engineer's department should be paid for by the undertaking, and that in future all architectural engineering or other work carried out for the electricity supply undertaking by the borough engineer's department should be paid for by the undertaking at the rate of 8% of the cost of the work or works involved.

Preston electricity department is to erect a 6 600 V overhead main from Hall Cross to Wrea Green, with a sub-station at Wrea Green, at a cost of £5 820, and application is to be made for sanction to borrow the money. The main transmission line between Blackburn and Preston will be required by the Central Board for the national scheme, and the Board is prepared to bear the capital costs relating to it from the appropriate date.

An agreement has now been reached between Blackburn Corporation and the Central Electricity Board concerning the terms on which the Whitebirk generating station will be taken over. The Board has decided that, while it cannot take over Whitebirk as a selected station owing to legal difficulties, it is prepared to pay 60% of the capital charges. This will mean an estimated gross saving to Blackburn of £20 500 per annum up to the year 1934–5.

In regard to the supply of electricity to be taken by Eastbourne Corporation from the national grid, it has been decided that four or five of the leading British manufacturers be asked to tender for the first portion of the switchgear required.—In reply to questions that have been put to him, the consulting engineer (Mr. W. C. C. Hawtayne) states that the total estimated additional cost of placing underground the 33 000V regional transmission lines in the areas proposed to be included in the new Order—approximately 16 route miles—allowing for increasing copper section from 0·10 sq. in. to 0·15 sq. in., would be £67 200. The 11 000 V mains are outside the borough, and (if they are as shown on Plan E.E.2) the additional cost of placing these underground will be in the neighbourhood of £17 500, allowing for increase of copper section to 0·15 sq. in. The Electricity Committee recommends the Council to bear the extra expense (estimated at £4 200) to place the 33 000 V transmission lines underground as far as the borough boundary only.

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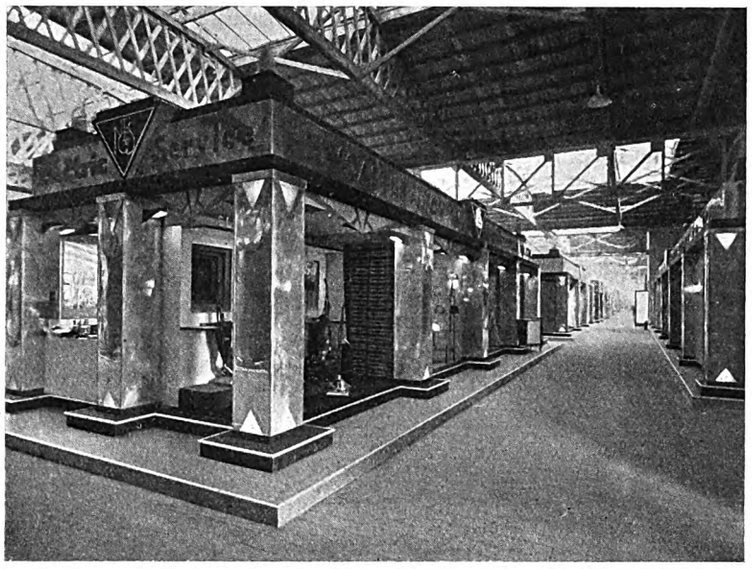
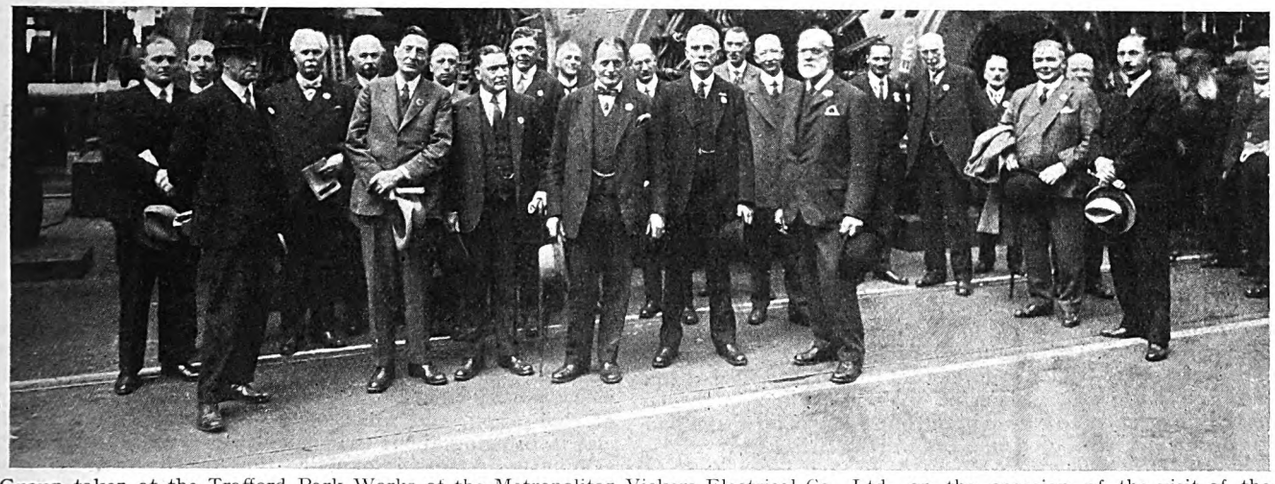
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

On Saturday, June 29th, the first five spans of the new Thames Embankment lighting at Westminster were switched on by Sir George Humphreys (left), chief engineer of the L.C.C., supported by Mr. C. A. Baker, divisional engineer, L.C.C., Mr. W. B .Thorpe, engineer-in-chief, Charing Cross E.S. Co., and Mr. W. J. Jeffries, mains engineer of the same company, all seen here to the right of Sir George.



A general view of the Newcastle-upon-Tyne E.S. Co.'s exhibit at the North-East Coast Exhibition. The columns and fascias of the stands are made of polished aluminium, and the lettering is illuminated by three-colour lighting. On the corner columns are boxes in which are 12-in. fans which keep in motion pieces of orange-coloured silk and produce flame-like effects. Amber lights in the boxes add a further touch of realism. Various tableaux on the stand include "Bruce and the Spider," "Alfred and the Cakes," the "North Pole" complete with Aurora Borealis and the "Evolution of Light." The exhibit covers no less than 3 500 square feet.



Group taken at the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd., on the occasion of the visit of the Institution of Mechanical Engineers last week. The photograph shows the President of the Institution, Mr. Daniel Adamson, past Presidents, vice-Presidents and Members of Council, together with Sir Philip A. M. Nash, chairman of the company. Following a tour of the works, the visitors were entertained to a luncheon, at which Mr. Adamson presided. Sir Philip Nash, in the course of a speech in which he proposed the toast of "The Institution," made a statement to the effect that last year, while his company had over 30 000 orders, some running into hundreds of thousands of pounds, the average value of each order was £115. They supplied plant to 22 different countries, and this not only involved the difficulty of dealing with nearly 22 different mentalities, but involved the somewhat arduous business of dealing with some 15 different governments. See page 38.

Burnham-on-Crouch U.D.C. has received a copy of the Burnham and District Electricity (Amendment) Order which the Commissioners propose to make, and which provides for the transfer of the undertaking from Dr. J. A. Purves to the County of London Electric Supply Co.

The Borough Surveyor and Electrical Engineer have reported to Tynemouth Electricity Committee with regard to experiments with 300 and 500 W lamps on the thoroughfares between the Coast Road and Tynemouth. It has been decided to substitute 500 W lamps for 200 W lamps at road junctions and other main points when necessary, and generally to substitute 300 W lamps for the present 200 W lamps.

Stoke-on-Trent Electricity Committee seeks sanction to borrow £2 500 for the erection and equipment of a sub-station in Campbell Road, Stoke. In accordance with the undertaking given to the Electricity Commissioners, the Electricity Committee has instructed the Engineer to proceed with the erection of the secondary transmission lines necessary to give supply to Whitmore pumping station and the Market Drayton Electric Light and Power Co., at a cost of £50 000. An experiment made to ascertain the consumption and load factor of supply to tubular heaters used to heat sanitary ware drying shops has shown that 7 kW had taken 17 077 kWh in four months, giving a load factor of 83%. The Committee has decided that for electric kiln and pottery drying, with maximum loads of less than 20 kW, the rate be 1d. per kWh with 50% load factor, falling by 0·1d. for each increase of 10% in load factor.

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ELECTRIC TRACTION.

Further Developments of the Southern Railway Electric System.

THE directors of the Southern Railway have sanctioned an expenditure of £597 000 on further extensions of their suburban electrified system. The new sections for electrification are (*a*) Hounslow Junction and Whitton Junction to Windsor, (*b*) Dartford to Gravesend, and (*c*) Wimbledon to West Croydon. It is hoped that most, if not all, of the work will be completed in time for next year's summer service. The work will provide considerable orders for British firms. On the new electric lines there will be a service of trains in each direction every 20 minutes during busy periods and every 30 minutes at other times. These extensions will increase the Southern Railway suburban electric system to 800 track miles. Passengers carried in the electrified areas last year were 6½ million more than in 1927, and in that year the increase was 11½ millions over 1926. Further extensions are under consideration.

The tramway service of Wiesbaden (Germany) was discontinued recently, owing to the refusal of the municipality to renew the concession. This is the first of the larger German towns to abolish its tramways.

Manchester Tramways Committee recommends that 50 of the Corporation's existing electric tramcars be equipped with interior upholstery, improved lighting, and seats for the drivers.

The last of the Wolverhampton tramway routes has now been converted to the railless trolley system. The Corporation's trolley vehicle services now cover 25 miles of route.

Doncaster T.C. has decided to convert three tramway routes to the trackless trolley system, with an extension along Carr House Road to connect with the Racecourse route.

Of 101 new cars ordered for the District Railway (London) 25 are now in service and the remainder are being delivered at the rate of three a week.

THE JOHN BENN HOSTEL.

Annual Dinner at Savoy Hotel—Sale of a Wells Manuscript.

THE annual dinner of the East End Hostel Association took place on June 25th at the Savoy Hotel, London, Lord Melchett presiding over a numerous company.

Sir Tudor Walters, M.P., proposing the toast of "The London Boy," said he was of opinion that the London boy comprised probably the finest human raw material in the world. He possessed many distinctive qualities, and the most notable was his alertness. The spirit that pervaded the John Benn Hostel made for a new England. The boys themselves contributed £2 200 annually towards its upkeep. The courage and determination of the London boy conquered the whole world. He could turn his hand to anything, and knew not the maxim of "one man one job." During the war he had a record of which any race might well be proud.

The Dean of St. Paul's, in support of the toast, said that the institution was doing wonderful work, though it might be said that it was a mere "drop in the bucket." The hostel had turned out scores of good men and worthy citizens.

The Rt. Hon. Wedgwood Benn, M.P., Secretary of State for India, responding, said the London boy was the enemy of pomposity and sham. He gave real friendship in return for friendship that was offered on terms of equality.

Proposing "The John Benn Hostel," the chairman said it was founded in memory of Sir John Benn, and was being supported and carried on to-day by Sir Ernest Benn. It formed an example which should be extended and followed. Besides the £2 000 that the boys contributed, another £4 000 was needed to make up the running expenses. They hoped to raise that night at least £2 000 by contributions. He would be glad to contribute £100 towards the fund.

Lord Feversham, who acknowledged the toast, advised those who had not yet visited the hostel to follow the lead of the Prince of Wales and make practical acquaintance with its activities in the premises at Stepney.

During the evening Sir Ernest Benn sold by auction Mr. H. G. Wells's MSS. of "Aepyornis Island," which realised £950, and was knocked down to Mr. Gordon Robbins, acting on behalf of an undisclosed bidder. Sir Ernest said the manuscript was written in 1894 and was published for a fee of nine guineas in the "Pall Mall Budget." Any publisher in London to-day would gladly pay 1000 guineas for a like privilege.

DISPLAY CONVENTION.

Opportunity for Electrical Contractors to Air their Views on Window Display.

ELECTRICAL installation contractors and electricity supply authorities, who are now taking a more active part than heretofore in the organisation or encouragement of window displays, will be interested to know that the British Association of Display Men will hold its convention this year at the Central Hall, Westminster, from September 9th to 11th, inclusive. The four previous conventions have shown display men the beneficial information and the knowledge that is to be obtained from these conferences, and the forthcoming conference—the first of its kind to be held in London—will surpass all its predecessors. The three days will be filled with a variety of lectures, demonstrations and social events, all calculated to help in the furtherance of the art and practice of window display. The British Association of Display Men, knowing who are the best demonstrators and lecturers on window display, will arrange for experts to deal with the respective subjects appearing in the programme. Apart from the value of the conferences, there is the opportunity to enter into fraternal intercourse and the exchange of ideas with one's fellow-craftsmen from all parts of the country. This side of the Convention will be much encouraged, for a mutual deliberation of common problems is bound to be beneficial to all concerned. When it is realised that the Display Conventions in the past have attracted delegates from as far north as Aberdeen and as far south as the Channel Islands, it will be realised that their influence is wide and far-reaching. The Convention will open at 10 o'clock on Monday morning, September 9th, and continue till the night of September 11th. A dinner will be arranged, at which it is hoped all delegates and all London display men will be present.

The Convention is open to members and non-members of the B.A.D.M. The registration fee will be 5s. per delegate, and 2s. 6d. each for the wives of delegates. Badges will be supplied, and must be worn to gain admission to the conference hall. The dinner will take place on the evening of September 9th. Registration forms from the Secretary, 43, Blandford Street, London, W.1.

INDIVIDUALIST BUYING.

American Views on the Hire-purchase Method of Trading.

AT the 26th Individualist luncheon, held at the Hotel Cecil, London, on June 19th, Prof. Edwin R. Seligman, who occupies the Chair of Economics at Columbia University, New York, addressed a large gathering of professional and business men on the subject of "Instalment Buying." The Right Hon. Sir Donald Maclean, M.P., presided.

Prof. SELIGMAN stated that the prevalent and growing system of purchasing articles and goods of all descriptions by deferred payments formed the foundation of a great fundamental economic development which would eventually enable every worthy citizen to take his rightful place in the progress of civilisation, and which would assist more than anything else in bringing about that equality of wealth and participation in the advantages of civilisation for which they all hoped.

The more modern analysts had come to the conclusion that the former distinctions between productive and unproductive credit were inadequate, and had now substituted for them the theory of utilisation. Financing the consumer was, in the long run, the same as financing the producer, since it encouraged increased consumption, to meet which further production was necessary.

With regard to the objection that the instalment system, while permissible when applied to the purchase of necessities, encouraged extravagance and the use of luxuries to an unjustifiable extent, it was essential to realise just what was meant by a luxury, for the whole modern theory of social development was disposed to wipe out the distinction between luxuries and necessities. In any country that was making headway the luxury of yesterday was the comfort of to-day and the necessity of to-morrow.

As regards the manufacturer, one beneficial effect of instalment buying had been to equalise production throughout the year and eliminate seasonal fluctuations. In the United States a scheme was being investigated by which the instalment plan would become applicable to capital investment.

A vote of thanks was proposed by Mr. Harold Cox and seconded by Mr. John Benn.

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COMPANY NEWS.

Electricity Supply and Traction Descriptions Remain Quiet—Manufacturing and Telegraph Holdings Mainly Steady—Market Generally Uninteresting—Dubilier Condenser Co. Negotiating Amalgamation.

THE market for electrical securities—supply, transportation, equipment and telegraph—has remained quiet during the past week. The favourite manufacturing shares have given way a little, under the lead of General Electrics, which have fallen 1s. 3d. from 52s. 6d. to 51s. 3d. English Electric 6% preference have dropped from just over 8s. to 7s. 6d., Siemens shares are 7½d. down at 30s., and Ever Readies and British Thomson-Houston preference, at 21s. 3d. and 23s., are each 3d. easier. Marconi's International Marine shares are half-a-crown lower at 62s. 6d. County of London Electric Supply ordinary shares are 6d. to the good, at 56s.

Last Annl. Divd.	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
%	**Electricity Supply.**				
(d)	Brompton & Kensington Ord. ..	26/–	26/–	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/–	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	,, ,, ,, ,, 6% C.P.	23/–	23/–	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	56/–	55/6	68/6	25/9
6	,, ,, ,, 6% C.P.	23/–*	23/–	24/–	21/3
(e)	Kensington & K'bridge Ord. (£1)	26/6	26/6	27/6	23/9
1/9⅜	Lon. Elec. Sup. Ord. (£1) ..	28/–	28/–	37/6	23/–
1/9⅜	Metro. Elec. Sup. Ord.	47/6	47/6	53/–	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6*	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	30/–	30/–	31/9	17/6
1/25	N'castle-upon-Tyne Elec. Sup. Ord.	26/10½	26/10½	30/3	19/3
6	N Metro. Elec. 6% C.P.	23/–	23/–	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11*	11	11½	9½
(e)	St. James & P.M. Ord (£1) ..	27/6	27/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	—	—
1/9 1/20	W'minster Elec. Sup. Ord. (£1) ..	26/–	26/–	52/9	24/–
4½	,, ,, ,, 4½% C.P. (£1)	17/6*	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	37/–	37/–	38/9	24/6
6	,, ,, ,, 6% C.P. ..	24/–	24/–	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	128½*	130½	152	117
7·67	,, ,, ,, 6% Pf. Stk.	128½*	130½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4	,, ,, ,, 4% Deb.	80	80	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	73½	75½	42½
4	,, ,, ,, ,, 4% Pf. Stk.	73	73	77	68
4	,, ,, ,, ,, 4% Deb. ..	78	78	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams. 1st Deb... ..	60*	62	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	71*	72	73½	62
5	,, ,, ,, 5% Deb. ..	67½	67½	70½	65½
3½	Met. Rly. Cons. Ord. Stk... ..	60	60½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	63	63	67	60½
3½	,, ,, ,, 3½% Deb. ..	68*	70	73½	67½
5	Met. Dis. Rly. Ord. Stk.	76	76	77½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	81½	81½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	68*	70	70	64½
7	Underground Electric Rlys. Ord.	23/–	23/–	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	,, ,, ,, 1st Deb. ..	57*	59	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P...	13/9	13/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	86/3	56/–
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	23/–	23/3	24/9	19/7
7	,, ,, ,, 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk... ..	135	135	153½	120
15	Callender's Cable Ord.	77/6	77/6	91/3	66/–
6½	,, ,, 6½% C.P. ..	25/–*	25/–	25/9	22/–
7½	,, ,, 7½% B. Pref. ..	27/6*	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	,, ,, 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	25/7½	25/7½	13/–	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½*	86½	92	81½
5½	Elec. Construction Ord.	18/9*	18/9	32/6	23/6
7	,, ,, ,, 7% C.P. ..	22/6*	22/6	22/9	21/–
—	English Elec. Ord.	6/3	6/3	15/9	5/–
—	,, ,, ,, 6% C.P. ..	7/6	8/1½	18/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	21/3	21/6	92/3	18/1
6	Ferranti 6% Pref...	18/–	18/–	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	51/3	52/6	46/6	26/6
25	W. T. Henley's Ord.	132/6	132/6	120/–	69/3
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/–
7½	Lon. Elec. Wire. & Smith's Pref...	23/9*	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	30/–	30/7½	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23½	23½	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
10	Eastern Ord. Stk.	266½	265	273	135
3½	,, 3½% Pref. Stk.	65½	67½	70½	59
4	,, 4% Deb.	78½	78½	81½	74
10	Eastern Extension Ord. (£10) ..	26½	26½	27½	14
22	Gt. Northern Telegraph (£10) ..	31	31½	43½	26
10	Indo-European (£25)	50½	50½	48½	30
20	Marconi's Wireless T. Ord. ..	75/7½	75/9	84/4	12/–
15	,, Int. Mar.	62/6	65/–	90/–	16/6
10	Western Tel. Ord. (£1)	26½	26½	27½	12½

(a) 19.2d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share.
(d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. † Ex share bonus.
* Ex dividend.

NOTTING HILL ELECTRIC LIGHTING CO., LTD.—Intm. div. of 5s. p. sh., less tax, on dfd. shs. of 1s. each will be payable on July 31.

EASTERN TELEGRAPH CO., LTD.—Div. at rate of 3½% p.a., less tax, on pref. stk., for qrtr. ended June 30, will be payable on July 15.

ST. JAMES' AND PALL MALL ELECTRIC LIGHT CO., LTD.—Intm. divs. at rate of 8·4d. p. sh. on £1 pref. shs. and 9d. p. sh. on £1 ord. shs. will be payable on July 27.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING CO., LTD.—Intm. div., on acct. of year endg. Dec. 31 next, of 9d. p. sh., less tax, on ord. shs. will be payable on July 20.

ELECTRIC AND GENERAL INVESTMENT CO., LTD.—Net pft. for year ended May 31, 1929, £10 221, agst. £8 016, plus £47 474 brt. in. Div. on ord. shs. 10% for year and on 1s. dfd. shs. 100%. To res. £18 538. Fwd. £20 024.

EDMUNDSON'S ELECTRICITY CORPORATION, LTD.—Extraordinary mtg. will be held today (July 5th) to consider a resolutn. to increase cap. to £3 150 000 by creatn. of a further 1 500 000 £1 ord. shs., with a view to acquisitn. of not less than 90% of issued sh. cap. of East Anglian Electric Supply Co. and Wessex Electricity Co. and investmts. in other electy. supply cos.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—Net pft for year ended March 31, 1929, £294 237 agst. £283 074, plus £529 931 was brt. fwd. Allowing for income tax (£27 257), pref. and int. ord. divs., and transferg. £50 000 to res., blce. is £691 530. Fin. div. of 2s. 6d. p. sh. is proposed on ord. shs., with bonus of 2s. p. sh. makg. total distributn. for 30% for year (agst. 25%). Fwd. £545 280.

ARON ELECTRICITY METER, LTD.—Pft. for past year, £6 594. Div. of 3% actual has been paid on cum. pref. shs., leaving £4 275. Directors recommend fixed div. of 6% p.a. on converted cum. pref. shs. for period from Oct. 1, 1928, to March 11, 1929, and 6% p.a. on 6% income deb. stk. for period from March 12, 1929, to March 31, 1929. No div. recommended on ord. shs. Fwd. £1 795.

WARD AND GOLDSTONE, LTD.—Net pft. for year ended March 31, 1929, £13 824, agst. £13 901. Directors propose to capitalise £8 000 for purpose of issuing 32 000 fully-paid ord. shs. of 5s. ea. to hldrs. of pref. shs, to pay fin. div. of 4% on ord. shs, agn. makg. 11%, and to pay fin. participatg. div. of 1% on cum. pref. shs., agn. makg. 8%. Fwd. £25 668, agst. £29 805.

LAMP MANUFACTURERS' WORKING AGREEMENT.—An agreement has been reached between the General Electric Co. of New York and the German Osram Trust, the incandescent lamp co. controlled by Siemens, the A.E.G. and Koppel and Co. The General Electric Co. has acquired 16% of the Osram shs., and agreemt. provides for technical and commercial co-operatn. The Osram Trust is a member of the international consortium of incandescent lamp mfrs., which extends to 18 countries.

DUBILIER CONDENSER CO. (1925), LTD.—Net pft. for year ended March 31, 1929, £15 946, agst. £33 331. Taxatn. absorbed £4 900, agst. £4 917. Half-yearly div. on pref. shs. paid on Nov. 30, 1928, absorbed £6 000, and, after paymt. of half yearly div. on pref. shs. due May 31, 1929, blce. is £11 052, agst. £12 006 brt. in. During year claim by Inland Revenue was decided agst. co., and £9 856 was paid in settlemt. and charged to cap. res. Mfrs. of broadcast receivg. sets have approached the co. with a view to amalgamation, and negotiatns. are proceedg.

EDMUNDSON'S ELECTRICITY CORPORATION, LTD.—Net pft. for year ended March 31, £149 272, agst. £125 083, plus £39 388 brt. in. During year cap. bonus equal to 150% was distributed to ord. shhldrs., increasing issued ord. cap. by £600 000, while a further 250 000 £1 ord. shs. were issued to ord. shhldrs. at par. Fin. div. of 4½% proposed on 1 000 000 ord. shs., makg. 8% for year, with div. of 4% on the 250 000 ord. shs. issued for cash. It is proposed to write off cost of increasing sh. cap., £8 501, and to place £25 000 to res. and £3 000 to staff benevolent fund. Fwd. £34 159.

TELEPHONE MANUFACTURING CO., LTD.—Net pft. for 1928, £20 220, agst. £35 234. It is proposed to utilise £10 000 in writing down new issue exes., and to carry fwd. £34 787. Unremunerative prices on mfg. side have continued, and, in

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spite of increase of 80% in output, operatn. of this dept. resulted in loss of £16 305. Directors have under consideratn. scheme by which installatn. side of business will be formed into a separate co., which, on the pfts. earned, will at once become a div. paying investmt. Particulars of this scheme are to be circulated to shhldrs. at earliest possible date.

OFFICIAL QUOTATIONS.—The Stock Exchange Committee has granted official quotatns. to 316 000 £1, fully paid, ord.

PHOTOGRAPH taken on the lawn at the Sports Ground of the Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester, during the visit of the Institution of Mechanical Engineers on June 25th. (*See page* 35.)

shs. of Callender's Cable and Construction Co., Ltd.; 250 000 £1, fully paid, 7% cum. pref. shs. of the Atlas Light and Power Co.; 333 333 £1, fully paid, ord. shs. of British Insulated Cables Ltd.; 35 000 £1, fully paid, ord. shs. of the Folkestone Electricity Supply Co., Ltd.; 5 025 540 cap. stk., of no par value, of the International Telephone and Telegraph Corporation, and 14 441 £1, fully paid, ord. shs. of the Underground Electric Railways Co. of London, Ltd.

HALL TELEPHONE ACCESSORIES, LTD.—Intm. div. 4%, less tax, has been declared. Business has continued to be satisfactory in all branches, and gen. expansn. has occurred. Benefits of increased trade will accrue mainly in second half of year. No further patents have been sold, but trade under licenses granted in foreign countries has expanded. Indicatns. are that absorptive capacity of various countries served by co.'s. proprietary articles is increasing, and co. has been requested to anticipate dates on certain home contracts. It has been necessary to make additns. to factory premises and to plant and machinery, in order to meet present requiremts.

LISBON ELECTRIC TRAMWAYS, LTD.—After deducting int. charges in connection with the Companhia Carris de Ferro de Lisboa and paying £24 290 int. on debs., net pft. for 1928 was £161 399, plus £17 587 brt. in. To gen. and depreciatn. res., £50 000. Pref. div. and intm. div. of 3% net on ord. shs. have been paid, £10 000 has been transferred to staff benefit fund., and £10 000 to exchange res. Fin. div. of 4% net recommended on ord. shs., making 7% for year. Fwd. £16 880. Passengers carried 112 874 963, compared with 104 581 427.

THE CABLES AND WIRELESS MERGER.—At an extraordinary mtg. of Marconi's Wireless Telegraph Co., Ltd., on June 26th, it was announced that the necessary percentage of assents of all the companies concerned in the merger, Cables and Wireless, Ltd., had been obtained, and the consummatn. and operatn. of the scheme was now ensured. Resolutions approving of the merger were confirmed by the mtg.—On June 27 Cables and Wireless, Ltd., issued a statement that in pursuance of the provisns. of the plan for the merger of the cable companies and the Marconi Co.'s interests and the deposit agreemt. therein referred to, Cables and Wireless, Ltd., certify that the above plan has become operative and that on and after the evening of July 15, 1929, the special register referred to in such plan and deposit agreemt. will be closed. The plan and deposit agreemt. provide that after June 28, no one will be entitled to make a deposit under such deposit agreement or in any other way to accept the offer of exchange contained in the plan, unless the Co. agrees to his so doing. Persons who are desirous of acceptg. the offer after that date should apply in writg. to the Co., who will give them permissn. to accept, subject to such adjustmts. as may be necessary with regard to divs. Notice will be given by advt. in "The Times" and two other newspapers published in London when this permissn. is withdrawn.—The directors of Marconi's Wireless Telegraph Co. recently decided to postpone paymt. of the half-yearly div. on the 7% pref. shs., which would ordinarily be paid on July 1, until the merger plan had become operative and the necessary adjustmts. had been made in the sh. registers.

Company Meetings.

CHADBURN'S (SHIP) TELEGRAPH CO., LTD.—Mr. A. Chadburn Bamford, presiding at the meeting on June 27th, referred with satisfaction to the improved working of the company during the past year, which had enabled them to wipe out the debit balance and show a credit. This more profitable year, he said, had been brought about through increase in sales, and, although the telegraph business was still the mainstay of the company, the directors, for several years, had endeavoured to enlarge their scope of operations so as not to keep their business eggs in one basket. As a result new and additional sidelines were again proving of extreme value to the company. They had secured a valuable order for the manufacture of highly special instruments. The order books were in a healthy condition, with the result they had every reason for expecting the works would be practically fully employed for several months ahead. Trading conditions were still very difficult, competition being as keen as ever. The report was adopted.

GREENWOOD AND BATLEY, LTD.—Col. O. C. Armstrong, presiding at the meeting on Monday, said: The past year's history of the company has beenmore or less a repetition of the preceding lean years which we have been passing through. In spite of seven years' continuous bad trade, we are, however, in a position, subject to your approval, to maintain our dividend on the ordinary shares at the level of 5%. In comparison with last year's figures, creditors stand at £28 101, which is £5 737 more; the reserve account is constant at £162 344. The reserves and surplus of the profit and loss account total £196 000, or 55% of your paid-up ord. sh. capital. The carry forward is £11 396—£2 063 less than last year. On the asset side, after writing off £6 000 for depreciation, we have £385 036. Investments are £21 045 higher than last year, and now stand at £126 179. Stocks are higher by £874. Debtors are £6 288 lower; cash is £11 414 lower. The cash balance, £109 248, is adequate to meet all our present needs. Investments, stocks, debtors, cash, and bills total £380 818. The report was adopted.

LISBON ELECTRIC TRAMWAYS, LTD.—Mr. L. Breitmeyer, presiding at the meeting on June 26th, said the period under review had been one of steady progress, though depreciation of the escudo had caused a falling off in the sterling value of their income of about £22 500, despite the increase of 4 832 contos in the receipts. On the other hand, expenditure showed a decrease of some £22 000. The net result was a profit of £185 689, against £186 416. After deducting interest and redemption of debentures, placing £50 000 to general and depreciation reserve, £10 000 to staff benefit fund, £10 000 to exchange reserve, dividends on preference shares for the year and interim dividend on ordinary shares, there was a credit balance of £54 922. The directors recommended a final dividend on the ordinary shares of 4% net, which would make a total of 7% net for the year, and leave £16 880 to carry forward. A great improvement had taken place in the general conditions in Portugal. He felt that they could look forward to the future with confidence and that the business would further expand with the general growth of the city. The report and accounts were adopted.

ANGLO-ARGENTINE TRAMWAYS CO., LTD.—At the meeting on June 25th, Sir George A. Touche, chairman, said during the 12 months under review the traffic surpassed all records, the passengers numbering 570 079 027, an increase of 9 331 473. The balance carried forward to net revenue account was £1 026 132, plus £26 044 from interest and minor receipts in London. The number of passengers carried by omnibuses in the city of Buenos Aires during 1928 was estimated at 190 000 000, and the number carried by all the tramways was 675 000 000. The significance of this comparison lay in its contradiction of the common belief that omnibuses everywhere could equal if not surpass tramcars in fulfilling the modern transit needs of large populations. The roads in the outer limits were not yet suited for omnibus traffic. The strain on the vehicles was excessive, the cost of operating heavy, and the life short. Under such conditions there was every temptation to concentrate in the central streets. In that way the omnibuses tended to increase rather than to relieve the existing congestion. In September last other competition made its appearance in the form of taxicabs plying for collective hire.

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Their entrance into the arena of the traffic struggle had aggravated the difficulties of an already very serious situation. Progress through the principal thoroughfares had been rendered so slow as to be a matter of general concern. The company had continued to pursue its policy of bettering services, on both the surface and underground lines. But there could be no real cure while the chief causes of traffic congestion remain. The best solution lay in a combination of tramway, omnibus and subway. Some 6 000 000 more passengers were carried in the subway than in 1927. The final plans for the second subway, which would run between the big railway termini at Retiro and Constitución, were presented during the year for the approval of the authorities. The board were now awaiting such action on the part of the municipality as would render procedure with the work of construction economically possible. The report and accounts were adopted.

GLOBE TELEGRAPH AND TRUST CO., LTD.—The Earl of Midleton, presiding at the meeting on June 25th, said their gross receipts for the 12 months ended May 31st, 1929, were £359 191, an increase of £4 331. The net income after deducting working expenses was £347 389, making, with the balance brought forward, £399 711, an increase of £5 048. The directors recommended final dividends of 3s. per share, less tax, on the preference shares, making 6% less tax for the year, and 5s. per share, net, on the ordinary shares, making a total of 10% for the year, and carried forward £77 370. There had been two important mergers during the year. The Mackay Companies had now become the Postal Telegraph and Cable Corporation and the International Telephone and Telegraph Corporation, and their holding of 1 050 preferred shares and 6 070 common shares was now converted into £16 800 5% gold bonds, £12 690 debenture stock, and 4 553 $100 shares of the preference stock of the Postal Telegraph and Cable Corporation, and $1 518 100 shares of the International Telephone and Telegraph Corporation. The latter had since been converted into shares of no par value at the rate of three shares for each $100 share, and they had received an allotment of 455 shares at $50 per share, which they had taken up. The present market price of these shares was about $83. With regard to the merger between the Eastern Associated Telegraph Companies and Marconi's Wireless Telegraph Co., at its inception the object of the founders of their company was to stabilise the securities of the Cable Companies at a time when the scientific development of a new industry was not regarded with the same economic confidence as it would be at the present day. For years their shareholders were content, or had to be content, with a very modest return on their original £3 000 000 of issued capital, which had been gradually increased to £4 165 000. Between 1910 and 1920 they gradually crept up to 8%, and since 1920 to date 10% had been paid. On May 31st, 1928, the value of their securities was £7 123 350, against a cost price of £3 968 990, showing an appreciation of £3 154 359. In 1929, at date of issue of their balance sheet, the value was £9 013 700, against a cost price of £3 977 509, showing an appreciation of £5 036 191. They had complete confidence in the future of the merger company, but the new Cables and Wireless company's dividend on the 7½% stock could not be declared until July, 1930, when the working of this year had been ascertained. Consequently, in the coming year they could not be sure of receiving the full revenue on their holding from dividends on the 7½% merger stock. They had, however, by the conservative policy of recent years, a reserve available for dividends of £158 000 apart from their balance forward of £77 000, so that they might hope to continue without any difficulty their dividend of 10%, free of tax, which had now been paid for 10 years in succession. The report and accounts were adopted.

New Companies.

GENERAL INSTALLATION CO., LTD.—Cap., £100. Electrical and general engineers, etc. Reg. Office: 183, Edgware Road, London, W.3.

J. H. EVANS AND CO., LTD.—Cap., £2 000. General, heating and electrical engineers, etc. Reg. Office: 18, Smithfield Street, Liverpool.

SWIFT TRANSPORTS, LTD.—Cap., £10 000. Proprietors of light railways and tramways, trolley vehicle systems, etc. Reg. Office: Staines Road, Hounslow.

ASSOCIATED ELECTRICAL SUPPLIES, LTD.—Cap., £5 000. Manufacturers of and dealers in electrical supplies, apparatus, plant, etc. Reg. Office: Lagan Mills, Dromore, Co. Down.

DISTRICT SUPPLIES, LTD.—Cap., £10 000. To acquire business of dealer in electric fittings, wireless instruments, etc., carried on by B. Usick at 43, High Road, Wood Green, London, N.

BLOOMFIELD STEEL CONSTRUCTION CO., LTD.—Cap., £2 000. Constructional engineers, electrical engineers, etc. Solicitors: Stockdale and Brown, Victoria Chambers, Wednesbury.

GOULD AND LAKE, LTD.—Cap., £1 000. To acquire business of dealers in wireless and electrical apparatus now carried on by C. H. Gould and H. G. Lake at Tram Terminus, Poole, Dorset, as "Radio House."

J. LYONS (ELECTRICAL AND WIRELESS), LTD.—Cap., £200. To acquire business of electrical engineer and wireless dealer carried on by H. Lyons, trading as "J. Lyons," at 300/10, Willesden Lane, Willesden Green, London, N.W.2.

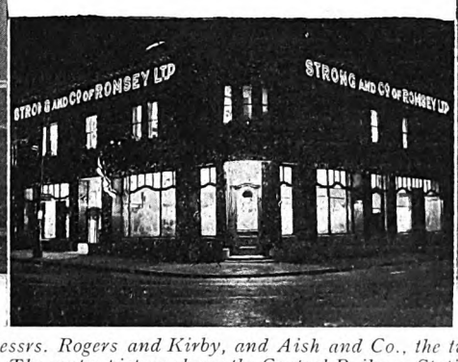
WOODHALL AND PARTNERS (1929), LTD.—Cap., £1 000. Manufacturers of, agents for and dealers in electrical equipment, contractors for the installation of electrical appliances, etc. A director: E. S. Hare, 47, Port Tennant Road, Swansea.

VANDERVELL ELECTRIC REPRODUCING CO., LTD.—Cap., £100. Manufacturers and repairers of and dealers in wireless, telegraphic and telephonic apparatus, etc. Solicitors: J. D. Langton and Passmore, 111, Old Broad Street, London, E.C.

ADVERTISING APPLIANCES, LTD.—Cap., £200. To acquire rights in respect of patents or inventions relating to illuminated signs (moving or stationary), for advertising purposes, or for dissemination of news or propaganda work, etc. Reg. Office: 57, Gracechurch Street, London, E.C.3.

WEINBAU INCANDESCENT AND ELECTRICAL CO., LTD.—Cap., £10 000. To acquire the business of manufacturers, importers and exporters of and dealers in electric lamps and bells, electric meters, switchgear, electric fittings, etc., formerly carried on by M. Weinbaum at 419-423, Commercial Road, London, E.1. Reg. Office: 419, Commercial Road, London, E.1.

MORE ELECTRICAL INTERESTS AT BOURNEMOUTH.



LEFT and right, G.E.C. displays by Messrs. Rogers and Kirby, and Aish and Co., the two well-known Bournemouth electrical contractors, during the E.C.A. Conference. The centre picture shows the Central Railway Station Hotel, featuring G.E.C. "Luxor" signs.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

DIALS WIRELESS STORES, 20/21, Chatham Place, Brighton £16 7s. 3d. May 27th.

DUNNING AND WATSON, Castlegate, Stockton, electrical engineers. £17 16s. 6d. May 29th.

EGERTON, R., AND CO., 26, Pear Tree Road, Derby, electrical engineers. £10 9s. 2d. May 10th.

ELTHAM RADIO SERVICES, 3, Merlewood Parade, Eltham, wireless dealers. £14 os. 4d. April 23rd.

EMPSON ELECTRICAL ENGINEERING CO., LTD., 22, Chancery Lane, W.C. £13 1s. 3d. April 24th.

HOOK, Mr. V., Electric Light Yard, West Street, Bromley, wireless dealer. £16 7s. 1d. April 22nd.

JINKS, H. J. R., Dolce Domum, Park Road, Aldershot, wireless manufacturer. £20 6s. 10d. May 17th.

McMILLAN, Mr. W. H., Rake Lane, Bromborough, wireless dealer. £14 18s. 2d. May 28th.

SOUTH ESSEX ELECTRICAL CO., 30, London Road, Romford. £27 18s. 5d. May 2nd.

SPERO, Mr. S., Peebles Works, Palmerston Road, Kilburn Road, N.W., wireless set manufacturer. £10 9s. 4d. April 30th.

SWEET, Robert C. (trading as LONDON RADIO STORE), 107A, High Street, Uckfield, electrical engineer. £11 11s. 10d. May 6th.

WALKER, Mr. H. F., 193C, Balham High Road, S.W., wireless dealer. £10 5s. 5d. May 24th.

Deeds of Arrangement.

HYDE, Robert, 67, Friargate, Preston, radio engineer. Dated June 19th, filed June 21st. Trustee, W. Atkinson, 25A, Winckley Square, Preston, C.A. Secured creditors, £1 910; liabilities unsecured, £761; assets, less secured claims, £1 325.

WILSON, Frederick Rupert, 266, Main Street, Thurmaston, electrical contractor. Dated May 19th, filed June 25th. Trustee, W. H. Harding, 27, Friar Lane, Leicester, accountant. Secured creditors, £207; liabilities unsecured, £354; assets, less secured claims, £207.

Receiverships.

ASTRA DYNAMO CO., LTD. H. C. Faulkner, of 27, Disraeli Road, Putney, S.W., was appointed receiver and manager on June 6th, 1929, under powers contained in debenture dated November 30th, 1925.

DANKS PATTISON COMBUSTION CO., LTD.—W. L. Bate, C.A., of Carlton Chambers, Baldwin Street, Bristol, was appointed Receiver on June 20th, 1929, under powers contained in debenture dated April 14th, 1926.

HIGHTENSITE AND EBONITE MANUFACTURING CO., LTD. H. G. Judd, of 8, Frederick's Place, Old Jewry, E.C., was appointed receiver on June 20th, 1929, under powers contained in first and second debentures.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

ELECTRO DYNAMIC CONSTRUCTION CO., LTD., London, S.E.—Registered June 18th, charge to Bank; charged on lease of premises at rear of 733B, Old Kent Road, S.E. *£1 000. May 14th, 1929.

FLEXIBLE ELECTRIC CORDS, LTD., Ponders End.—Registered June 12th, £200 debenture, to Mrs. G. A. Riley, The Ridgeway, Enfield; general charge. *£500. December 31st, 1928.

"M. P. A." WIRELESS, LTD., London, W.—Registered June 13th, £5 370 debentures part of £35 000 and bonus of 12½%; general charge.

"K. N." ELECTRICAL PRODUCTS, LTD., London, E.C.—Registered June 18th, £1 000 debentures, to P. Ferguson, The Garth, Grange Road, Highgate; general charge.

ROBINSON AND REX, LTD., Hampton Wick, electrical engineers.—Registered June 4th, debentures, to R. J. Mott, director of the company, securing all moneys not exceeding £400 for which he may become liable under his guarantee to bank; general charge.

Satisfactions.

COLE (E. K.), LTD., Leigh-on-Sea, wireless manufacturers.—Satisfaction registered June 10th, £3 000 (not ex.). registered May 16th, 1928.

COLNE VALLEY ELECTRIC SUPPLY CO., LTD., London, E.C.—Satisfaction registered June 12th, £2 325, part of amount registered July 17th, 1925, and November 25th, 1926.

MICANITE AND INSULATORS CO., LTD. (late MICA INSULATOR CO., LTD.), London, E.—Satisfactions registered June 11th, £15 000, registered April 2nd, 1908, and £10 000, registered November 28th, 1916.

SAUNDERS ELECTRICAL CO., LTD., Coventry.—Satisfaction registered June 30th, £1 000, registered September 14th, 1920.

WATFORD ELECTRIC AND MANUFACTURING CO., LTD. (late THOMAS KESNOR AND CO., LTD.).—Satisfaction registered June 10th, £3 000 (inclusive of £2 500 previously satisfied), registered June 11, 1923.

WORTEX MANUFACTURING CO., LTD., London, E.C., electrical manufacturers.—Satisfaction registered June 6th, £2 000, registered July 15th, 1927.

London Gazette, etc.

Companies Winding-up Voluntarily.

HENDON ELECTRIC LAMP CO., LTD.—By reason of its liabilities, June 26th, F. Rowland, F.C.A., 76, Finsbury Pavement, E.C.2, appointed as liquidator. Meeting of creditors at the offices of the liquidator, on Monday, July 15th, at 12 noon.

PERRING-THOMS WIRELESS SYNDICATE, LTD. By reason of its liabilities, June 20th. A. Williams, 82, Queens Road Brighton, appointed as liquidator.

Bankruptcy Information.

AUSTIN, Clifford, 97, Domestic Street, Leeds, trading as C. AUSTIN AND SON and AUSTIN'S ACCUMULATOR AND RADIO SERVICE, wireless accessories dealer. Receiving order, June 24th. Debtor's petition.

Notice of Intended Dividend.

BROCK, Reginald Lewis, trading as R. L. BROCK AND CO., 5, Bedford Row, Tavistock Road, Plymouth, electrical engineer. Last day for receiving proofs, July 17th. Trustee, J. S. B. Hole, 240, High Holborn, W.C.1.

Partnership Dissolved.

FINNEMORE AND WILLS (William Henry FINNEMORE and Frank WILLS), motor, electrical, and general engineers, The Quay, Kingsbridge, Devon, by mutual consent as from June 1st, 1929. Debts received by W. H. Finnemore, and debts owing by the late firm will be paid by F. Wills. The business will be carried on by F. Wills.

METAL AND CHEMICAL PRICES.

TUESDAY, July 2nd.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£75 10 0	—	10s. 0d.
Electro Wirebars	„	£84 10 0	—	5s. 0d.
H.C. Wires, basis	per lb.	11⅝d.	—	⅛d.
Sheet	„	11⅝d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 2⅛d.	—	⅛d.
Brass 60/40—				
Rod, basis	per lb.	9d.	—	—
Sheet „	„	10⅞d.	—	—
Wire „	„	11⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig—				
English	per ton	£24 15 0	—	10s. 0d.
Foreign or Colonial	„	£23 7 6	—	10s. 0d.
Tin—				
Ingot	per ton	£202 5 0	10s. 0d.	—
Wire, basis	per lb.	2s. 8d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£25 5 0	—	17s. 6d.
Mercury	per bottle	£22 0 0	—	5s. 0d.

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
Sodium Bichromate—Per lb. 3½d.
Rubber—Para fine, 11d.; plantation, 1st latex, 10⅝d.

***. The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

The market opened last week with a slightly firmer tone, but, according to James Forster and Co., prices later became easier though the tone remained steady.

Closing prices on June 28th were £23 7s. 6d. for June, £23 6s. 3d. for July, and £23 5s. for August and September, 8s. 9d. to 7s. 6d. per ton easier on the week.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

311 020 F. H. Royce. Electrical turning-gear for starting internal-combustion engines. (14/2/28.)
291 425 R. Bomig. Device for fastening electric bonding-conductors to rail base. (3/6/27.)
287 167 C. Lorenz A.-G. Alternating-current electrical generators. (18/3/27.)
286 317 Quarzlampen-Ges. Mercury-vapour lamps or quartz lamps. (4/3/27.)
311 045 J. Morris. Electric storage batteries. (16/3/28.)
311 055 P. Freedman and W. J. Rickets. Piezo-electric substances. (29/3/28.)
288 288 Siemens and Halske A.-G. Device for measuring electric resistances with the aid of a cross-tail instrument. (9/4/27.)
288 979 L. Mellersh-Jackson (Maschinenfabrik Esslingen). Electromagnetic transmission gearing. (14/4/28.)
311 071 Graham Amplion, Ltd., and P. K. Turner. Sound-reproducing devices (16/4/28.)
311 075 A. Carpmael (Telefunken Ges. fur Drahtlose Telegraphie). Picture telegraph, television, and the like systems. (21/4/28.)
294 976 Siemens and Halske A.-G. Arrangement for the testing of electric resistances by means of a cross-coil instrument. (3/8/27.)
311 082 General Electric Co., Ltd., W. Wilson, and T. W. Dann. Electric transformers. (1/5/28.)
290 973 Telefunken Ges. fur Drahtlose Telegraphie. Picture and the like telegraph systems. (21/5/27.)
311 091 G. Brewer (F. Krupp A.-G.). Electromagnetic controlling-apparatus for transmitting movement electrically. (4/5/28.)
311 096 General Electric Co., Ltd., and L. Gardner. Electric radiators. (7/5/28.)
293 446 Marconi's Wireless Telegraph Co., Ltd. Electrical filter and the like frequency selective circuits. (7/7/27.)
291 057 British Thomson-Houston Co., Ltd. Regenerative braking of electric motors. (25/5/27.)
311 131 H. W. Sullivan, Ltd., and W. H. F. Griffiths. Electrical condensers of the variable differential type. (22/6/28.)
294 172 H. Stammereich. Metal-arc or metal-vapour lamps. (19/7/27.)
294 249 British Thomson-Houston Co., Ltd. Liquid-film seals for use in gas-cooled dynamo-electric machines. (22/7/27.)
302 884 Geb. Junghans A.-G. Means for the generation of compressed air for electropneumatic devices, in particular clock installations. (22/12/27.)
298 073 A. Rupps. Electric cigar-lighters. (1/10/27.)
308 675 P. Schober and R. Schober (trading as R. Schober). Electro-magnetically-operated vehicle direction-indicators. (26/3/28.)
300 263 Siemens-Schuckertwerke A.-G. Frame-shorting protective device for generator plants having several bus-bar systems. (10/11/27.)
301 327 Marconi's Wireless Telegraph Co., Ltd. Picture and the like telegraph apparatus. (25/11/27.)
301 510 C. Lorenz A.-G. Piezo-electric control of valve oscillation generators. (2/12/27.)
301 518 C. Lorenz A.-G. Vacuum-tube oscillators controlled with piezo-electric resonators. (2/12/27.)
303 171 Telefunken Ges. fur Drahtlose Telegraphie. Circuit arrangements suitable for use in valve transmitters. (29/12/27.)
311 004 G. W. Pierce. Magnetostrictive and piezo-electric vibratory systems. (3/1/28.)
281 728 Radiofrequenz Ges. and H. Eberhard. Piezo-electric quartz resonator or oscillator. (24/12/26.)
311 065 E. Pye and J. Heale. Tubular electric lamps. (15/10/28.)

Applications for Patents.

April 16th.

11 797 Automatic Telephone Manufacturing Co., Ltd., and L. M. Simpson. Electrical relays.
11 767 E. Baron and W. Burwell. Apparatus for electrical transmission of orders, etc., to ship's telegraphs.
11 753 Bing Werk, vorm Bing Akt.-Ges. Electro-magnetic switch arrangements. (19/4/28, Germany.)
11 808 L. Wolf-Carnejero and M. Peiser. Obtaining electrical power.
11 784 E. W. Challans, R. M. MacGregor, L. H. Peter, and Westinghouse Brake and Saxby Signal Co., Ltd. Electric relays.
11 756 J. E. Collyer and Coventry Automatic Telephones, Ltd. Automatic telephone systems, etc.
11 690 F. A. A. Elmore. Apparatus for testing electric coils.
11 763 International General Electric Co., Inc. Oil switches, etc. (17/4/28, Germany.)
11 764 International General Electric Co., Inc. Temperature compensation devices for electric measuring instruments. (19/4/28, Germany.)
11 781 G. K. Jensen. Electric resistances.
11 782 F. Murphy and E. J. Power. High frequency amplification by thermionic valves.
11 794 N. V. Philips' Gloeilampenfabrieken. Magnet systems for telephones, etc.
11 795 N. V. Philips' Gloeilampenfabrieken. Loud speakers. (27/4/28, Holland.)
11 777 A. H. Seabrook. Armouring for electric cables.
11 838 Soc. des Etablissements Industriels de E.C. and A. Grammont. Connections for rectifiers. (17/4/28, France.)
11 816 G. Somajni. Electric control apparatus. (20/4/28, Italy.)
11 740 H. N. Soper. Electrically controlled shutters.
11 787 Telefonaktiebolaget L. M. Ericsson. Telephone systems. (21/4/28, Sweden.)
11 817 Telefunken Ges. fur Drahtlose Telegraphie. Directional aerial systems. (17/4/28, Germany.)
11 785 Westinghouse Brake and Saxby Signal Co., Ltd. Electric rectifiers. (17/4/28, U.S.)

April 17th.

11 955 British Thomson-Houston Co., Ltd. Electric transformers. (18/4/28, U.S.)
11 956 British Thomson-Houston Co., Ltd. Electromagnetic apparatus. (18/4/28, U.S.)
11 964 Burovax, Ltd., and S. C. Winfield Smith. Telephone systems, etc.
11 988 F. B. Dehn (Mills Novelty Co.). Switch mechanism for electrically-operated musical instruments.
11 977 A. G. Clark, W. O. Heyne, and Plessey Co., Ltd. Wireless receiving sets.
1 1965, 11 966, 11 967 Electro Bleach and By-Products, Ltd., and J. Hollins. Electro-deposition of metals. (25/2/28.)
11 862 T. W. Fairlie. Electric light fittings, etc.
11 850 R. E. Forster, Tramcar, etc., seats.
11 971 W. T. Henley's Telegraph Works Co., Ltd. Contact arrangements of links, etc., for insertion in electric circuits.
11 954 International General Electric Co., Inc. Transformers. (17/4/28, Germany.)
11 966, 11 967 D. Jepson. Electrodeposition of metals. (25/2/28.)
11 847 B. K. Kirkby. Electrical keyboard for receiving messages.
11 929 R. Mayrshofer. Electric plugs. (21/4/28, Germany.)
11 981 W. D. Rhys. Means for controlling battery ignition circuits for motor vehicles, etc.
11 934 Siemens-Schuckertwerke, A.-G., and F. Wellhofer. Current transformers.
11 950 Siemens-Schuckertwerke, A.-G. Submarine cables.
11 935 Siemens and Halske, A.-G. Arrangements for transformation of light variations into changes of electric current, etc. (2/5/28, Germany.)
11 899 W. E. Styles. Electric switches.
11 894 U. C. Tainton. Methods of electrolysis.

April 18th.

12 115 Associated Electrical Industries, Ltd.—Control systems for power plants. (19/4/28, U.S.)
12 035 J. L. Baird and Television, Ltd. Apparatus for production of electric signals, etc. (20/6/28.)
12 036, 12 037, 12 038 J. L. Baird and Television, Ltd. Television, etc., apparatus. (20/6/28.)
12 063 E. J. Bertles and English Electric Co., Ltd. Electric contactor apparatus for rheostatic purposes, etc.
12 088 British Thomson-Houston Co., Ltd. Frequency changers. (13/4/28, U.S.)
12 030 Electro Bleach and By-products, Ltd., and J. Hollins. Electro-deposition of metals. (25/2/28.)
12 031 Electro Bleach and By-Products, J. Hollins, and D. Jepson. Electro-deposition of metals. (25/2/28.)
12 095 F. W. Fawdry. Overhead conductors for electric tramways, etc.
12 122 Ferranti, Ltd., and G. I. Finch. Electric spark discharge systems.
12 026 W. G. Gale. Telephone receivers, etc.
12 104 W. Haddon. Accumulators.
12 008 L. Hewitt. Electric terminals.
12 033 S. A. Hunter. Resistance grids.
12 013 P. L. V. Lambert. Electrical device for developing agriculture.
12 071 A. E. O'Dell (Elektrotechnische Fabrik Schmidt and Co. Ges.). Electric hand lamps, etc.
12 069 Telefunken Ges. fur Drahtlose Telegraphie. High-frequency generators. (21/4/28, Germany.)
12 075 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Electrical transmission systems.
12 074 Western Electric Co., Ltd. (Electrical Research Products, Inc.). Sound recording, etc., systems.
12 028 Westinghouse Lamp Co. Cathode ray tubes. (23/4/28, U.S.)

April 19th.

12 217 Associated Telephone and Telegraph Co. Telegraph switching systems. (30/4/28, U.S.)
12 216 Automatic Telephone Manufacturing Co., Ltd., F. Kessler, and J. Scowcroft. Telephone systems.
12 200 R. W. Biles and A. Reyrolle and Co., Ltd. Electric protective arrangements.
12 203 British Thomson-Houston Co., Ltd. Protecting systems for a.c. commutator motors. (20/4/28, U.S.).
12 161 G. B. Burnside. Electric water heating apparatus.
12 173 Callender's Cable and Construction Co., Ltd. Production of foundations for poles, etc.
12 205 Dubilier Condenser Co. (1925), Ltd. Thermionic valves. (20/4/28, Germany.)
12 240 Electro-Physikalische Ges. and E. Kassner. Electrical condensers.
12 149 S. Frais. Storage batteries.
12 204 International General Electric Co., Inc. Dynamo-electric machines. (23/4/28, Germany.)
12 246 H. T. Logan. Terminal mounts for radio sets.
12 197 Newton and Wright, Ltd., and H. A. Quinton. Electrical controlling apparatus for hot cathode X-ray tubes.
12 232 A. Peloux. Automatic cut-outs.
12 238 Pirelli-General Cable Works, Ltd. Apparatus for de-gasifying liquids.
12 179 J. R. Quain. Electric signs.
12 224 F. Savayo. Operating plurality of adjustable members of wireless receivers. (20/4/28, France.)
12 222 Siemens and Halske A.-G. Train controlling systems. (20/6/28, Germany.)
12 176 Standard Telephones and Cables, Ltd. Electronic device. (26/4/28, U.S.)
12 266 C. W. I. Thomas. Bell indicator and fire alarms.
12 198 R. A. L. Volet. Electrical machines comprising rotary working tools. (10/5/28, Belgium.)

April 20th.

12 366 British Thomson-Houston Co., Ltd. Electric meter compensating devices. (24/4/28, U.S.)
12 357 H. V. Carlisle and Ferranti, Ltd. Radio receiving systems.
12 345 Duro-Ray, Ltd., and R. W. Johnston. Electric lamps.
12 326 M. B. Field. Magnetic compasses.
12 363 V. H. Gilbert and Radiovisor Parent, Ltd. Manufacture of light sensitive bridges.
12 293 T. Hartley. Electric wiring, etc., clip.
12 335 A. P. Lundberg and Sons, Ltd., and G. Pegg. Electric lampholders.
12 304 L. H. Pearson and W. J. Randall. Means for controlling and operating electrical circuits.

COMING EVENTS.

Friday, July 5th (To-day).

Tramways and Light Railways Association.—Sheffield. Annual Congress.
Overhead Lines Association.—Summer meeting. Charabanc tour in the Mid-Cheshire area, starting from Winsford (L.M. & S.), 12.15 *p.m.*

Saturday, July 6th.

Physical Society.—Visit to Birmingham and meeting at the University. Leave Paddington, London, 9.10 *a.m.*

Monday, July 8th.

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting.
Electrical Contractors' Association (Hastings Sub-Branch).—Lewcocks' Restaurant. Ordinary meeting.

Tuesday, July 9th.

Electrical Contractors' Association (Leicester Branch).—Corridor Chambers. 2.30 *p.m.*
Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Wednesday, July 10th.

Electrical Contractors' Association (Eastbourne Sub-Branch).—South Street. Ordinary meeting.
Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting.

Wednesday, July 10th—Friday, July 12th.

Electrical Association for Women.—Conference and Annual General Meeting at Newcastle-on-Tyne, by invitation of the North-East Coast Branch.

Thursday, July 11th.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.
Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting.
Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

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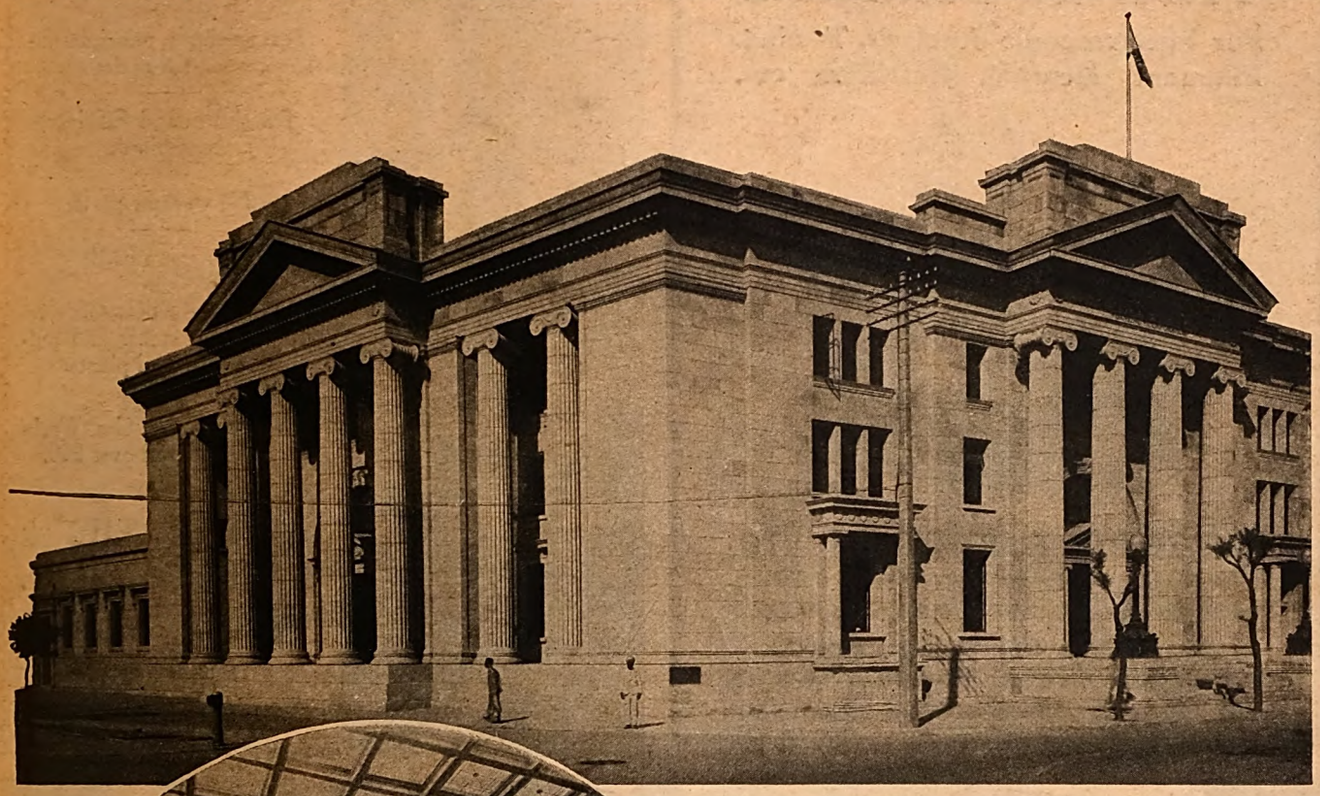
THE ELECTRICIAN

Vol. CIII.—No. 2667. Friday, July 12, 1929. [Registered at the General Post Office.] Sixpence



Another Chinese Bank

Henley V.I.R. Wires of 600-Megohm grade installed in steel conduit form the basis of the electrical installation of the Hong-Kong and Shanghai Banking Corporation's imposing building in Tientsin.

An interesting feature of this installation are the combined lamp standards and electric fans, shown in the smaller illustration.

At home and Overseas the best Contractors use the best possible wires for the best of installations.

There is a flexible cord which does not kink or break at the connector. It is Henley "Thermoid" Flexible Cord.

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HENLEY
V.I.R. Wires

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., HOLBORN VIADUCT, LONDON, E.C.1

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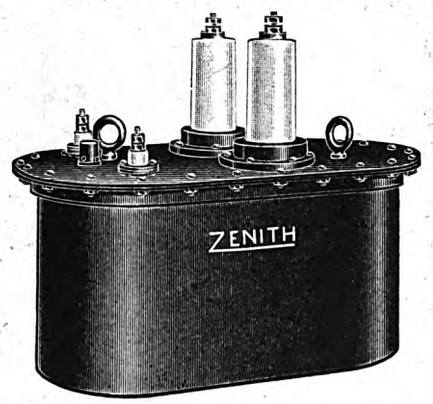
ZENITH

(REGISTERED TRADE MARK)

TRANSFORMERS

For Spectroscopic Analysis, Testing, Filament Heating, Rectifiers, etc.



THE ZENITH ELECTRIC CO., LTD.

Sole Makers of the well-known "Zenith" Electrical Products

Contractors to the Admiralty, War Office, Air Ministry, Post Office, L.C.C., &c.

Zenith Works, Villiers Road, Willesden Green, London, N.W.2

Phone: Willesden 4087-8. Telegrams: Voltaohm, Willroad, London.

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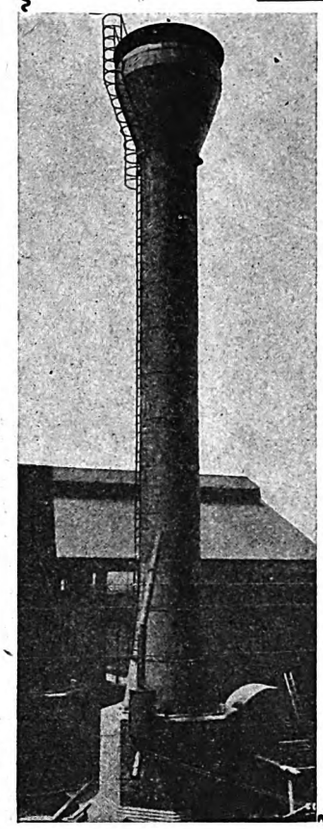

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THE ELECTRICIAN

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Current Topics.

The Need for International Specifications.

A SERIES of meetings of the members of the International Electrotechnical Commission on questions relating to machinery and materials used in connection with electrical work was concluded in London last week. A large number of foreign delegates took part in the discussions, which were organised by the British Committee of the I.E.C., in conjunction with the Steam Turbine Section of the British Electrical Manufacturers' Association, which association, so far as work in regard to the formulation and amendment of standard specifications is concerned, is included in the Electrical Section of the British Engineering Standards Association. The time may, perhaps, be opportune to indicate briefly the relationship of the B.E.S.A. and the I.E.C. The Electrical Section of the B.E.S.A. is identical with the British Committee of the I.E.C., and this section or committee has long been of opinion that, in addition to purely electrical work, it is the proper body to deal also with the mechanical portion of plant used for electrical purposes. In pursuance of this policy, it raised, amongst other matters for discussion at the recent sessions, important proposals with a view to securing an international specification for cast iron and a recognised international standard providing a common basis on which tenders for machinery should be prepared. British manufacturers often fail to secure important contracts because foreign firms can undersell them, in consequence of the use of inferior materials, the defects of which are not discovered until after the makers' guarantee period has expired. To revert to the matter of the organisation of the I.E.C., the national committees in the various countries are in touch with the central office in London, and some of the said national committees are each made the secretariat of an international committee dealing with a certain subject. For instance, the British National Committee is the secretariat of an international committee dealing with the rating of electrical machinery, and the French National Committee is the secretariat of an international committee dealing with traction motors. Technical details of the results of the recent discussions will be published by the I.E.C. in due course, while a brief report of the social activities following the conclusion of last week's meetings will be found elsewhere in this issue.

The I.E.E. Conversazione.

THE annual conversazione of the Institution of Electrical Engineers, which was held on Thursday of last week, was, as usual, a most imposing function, and the vast assembly received by the president, Lieut.-Colonel KENELM EDGCUMBE, and Mrs. EDGCUMBE, included many notable scientists and engineers. The string band of the Royal Engineers gave able renderings of a variety of musical selections, and a company of talented artistes provided an enjoyable instrumental and vocal concert. The fact that the function is held in the Natural History Museum at South Kensington—which, like other buildings of a similar character, engenders a feeling akin to awe in most people, even when they are far past childhood—does not appear to reduce the attendance. We do venture to think, however, that if a sufficiently large hall minus collections of exhibits in glass cases could be secured for the conversazione, and if those who listened to the concert were not obliged to sit at—and almost on—the feet of skeletons of dinosaurs and other monsters in the Reptile Gallery, there would be no risk of its encouraging too great a departure from the solemnity which seems to be considered proper to the Institution's entertainments. Another advantage ensuing from a change of venue might also be liberty to smoke in some part of the premises, which would certainly be appreciated by a considerable number of the visitors.

Power Transmission in the United States.

THOUGH we in this country have perhaps always associated the transmission of power in the United States with long distance, such conclusions are apparently without foundation, for, according to the N.E.L.A., a review of the movement of electric power during the past few years indicates that the average distance traversed by the average kWh in its course from power house to consumer in the United States is about 22 miles. If the production of the State of California, with its power plants for the most part in the Sierras and its use in the lowlands along the sea coast, is excluded, the average for the rest of the States

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is only 18 miles. It would seem therefore, that in spite of the progress in the interconnection of electric light and power systems and the extension of transmission lines during recent years, the bulk of the energy is still consumed in the vicinity of the power plants. To some extent this is the result of economic factors which have dictated the position of steam plants in the near neighbourhood of the large markets for their power in the seaboard cities and the industrial regions of the country. It is also the result of the increasing economies being effected in generation by steam near the centres of use, as compared with the cost of making water-power developments at a distance and of bringing this power to market over long transmission lines. Statistics indicate that this average distance travelled by electric power is becoming shorter and that this trend should gradually become more pronounced. Although the production of hydro-electric power in the United States was larger than the average during 1928, this represents a situation which probably will not persist, for many of the projects recently completed were determined upon and prepared at least five years ago, when the price of coal was at its peak and when the efficiency of steam generation was much lower than it is at present. Since then, the operating cost of generating by steam has, in America, been cut nearly in two, and, as a result, the attractiveness of most of the remaining undeveloped water-power plants has been seriously impaired. Five years from now, the oft-repeated prediction as to the shrinkage in the proportion of the total amount of electric energy produced in the United States by water power will, in all probability, be measurably fulfilled.

A Fallacy Re-exposed.

THE old mistaken theory that from the business point of view the holiday months must of necessity contribute a period of slackness has been the subject of frequent references in our columns in recent years, but careful observation this year has fortunately shown that the warning against holiday-time slackness is not nearly so applicable to the electrical industry now as it was three or even two years ago. The ideal of " business as usual " during the months of July, August and September is one that is well worth striving for. It has been shown over and over again that instead of having less to spend during this period most people are spending money more freely and at a greater rate than at any other time of the year. This tendency can obviously be turned to account on the domestic appliance side. In the heavier fields of manufacturing this expenditure of the savings of nine months is not a feature of the season, but the same old holiday spirit frequently holds up important constructional and development work, and in this and other ways profoundly affects the year's trading results. The remedy for this is easy, but it can only be applied when executives realise that deputies may—at least for a short time during their absence—quite capably carry out much of the normal work of their chiefs, and that by thus delegating responsibility they not only permit work to proceed unhampered but give those temporarily in charge a keener interest in, the job and an added sense of responsibility which cannot fail to be of value to their employers. We are glad to see that one of the popular daily papers is devoting a considerable amount of space to a re-exposure of the fallacy that holiday time is a slack time for business, and it is also interesting to note that some of the biggest national advertisers are giving practical evidence of their belief in the theory that the holiday months are particularly good ones for the advertiser.

Registration Progress.

THE latest figures of admissions to the National Register of Electrical Installation Contractors are distinctly gratifying. At its last meeting the Executive Committee had for consideration no fewer than 48 applications for registration, and of this number 37 were accepted. The current list of newly registered contractors is also of interest in view of the fact that 17 out of the 37 successful applicants are carrying on business in Leeds, where enrolment on the National Register is a necessary qualification for any installation contractor desirous of participating in work on the Corporation's wiring schemes. The supply authority's action at Leeds has been, and is being, imitated in other places, and it is becoming increasingly evident that suppliers who in the past have been critical of installations connected to their mains now have the remedy entirely in their own hands. By insisting that installations over which they have control are put in by registered contractors they not only help to raise the status of the installation side but also equip themselves—through the Registration Board—with disciplinary powers against any contractors who may transgress the accepted canons of sound installation work.

Domestic Appliances in Canada.

THE increasing use of electricity for domestic purposes in Canada is, as must be expected, having a direct effect on local manufactures of electrical appliances. From the standpoint of the number of individual units, the largest production in the entire industry is in dry cell batteries, followed by incandescent lamps, accumulators and irons. The growing popularity of radio has accounted for a greatly increased production, but the item which has made probably the greatest advance is electrical refrigeration. Whether one looks to electric cookers, stoves or vacuum cleaners, everywhere is there a considerable increase in manufacturing output to be found, showing that though Canada is still in advance of the mother country so far as the domestic application of electricity is concerned, there is still room for further development. As an Empire market Canada should offer opportunities to manufacturers in this country, and though much of the imported electrical apparatus is made in America, many of the Canadian people would prefer if possible to buy British. In many ways, Canada has become the Cinderella of the Empire so far as electrical manufacturers in the country are concerned, and though they look to Australia, New Zealand, India, and South Africa for orders, rarely do they remember the electrical importance of the Dominion of Canada.

Electrical Development in Belgium.

PERHAPS one of the most interesting developments of the electrical industry since the war is that taking place in Belgium. The majority of the distribution system is carried out with overhead lines, and it is interesting to note that the total length of lines, both of high and low tension, now attains 25 000 kilometres. This figure compares with 8 800 kilometres in 1900 and 14 000 in 1924, and of the total population of 7 930 000 as many as 7 270 000 are served with electrical energy. Public authorities are taking a lively interest in the use of electricity, either by means of subsidies for the construction of lines as in the case of Eastern Flanders and the provinces of Luxemburg and Namur or by participating in the formation of associations for the purpose of exploiting a system, as has happened in the Provinces of Antwerp, Limburg, Liège, Hainaut and Western Flanders. In the province of Brabant an association has just been formed which will serve nearly all the community within its boundaries hitherto unprovided with electricity. Centralisation in the industry is, as here, again noticeable, and the Union of Liège power stations have been joined by the power stations of Namur and Luxemburg with the title of " Linalux." Distributing companies have founded the Union Belge des Producteurs d'Electricité, whose aim is to group all producers without infringing the unacquired rights, while further mergers will probably take place with a view to a community of interest and consequent further development of the industry.

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RECENT ELECTRICAL PROGRESS IN INDIA.*

Testing Out Automatic Telephone Exchanges—Electricity Supply Available in all Cities—Increased Demand in Calcutta—A Sub-station Equipped for "Siege Conditions"—The Position in Industrial Areas.

By A. T. COOPER, M.Inst.C.E., M.I.Mech.E., M.I.E.E., M.Cons.E.

DURING the past five years the total annual value of Indian imports of electrical apparatus, machinery and accessories has averaged 5½ crores of rupees (about £4 000 000), and has not varied more than 10% on either side of that average. Although this figure includes the cost of replacements of existing articles which have worn out or become obsolete, it does not include that of the many items of plant and material ancillary to electrical development. Assuming that the addition on the one hand cancels the omission on the other, and bearing in mind the growing tendency to manufacture many small electrical articles in the country, the steadiness of the absorption may be deemed to be indicative of substantial progress.

TELEGRAPHY.—The principal improvements in land line working, which have been introduced by the Government of India Telegraph Department during the last six or seven years, have been in connection with long distance circuits employing high-speed printing systems. The installation of regenerative repeaters or retransmitters has rendered quadruple "up-and-down" working on the Baudôt system possible over the longest circuits operated by the department. Calcutta—Agra, 808 miles, and Bombay—Agra, 843 miles, are worked satisfactorily without any intermediate retransmitting station.

Progress in Wireless Communication.

The most recent application of wireless telegraphy is of outstanding importance. In 1925 the Indian Radio Telegraph Co. was floated for the purpose of establishing a system of reciprocal wireless communication between India and Great Britain, and a short-wave transmitting beam station at Kirkee, near Poona, and a receiving station at Dhond, were officially opened by the Viceroy in July, 1927, and came into regular public use two months later. The success of the "Empiradio" wireless service was immediate, and the volume of traffic so far exceeded the estimates as to constitute an actual embarrassment. An extension of the beam system from India to other countries is under negotiation, and developments in this direction are anticipated as soon as the merger between the submarine cable and wireless interests has come into active operation.

Further uses for wireless telegraphy will no doubt be found in India, such as navigational direction-finding (stations at Karachi, Bombay, and Calcutta having already been installed) and also for communication with lightships and police outposts.

TELEPHONY.—Developments under this head may be broadly divided into two classes: (1 Those relating to the modernising of old exchange equipment. (2) Those in connection with long-distance working with the aid of thermionic repeaters.

Within the last few years a number of automatic exchanges have been installed by the Government in place of the original manually-operated plants. Details are as follows:

Name of Exchange.	Size. Present Equipment (Circuits).	Size. Ultimate Capacity (Circuits).	Type of Automatic Equipment.
Delhi	1 500	3 000	Peel-Conner, Machine
,,	1 400	3 000	switching.
Cawnpore ..	500	2 000	Ditto.
Nagpur	200	500	All-Relay (Relay Automatic Co.).
Poona	500	1 000	Ditto.
Amritsar	700	700	Strowger, Machine switching.
Rawalpindi ..	500	600	All-Relay (Relay Automatic Co.).
Quetta	300	300	Ditto.
Allahabad ..	220	300	Ditto.
Bengal Coalfield Exchanges (4) .	780	2 000	All-Relay (Peel-Conner).
Ootacamund ..	150	300	Ditto (Relay Automatic Co.).
Conoor	150	300	Ditto.
Meerut	80	160	All-Relay (Peel-Conner).

* Extract from a paper read before the Indian Section of the Royal Society of Arts.

Upon the working of these exchanges the Government will shortly be in a position to decide which system of automatic working is best suited to Indian conditions.

The telephone service in the three Presidency cities, and also in Karachi and Ahmedabad, are in the hands of private companies working under licence.

Bombay (9 000 subscribers) and Madras (3 000 subscribers) have both recently changed over to automatic working, but Calcutta (9 000 subscribers) still retains manual operation.

Extensive development in the Government long distance trunk service has recently taken place, and the network is now very comprehensive.

For distances of over 350 miles thermionic repeaters are used, and the quality of speech transmission is claimed to be good, as a rule, up to 1 000 miles, but beyond this distance difficulties in maintaining uninterrupted communication are met with. In the absence of "interruption" or "disturbance," "commercial" speech is sometimes possible between Calcutta and Bombay via Delhi, a distance of 1 800 miles, but as compared with Europe and the U.S.A., India is evidently very backward in long-distance telephony in spite of the urgent need for an efficient service for linking up the ports with the capital and with industrial centres.

So far, no provision for inter-continental telephony has been made, but it forms part of the future programme of the Indian Radio Telegraph Co.

ELECTRICITY SUPPLY.—A general supply of electrical energy is now available in all Indian cities of any importance, while many licences for supply in the smaller urban centres have recently been granted. In the secondary towns, with few exceptions, oil engines have been utilised as prime movers, while in the larger, apart from Bombay, steam turbines and water tube boilers are employed.

The demand per head of population varies over wide limits, ranging from 5 or 6 units per annum in some of the smaller cities to about 200 in the case of Bombay.

The following notes record some recent developments in the principal cities, taking them in the order of relative population of areas of supply:

Calcutta.—The demand has recently increased very rapidly, and energetic steps have had to be taken by the Electric Supply Corporation to keep pace with the requirements of its population of one and a half millions.

In 1925 100 million units were sold. Last year this output reached 148 millions, while the estimate for the current year is 168 millions.

The first section of a new Southern power station laid out for an ultimate capacity of 150 000 kW came into operation at the end of 1926. This is equipped with stoker-fired water tube boilers and turbo-alternators generating at three-phase 6 000 V, circulating water being taken from the River Hooghly.

So far, 24 000 kW of plant have been installed and a further 15 000 kW set is due for installation this year.

Circulating Water at 93 deg. F.

Although this new station was designed more with an eye to high reliability and low maintenance than to spectacular steam results, only 200 lb. pressure and a total steam temperature of 600 deg. F. being utilised, yet its actual performance works out favourably when compared with the modern home stations of the same size and equipped for much higher steam pressures and temperatures, the overall thermal efficiency for last year being in the neighbourhood of 14%, and this in spite of the many tropical disadvantages met with, including circulating water running at times up to 93 deg. F.

The Southern station is linked up with the older Northern station at Cossipore by means of two 6 000 V trunk feeders laid along separate routes.

The leading developments to be noted with regard to the general supply in the city are the recent completion of the transfer of the Tramway Company's load to the Electric Supply Corporation and the substantial progress made in the electrification of the jute mills and other large industries.

An interesting recent addition to the distribution system is a large rotary sub-station arranged for an ultimate capacity

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of nearly 40 000 kW of convertor plant. As this is situated in a somewhat critical position in the bazaar, it is fully equipped for "siege conditions" during periods of communal disturbances, special window and door protection being arranged, together with provision for rationing and for emergency sleeping quarters for the running staff.

Bombay.—The outstanding recent development in Bombay was the completion of the change-over from a thermal power station to bulk hydro-electric generation. For many years the Electric Supply and Tramways Co., although owning a large steam power station on the waterside, had taken supply from the Tata Hydro group on outlying districts to avoid the necessity of running out costly feeder mains, and when, owing to the rapid increase in the demand, they came to be faced with the necessity for major extensions to their power station, a contract was entered into with the Hydro Companies for their entire requirements. The change-over necessitated building a large receiving station alongside the steam power station. This is fed at 20 000 V 3-phase from the Tata receiving station, and is equipped with 20 000/5 500 V transformers and the necessary switchgear. The change-over of the 550 V feeders to the new receiving station was of necessity a gradual one, but the whole of the load was finally transferred in January, 1926, and the power station shut down.

Development in the D.C. Area.

A more recent development in Bombay city has been the decision to deal with the direct current area in the Fort district by means of remote-controlled peak-load rotary convertor sub-stations located at strategic points and operated from a central control office.

As regards the general tendency of public electricity supply in this city, it is interesting to record that the middle-class Indian has not been slow in taking advantage of the domestic amenities which electricity has to offer in the way of refrigerators, water heaters and electric cooking appliances, while the electric *dhobi* is rapidly gaining favour, and the charcoal *sigri* will shortly become a suffocating memory.

The recent decision of the G.I.P. Railway to instal electric cooking apparatus throughout the large restaurant in the new building at their Victoria Terminus constitutes a significant confirmation of the adaptability of this application of electricity to Indian conditions.

The B.B. & C.I., the other railway running into Bombay, have adopted flood-lighting of their administrative block for notifying the arrival of their mail trains at night.

Madras.—This third city of India is supplied with electrical energy on the same lines as those obtaining in Bombay and Calcutta, i.e., direct current in the centre and alternating current in the outskirts. The Madras climate, which has been described as "three months hot and nine months hotter," calls for the continuous use of electric fans which, while contributing to the satisfactory annual load factor of 45%, have been recently utilised as a means of improving the power factor of the alternating current system. Condensers have been incorporated with all fan regulators, bringing the system power factor up to 0·95, and sometimes near unity.

Delhi.—Although the capital city of British India and fourth in order of population, the electricity supply arrangements in Delhi call for little comment. An English company has for many years dealt with the public supply in the old city from an oil engine plant, while the requirements of the new Imperial City and the cantonments are derived from a small steam power station put down by the Government in 1925 equipped partly with old and partly with new generating plant, transmission being at 6 600 V 3-phase, with distribution on the direct-current system. As the aggregate generating capacity of the two undertakings is only 6 000 kW, it is to be regretted that no combination of interests was found possible.

Lahore.—This city is now supplied by the local company on modern lines from a new steam turbine station with 3-phase generation and 6 000 V underground transmission to rotary and static sub-stations. Over 9 000 consumers are connected, and the annual consumption is about 5 million units.

As Lahore is shortly destined to become the terminal station of the long distance transmission from the Mandi hydro-electric installation referred to later, its supply of electrical energy appears to be well assured.

Ahmedabad.—Considering its population of only 200 000, Ahmedabad may claim to be one of the most industrialised cities in India, but although it possesses nearly 100 textile mills, it is only recently that a general power supply has been seriously contemplated. The successful local Electric Supply Co. with its Diesel driven plant has not been in a position to cater for large blocks of industrial load, and some of the more enlightened mill-owners have installed their own generating stations in order to obtain the advantages of the electric drive.

Last year, however, the Ahmedabad Power Electric Licence was granted authorising the supply to industrial users, and it is hoped that if sufficient support is forthcoming a concrete scheme may shortly be prepared. In view of the condensed nature of the industrial area on the one hand, and the comparatively low average individual capacity of the mills, viz., 700 H.P., on the other, there is evidently an opening for a successful power undertaking.

Karachi.—Although at present it stands ninth in the list of Indian cities as regards population, Karachi has a great future before it, not only as a maritime but also as an air port, and the local Electric Supply Corporation has been fully alive to the necessity of providing for the future. In 1924 a 6 600 V 3-phase power station was built alongside the old d.c. plants in order to enable outlying areas to be dealt with, and several schemes are projected for throwing over the load of small private generating plants on to the public distribution system. Diesel-type prime movers are used throughout.

Cawnpore.—No outstanding recent technical developments can be recorded in connection with the electric supply system of Cawnpore (which apart from the Presidency cities may be looked upon as the pioneer system in British India, general supply having been started on Christmas Day, 1906), yet attention must be called to the rapidity with which demand has been fostered during the past few years by the far-sighted administration of the Cawnpore Electric Supply Corporation. Following the laying down of a new riverside power station in 1921, the consumption of electrical energy has increased nearly fivefold, from 5½ million units in 1922 to 27 millions in 1928, while the average receipts per unit sold have been lowered during that period from 2·62 annas to 1·26 anna.

Aden.—Although this paper is only intended to cover the Indian Peninsula, and no attempt is made to deal with Burma and the numerous outlying islands and dependencies which fall within the Indian Empire, it may, perhaps, be permitted (as the writer had a hand in the scheme) to make reference to the electric supply undertaking at Aden, which, although 1 600 miles from the Indian coast, is yet included from an administrative point of view, in the Bombay Presidency. This arid "Gibraltar of the East" had long craved for the amenities which electricity can provide, and under the ægis of the Settlement (or Municipality) a general supply was inaugurated in February, 1926. An installation comprising oil-fired water-tube boilers and small geared turbo-alternators arranged as a miniature replica of a large modern steam power station now supplies the settlement and cantonments through 6 600 V 3-phase overhead lines stepped down to 230 V by transformers located in the bases of special transmission towers. The undertaking secured immediate support, and the initial outlay having been cut down to a minimum, the results for 1928, the third year of working, show a substantial surplus after paying all interest and sinking fund charges on a total capital expenditure of 11¾ lakhs of rupees.

(*To be continued.*)

INDICATING INSTRUMENTS.

REVISIONS of B.S.S. Nos. 89 and 90, dealing with indicating instruments and graphic (recording or chart recording) instruments respectively, have recently been issued. The technical requirements of these new specifications are similar to those of the previous editions, with the important exception, however, of the clauses dealing with the marking of the instruments and the issue of test certificates. In the past difficulties have been experienced in connection with the provision of the independent test certificate required under the conditions governing the use of the Mark "BeSa," and, in order to facilitate matters, a report is now called for in place of the certificate originally required. The substitution of the report for the certificate arises from the fact that "certificates" issued by the N.P.L. have acquired a special significance of their own in the eyes of the public, as something in the nature of a guarantee that the article concerned is a satisfactory one, quite independently of the B.S.S. covering the article submitted for test. What is often required is a plain statement from the testing authorities that the article submitted conforms in certain respects to the appropriate British Standard. Such a statement is now provided as a report.

Copies of the new specifications may be obtained, price 2s. 2d. each, post free, from the British Engineering Standards Association, 28, Victoria Street, S.W.1.

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A HIGH FREQUENCY OSCILLOGRAPH.

Simultaneous Recording with Three Vibrators—Investigations at Telephone Frequencies—The Apparatus Described—Simplicity of Operation.

THE rapid advances which have been made in the analysis of complicated phenomena in electrical circuits have stimulated the demand for an oscillograph which is capable of producing simultaneous records from three vibrators. Such an instrument should of necessity be easy to operate, compact and sufficiently robust to withstand ordinary workshop conditions.

Within the last year or so instruments of this type have been developed by the Cambridge Instrument Co. for low frequency work in circuits up to 600 V, and also for high tension circuits up to 100 000 V. This firm has now designed a somewhat similar outfit for use on high frequency circuits. This apparatus, which is illustrated in Figs. 1 to 3, has the frequency and sensitivity of the original Duddell design, but possesses several additional features which render it particularly suitable for investigations at telephone frequencies.

The three vibrators, A, B, C, are separate units mounted in individual oil baths. They may thus be independently operated, and should one of the vibrators become defective, it may be easily and quickly replaced. Provision is made for adjusting the position of each vibrator so that the image of the vibrating mirror is brought to the correct position on the sensitive photographic surface. Each vibrator is protected by a fuse and controlled by a switch which enables the polarity of the supply to the vibrator to be reversed. The undamped natural period of the vibrators is 0·00008 sec., and the d.c. sensitivity (in oil) is 60 mA for a deflection of 20 mm. at a scale distance of 60 cm.

The three vibrators in their oil baths are mounted between the poles of an electro-magnet, which is of somewhat simpler design than the electro-magnet used in earlier types of Duddell oscillographs. The provision of a small air gap between the magnet cores and the coil windings minimises the conduction of heat to the vibrator elements and thus reduces any changes in the viscosity of the oil in the oil bath, and hence in its damping effect. The magnetising coils may be connected in series for use on a 220 V d.c. circuit, or in parallel for a 110 V d.c. circuit. The oscillograph stands in a metal case on the front of which is a switchboard accommodating the necessary terminals, fuses, switches, etc. A metal cover prevents any extraneous light reaching the vibrators when a record is being taken. A lamp connected across the windings protects the electro-magnet against voltage surges on switching off.

The oscillograph in its case, the automatic arc lamp E and the camera F are mounted on a substantial base-board. The carbons of the arc lamp are fixed at right angles to each other and are controlled by an automatic feed. This type of lamp has been used satisfactorily for some years. Provided that the voltage of the supply is reasonably steady, no troubles occur due to flickering or hissing. The light from the lamp passes through an optical system which ensures that a separate beam of light is brought to a focus on each vibrating mirror, an adjustment enabling a more intense light to be obtained at higher frequencies, if desired. The reflecting beams from the vibrating mirrors pass through a cylindrical lens which reduces the long slit images to bright spots of light on the photographic surface, which travels in a vertical plane at right angles to the plane of the vibrating beams. When the camera shutter is closed, the beams of light, instead of passing into the camera, are reflected by means of a polished stainless steel mirror fitted at the back of the shutter, on to a semi-transparent celluloid screen. On viewing the movements

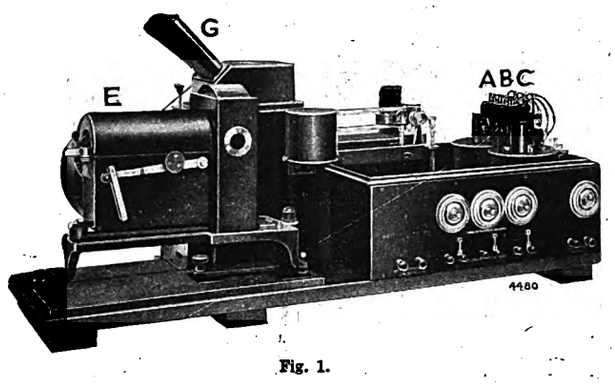

Fig. 1.

of the spots of light on the screen by means of a system of rotating mirrors, the operator sees the wave form of the circuit under investigation. The rotating mirrors are driven at the correct speed by means of a belt from the spindle which drives the camera; this, in turn, being driven by means of an electric motor. The wave forms are viewed through the aperture G.

Prior to taking a record the adjustment of the vibrators is facilitated by projecting the light images reflected by the vibrating mirrors on to a white screen, which may be brought in front of the cylindrical lens. Having roughly aligned the spots of light with the aid of this screen, it is hinged out of position. The shutter is then opened and the light images after passing through the cylindrical lens, pass through the aperture on to a frosted screen in the same plane as the photographic surface. The final adjustments may then be made. The standard outfit includes a drum camera taking film or paper 7 cm. wide by about 48 cm. long. The shutter is spring-operated, and it is released and controlled by means of two electro-magnets. These electro-magnets are operated through an adjustable contact device on the camera driving spindle, the contacts being so set as to utilise the whole length of film or paper in either one, two or four exposures, as desired. The shutter is reset (that is closed) by means of a plunger and the process of resetting extends the control spring to its maximum position. On energising the first electro-magnet, the shutter moves to the fully open position. At the completion of the desired exposure, the second electro-magnet is energised, which allows the shutter to complete its travel, and again close the aperture. It is only when the shutter is closed that the stainless steel mirror reflects the spots of light from the vibrating mirrors for visual observation. Since it is desirable to have the drum rotating at the required speed

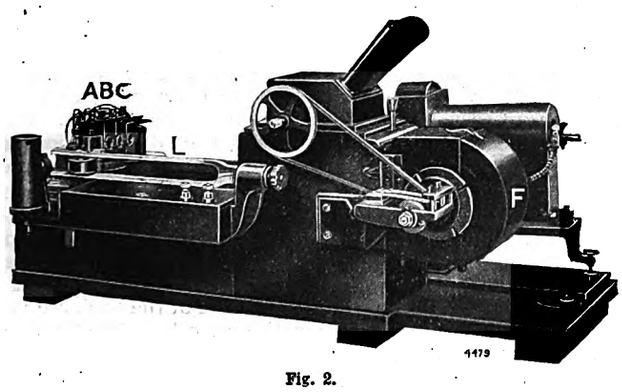

Fig. 2.

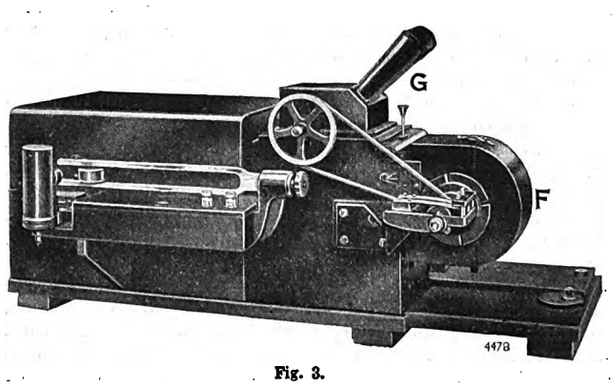

Fig. 3.

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while the wave form is being observed visually, it is necessary to prevent the shutter operating at each revolution of the spindle until it is desired to take a photograph. A tapping key is therefore connected in series with the spindle contacts, and, when the operator desires to obtain a record he depresses this key, thereby closing the circuit to the contacts on the spindle and energising the electro-magnets in the correct sequence.

When the outfit is to be used for investigations lasting a considerable time, the drum camera may be replaced by a film camera using film having a width of 6·4 cm.; records up to 30 metres in length may be obtained. When using this camera, the camera shutter is closed until the operator moves a lever which tightens up the driving belt, through the medium of a jockey pulley, thus transmitting the drive to the camera and, at the same time, closes a contact which allows the shutter to open. The shutter remains open as long as the camera is running—that is, as long as the operator holds the lever over. When the record has been obtained the lever is allowed to return to its original position, when the driving belt is slackened and the circuit opened, thus stopping the movement of the film and closing the camera shutter.

A convenient accessory is a timing device consisting of an electrically maintained tuning fork L (see Fig. 2) to each prong of which is fitted a metal plate with a horizontal slit.

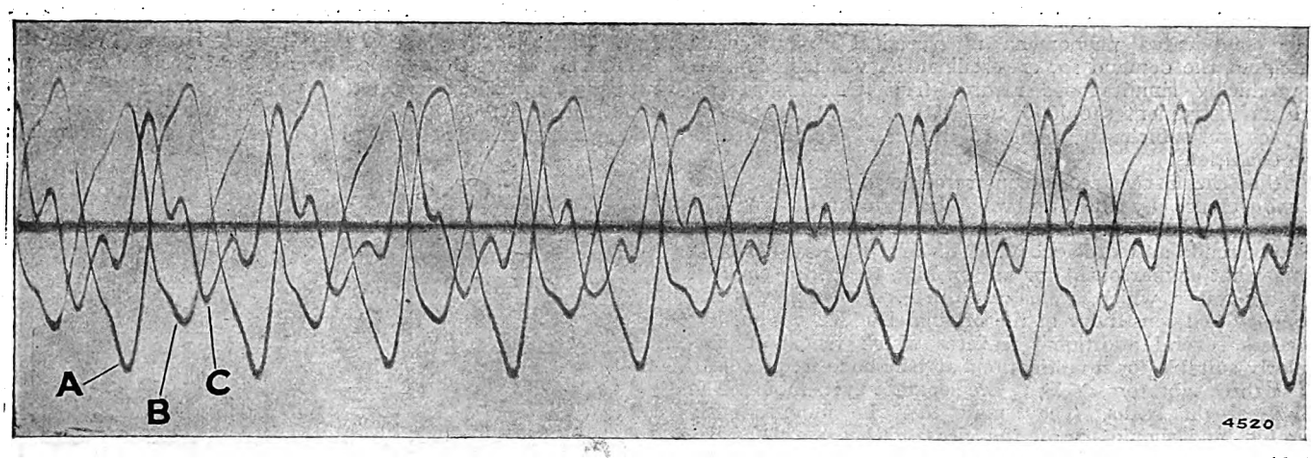

Fig. 4.

When the fork is in the position of rest these slits are coincident and allow a beam of light from a metal filament lamp to pass through the optical system on the fork and come to a focus on the photographic surface. When the fork is vibrating the slits come into coincidence at each passage of the fork prongs through the zero position, causing a horizontal shadow to be marked on the photographic surface. The fork has a frequency of 50 cycles per second, so that time markings are produced on the record at 0·01 second intervals.

Fig. 4 shows a full-size reproduction of a portion of a record obtained on bromide paper. Curves A and B represent two non-inductive loads while C is a capacity load consisting of a condenser (capacity 0·05 mfd.). The source has a frequency of 600 cycles per sec. The horizontal line in the record is obtained by means of a zero mirror.

BOOK REVIEW.

A Course in Electrical Engineering. Vol. II. Alternating Currents, 2nd edition. By CHESTER L. DAWES. (London: McGraw-Hill Publishing Co.) Pp. xvii+618. 20s. net.

Six years have elapsed since the publication of the first edition of Prof. Dawes' volume on alternating-current working. The book was designed to give a course for engineering students who were not specialising in electrical engineering, so that a wide range of subjects was included, while the treatment was essentially elementary and largely descriptive. It would seem, however, that the book has also found favour as a text-book for students taking electrical engineering courses in schools and universities. In view of the higher standard of attainment demanded for the latter, and the changes and progress which have been made in almost every branch of electrical engineering since the first appearance of the book, a new edition has been considered desirable.

The author assumes a knowledge of the principles of direct-current working on the part of the student, and begins with an account of the fundamental laws of alternating currents and alternating current circuits on familiar lines. The sequence followed, in a few cases, is not to be recommended. One example occurs in chapter two, where power is treated before inductance and capacity in the a.c. circuit. Again, it would be better to discuss the polyphase wattmeter after, and not before, polyphase working and three-phase power measurement. However small such points may appear, every teacher knows that a correct sequence is of the utmost importance, when a subject has to be developed from first principles. The chapters on elementary alternating-current theory, taken together, are well done; while the new chapter on complex quantities is particularly valuable in many calculations of alternating-current networks for steady conditions. The numerical examples, fully worked out in the text, should be of great help in rendering more familiar the employment of complex quantities expressed in terms of polar vectors or of real and imaginary components.

Chapter IV deals fairly adequately with measuring instruments, and includes descriptions of the action of different wattmeters, frequency and phase meters, the oscillograph, and a short account of an impedance bridge. The alternator, introduced by a description, with many diagrams, of stator windings, is followed by accounts of alternator construction and the calculation of the e.m.f. Regulation and other problems relating to alternator characteristics are then considered, and the usual methods of voltage prediction under various loading conditions explained. The method recommended by the American Institute of Electrical Engineers is included.

Transformers, induction and single-phase commutator motors, synchronous motors and convertors each have a section of about 120 pages, and notwithstanding the limits imposed by the size of the book, receive adequate treatment. Contrary to what is found in so many American text-books, which endeavour to cover such a wide field, proper theoretical exposition and vector representation of working principles are not neglected in favour of photographs which convey little more than the appearance of machines and apparatus. Typical three-phase transmission line calculations are given in connection with the transmission of power by alternating currents, assuming, of course, short lines with lumped constants.

A new chapter appears in this edition entitled "Electron Tubes." This proves to be a popular account of the properties and principal applications of the thermionic valve. The action of the valve as an amplifier, rectifier and oscillator is given in an easy fashion, but the explanation offered of the leaky condenser in connection with the rectifying action of a detector valve is not at all satisfying, although quite plausible.

The concluding chapter on illumination and photometry finds a place in this book on alternating currents, because the subject is "important in a general course in electrical engineering." The main facts are stated, but the more recent developments are too much obscured by generalities.

The questions and problems at the end of the book are very varied. Many of them are repetitions, others like "define a transformer" are of doubtful usefulness, but the numerical examples, which have a direct bearing on the text, should be useful to students and teachers.

S. PARKER SMITH.

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NEW SWITCHGEAR ASSEMBLY SHOP.

Manufacturers' New Plant in Full Production—Special Provision for Rapid Assembly—Unique Testing Equipment—A Heated Storeroom for Insulating Materials.

THE new building recently added to the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., is designed chiefly for the assembly of metal-clad and outdoor switchgear, including large high voltage oil current-breakers. and is supplementary to the older works switchgear departments, which, including the main switchgear aisle 900 ft. in length, are still given up entirely to switchgear manufacture. This building, undertaken a little over a year ago, has recently been put into full production. It consists of a single-storey open-type shop, 420 ft. in length and 220 ft. in width, with provision for extensions to several times the present size. In its structure, its lay-out and its equipment it has many interesting features and constitutes an excellent example of modern factory planning. It provides for the assembly, testing, and handling of switchgear units up to the largest sizes, and for the highest voltages which are likely to be employed in transmission systems. It has special provision for the rapid assembly of standardised units and for the testing of all kinds of apparatus at the place where it is assembled in the shop, thus obviating the trouble and delay of moving equipment in and out of a test area. The test supplies, even at the highest voltages, are extended over the assembly area for this purpose, and a system of portable interlocking screens is provided for the safety of operators and others. The testing equipment is of particular importance, including, as it does, a 500 000 V testing transformer and a Schering bridge equipment for measuring the energy losses in insulation at working pressures up to 390 000 V. The latter equipment, which has been constructed by the Metropolitan-Vickers Electrical Co., is claimed to be the only one of its kind built or installed in this country, and probably the first in the world to be installed for use up to so high a voltage.

Effective Lighting.

Like the main works, the new building consists of a steel framework with brick walls filling in the girder structure. The roof is saw-toothed, the northern side of many sections being of glass, as are also both sides of the large section of roof at the northern end. The roof lights, together with large windows provided in the north wall, give very effective natural lighting.

The floor of the building is of reinforced concrete faced with a special variety of red brick. The new roads which serve the building are also of reinforced concrete. Railway communication has also been provided, extension lines which connect with the main railway systems being laid into the north end of the building, and four lines are laid into the

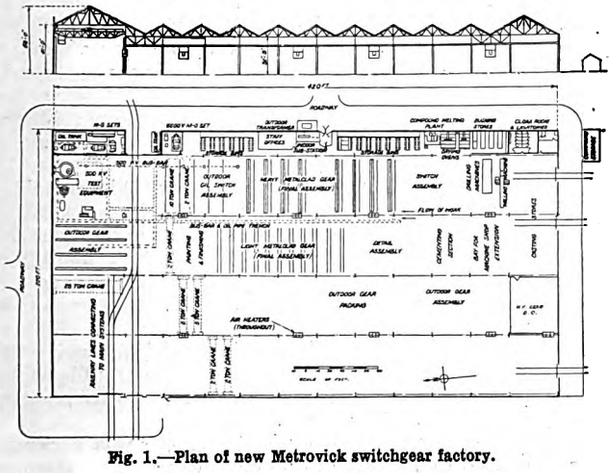

Fig. 1.—Plan of new Metrovick switchgear factory.

south end from the shunting system of the works. Heating and ventilation are provided by a series of steam-heated air-circulation units. The system circulates the air at the rate of 1·61 changes per hour, and has a heating capacity of 4 690 000 B.Th.U. per hour. The artificial lighting is of a high standard, and includes 30 lamps of 1 000 W in concentrating reflectors, mounted 40 ft. from the floor, and 92 lamps of 500 W in angle reflectors mounted 16 ft. from the floor.

Fig. 1 shows the lay-out of the equipment and operations, while Figs. 2 and 3 show typical views of the assembly bays, with switchgear of various types in course of construction. Fig. 2 shows also one of the features of equipment introduced to facilitate the work of assembly, namely, the use of mounting plates let into the floor in such positions that they serve as temporary mounting bases for the assembly of units of different sizes. As seen in Fig. 2, and indicated in Fig. 1, the floor plates for metal-clad units are arranged to suit various sizes of supporting frames. Fig. 3 gives a general view over

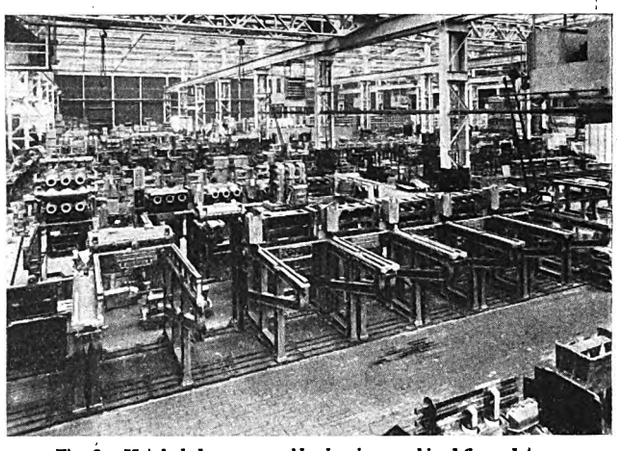

Fig. 2.—Metal-clad gear assembly showing machined floor-plates.

the area in which circuit-breakers of the outdoor type are assembled. The units seen in this illustration are a small part of orders for 132 000 V and 115 000 V gear for the British "grid" and for transmission systems abroad.

As noted on Fig. 1, the flow of work in each assembly bay is from south to north. The assembly bays are served by seven travelling cranes ranging from two tons to ten tons capacity, while the north-end bay is traversed by a 25-ton travelling crane, and has a small jib crane in the test area. The travelling cranes are all equipped with motors, control gear and protective panels of Metrovick manufacture.

Notable Shop Equipment.

Several items of shop equipment are worthy of special mention. One of these is a heated storeroom in which all bushings, bakelite and other insulating materials are stored until they are required for use. In order to prevent the deterioration which might result from moisture condensing on these materials, the room is maintained at a temperature of 15 to 20 deg. F. above the atmospheric temperature. Adjoining the heated bushing store are two drying ovens, one 12 ft. high, 7½ ft. wide, and 14 ft. deep, the other 7½ ft. high, 11½ ft. wide, and 14 ft. deep. The former oven is used in conjunction with the assembly of porcelain rainsheds on high voltage condenser bushings. The porcelain rainsheds undergo a preliminary drying out before assembly, and the rainshed on the assembled terminal is submitted to prolonged drying out before compounding. The latter oven finds its chief application in the drying out of castings before compound filling in the case of the higher voltage metal-clad switchgear, and also for a large quantity of miscellaneous work.

A special plant of improved design is installed to facilitate the melting and pouring of the bitumen compound which is used extensively in metal-clad gear. The plant consists of two boilers fitted with motor-driven stirring paddles to prevent excessive local heating of the material. The plant is installed in a convenient position opposite the detail assembly sections, and most of the filling of apparatus is done direct from the boilers. For operations in other parts of the shop the compound can be conveyed in a crane ladle. As most of the machining operations are done in the main shops the machine-tool section is limited in extent. The equipment includes a double-headed, double table, horizontal milling machine for machining the side frames for metal-clad gear, a number of radial arm drilling machines fitted with direct motor drive for both pillar and saddle, and a number of small drilling and grinding machines.

The supply of power for services in the buildings and for

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testing purposes is brought by means of a new 6 600 V feeder, which has been laid from the main works sub-station to an outdoor sub-station, and an indoor sub-station provided at the east side of the new building. The outdoor sub-station consists simply of a weatherproof transformer mounted, together with the necessary isolating switches, in an enclosure of expanded metal screen work. The transformer

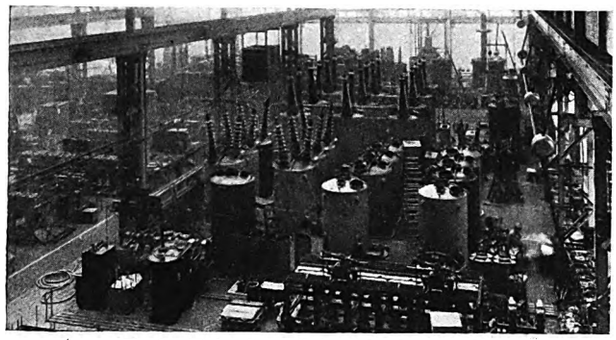

Fig. 3.—High voltage oil circuit-breaker assembly.

is of 625 kVA capacity, giving its output at 440 V, three-phase, 50 cycles for general use, including the supply to the cranes, heater fans, shop lighting and testing. The indoor sub-station equipment includes a motor generator set consisting of a 6 600 V synchronous induction motor driving a 500/250 V direct current generator which supplies a three-wire system for the variable speed motor drives and for testing purposes.

The arrangements for testing are marked by interesting and novel features. It has already been mentioned that the equipment includes a 500 000 V transformer, and a Schering bridge equipment, for direct measurement of energy losses in insulation under working stresses up to 300 000 V, and apart from these items of the equipment, a new principle has been introduced. In place of the usual practice of bringing finished apparatus into a test area, the requisite supplies are made available throughout the assembly areas. The principle has been extended even to the supply at 500 000 V, involving the design of a 500,000 V busbar which itself is believed to be unique in switchgear factory equipment. The 500 000 V transformer is seen on the extreme right of Fig. 4, which shows also, in the centre, the large air condenser of the Schering Bridge equipment, and on the left, an oil tank with condenser type bushings mounted for test, and an oil circulating pump. Another oil tank, 18 ft. in length, has now been installed between the transformer and the condenser, as shown in Fig. 1, to provide for tests on high tension terminals completely immersed in oil. Both oil tanks are fitted with automatic temperature control. The supply to the transformer, which has a ratio of 1 000 / 500 000 V, is provided by a motor generator set housed in the adjoining annexe, the voltage being regulated by means of a motor operated rheostat in the alternator exciter field, the alternator giving a true sine wave voltage curve at varying frequencies. The complete control of operation, whether of the transformer alone, or with the Schering bridge equipment, is effected by means of push buttons from a control desk on a gallery which commands a view of the whole of the test equipment and the area into which the high voltage supply is extended. The equipment of the control desk includes a crest voltmeter which gives direct indication of the high tension pressure. Provision is made near the 500 000 V transformer for the production of artificial rain, so that high voltage tests may be made under wet weather conditions.

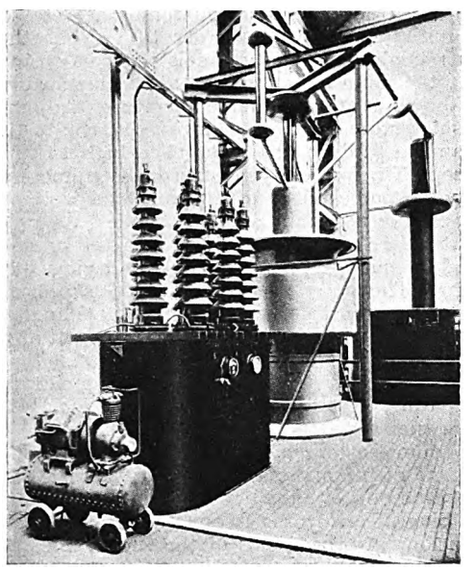

Fig. 4.—500 000 V transformer, with Schering bridge condenser and 132 000 V condenser-type terminal bushings under test.

The high voltage testing supply is carried over the assembly area for outdoor gear by means of a collapsible busbar running from the transformer throughout the length of the erection bays. The supports are bakelite tubes, compound filled and shielded from brush discharge by aluminium spinnings carried on the busbar. When not in use the busbar is lowered into a convenient position close to the stanchions.

For tests at from 2 000 V to 120 000 V a number of portable equipments are provided. The largest comprises a 440/120 000 V 50 kVA transformer with an induction regulator and control panel with a crest voltmeter, which form a separate portable unit. Other equipments provide a.c. testing supplies up to 35 000 V, 10 000 V and 2 000 V respectively.

Close on each tapping on the busbars is a pipe connection with oil under pressure for filling circuit-breaker tanks quickly by means of flexible pipes. As the motor-driven oil pump is reversible the same connections can be used for pumping the oil back to the storage tanks.

Even in the short time during which the new works have been in commission, the whole organisation has thoroughly justified itself, and we are given to understand that it has shown a marked improvement on previous practice with regard to convenience and efficiency of operations in this branch of the company's work.

CABLE SUBWAY FIRE.

Important Recommendations Made by London Inquest Jury.

DR. F. J. Waldo, coroner for the City of London and Southwark, and a jury, concluded last week an inquiry into the cause of the fire which occurred on the night of June 6th in the telephone subway under the Victoria Embankment, London.

The coroner said three other fires had occurred under the Victoria Embankment in the last nine months, and in each case the cause had been determined as due to the ignition of combustible material by sparking from electrical apparatus and cables. All these fires were discovered shortly after the switching on of the electric current for lighting the Embankment. The jury at the inquiry into the cause of the fire of September 8th last, expressed the opinion that the London County Council's electric lighting system was obsolete and dangerous.

Mr. C. A. Baker, divisional electrical engineer to the London County Council, said if a fire were burning in the subway the heat might readily damage the insulation of the cable to such an extent that the fuse would blow. A new electric lighting system was approved by the Council on January 16th, and the work was now well advanced. The new system ran the cables under the footpath, and not in the subway.

Mr. Baker added that the voltage in telephone cables was only 5 or 6. He thought it would be satisfactory to have the high voltage cables in a subway.

Mr. E. Gomershall, G.P.O. superintendent engineer, said the linking up of the lighting leads of the refuge lamps with some other wires might have caused the trouble. Another cause could have been short circuiting in the refuge lamp leads. The leads to the refuge lamps had no metal covering. The work was of a makeshift character and, in his opinion, was unsound.

Mr. W. J. Jeffrey, distribution engineer to the Charing Cross Electricity Supply Co., did not agree that the trouble arose in the connection between the armoured cable and the vulcanite india-rubber leads to the refuge.

The jury returned a verdict that the fire was accidental, and was caused by sparking at a defective porcelain connector temporarily used by the L.C.C. to replace the cut-out or switch-box formerly placed at the junction of the main cable with the overhead lighting cables. They recommended that the Exchange Telegraph Company be requested to replace the gutta-percha insulation of their cables by a more recognised and efficient method of insulation. They added riders recommending that all cables carrying over 200 V be removed from the subways and that all subways should be permanently wired for lighting according to the Institution of Electrical Engineers' rules, so as to eliminate all portable means of illumination.

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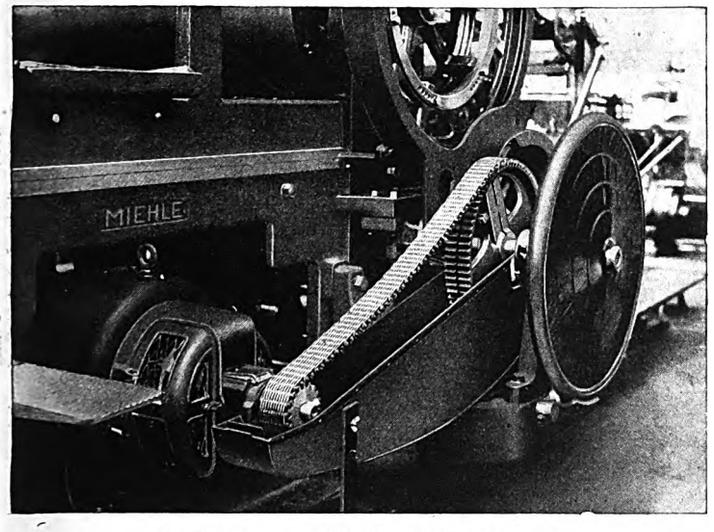
MANUFACTURERS' EQUIPMENT.

Extinguishing Devices for Electrical Fires—Automatic Systems of Fire Protection—Chain Driving of Works Machinery.

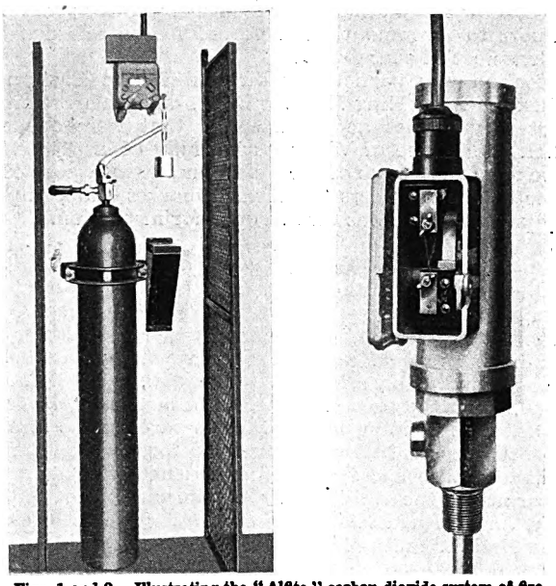
IN connection with the increasing popularity of chain gearing for power transmission, some details of the Morse chain drive may be of interest to our readers. With all chain drives there are the obvious advantages of positiveness and the feasibility of using short centre distances, thus often enabling floor space to be saved by placing motors on brackets close to the lineshaft. Moreover, chains require little attention, and, if of the silent type, run with a marked reduction of transmission noise. The Morris rocker-joint chain drives, manufactured by THE MORSE CHAIN CO., LTD., of Letchworth, Herts, which were formerly known as Westinghouse Morse chains, have now been considerably improved, and are claimed to be distinctly superior to the ordinary round pin chains, with their liners or bushings. In a Morse chain, the joint consists of two hardened steel pins—the one rocking on the face of the other as the chain passes on and off the wheels. These pins are locked in alternate driving links, but have clearance on their backs in the intermediate links; the process is reversed in the opposite holes of the links. As a result, there is no sliding friction between links and pins, while between the pins themselves there is no sliding friction but only a rocking motion as the one pin, termed the rocker pin, rocks over the face of the other, termed the seat pin. An important gain in mechanical efficiency is thus obtained. Furthermore, wear at the joint is reduced to a minimum, while the construction is not so dependent on elaborate lubricating devices as some other methods of link connection. The rocker pin normally extends the whole width of the chain up to and including the outside link, while the seat pin also extends through the complete width, but has a shoulder on either side, beyond the outside of the link, on to which are driven washers, secured by a riveting construction. In this way, the links are held in place on the pins, and the rocker pin has perfect freedom—when actuated by the links with which it is fixedly connected—to rock over the face of the seat pin. The chain thus has the merit of a full bearing the width of the chain, in contradistinction to chains in which bushings, holding two or more link plates together, bear against a round pin.

The link form of the Morse chain is so designed in conjunction with the shape of its wheel teeth that when, ultimately, wear takes place, the chain takes up a higher position on the driven wheel teeth; all units in contact continue to take their share of the load, so that this link form may be described as of the compensating type. Morse chains are made in 12 standard pitches, and up to 30 in. maximum width. Sprockets from 13-T up to about 130 are generally used. Drives in operation range from fractional H.P. at 2 500 r.p.m. to 1 000 H.P. at 200 r.p.m. The accompanying illustration shows a 6 H.P. Morse chain drive to a Miehle printing press.



A 6 H.P. Morse chain drive to a Miehle printing press.

The "Alfite" carbon dioxide system of fire protection developed by FOAMITE FIREFOAM, LTD., 55-57, Great Marlborough Street, London, W.1, has several interesting features. The merits of CO_2 as a fire extinguishing medium in cases where air is sufficiently confined to be easily diluted by the gas are generally known, but it may be mentioned here that it is non-poisonous, does no damage to materials, leaves no residue, and is a non-conductor. The last fact is an important advantage when it is necessary to extinguish fires which have broken out in h.t. equipment, as it is not essential to kill exposed terminals. A single battery of "Alfite" cylinders, suitably arranged in a power station, is claimed to give adequate protection for generators and other rotating equipment, switchgear and transformers. Provision for automatic closing of air ducts is made when the open system of cooling is in use with rotating machinery; by means of a time-delay unit the "Alfite" gas can be admitted to the space between rotor and stator at intervals, in order to maintain the required proportion of CO_2 until the rotor comes to rest and re-ignition of insulation is impossible. In the instances of transformers and switchgear, means are provided for flooding with gas the spaces above the oil, so that the burning liquid is smothered and time allowed for its temperature to fall below the flash point. Differential relays operate the cylinders and directional valves when the system is automatic. A special feature of the "Alfite" system is the cylinder discharge valve, in which one copper disc seals the cylinder and acts as a safety valve, while the same orifice is used for recharging. The possibility of leakage is thus reduced to a minimum. Discharge is effected by depressing the valve cutter, which may be accomplished manually or automatically: the operating head, which is screwed on to the cylinder valve, varies according to the nature of the risk to be protected. In one form of automatic operation the lever head is so arranged that downward motion cuts the disc: a weight is attached to the end of the lever, which is suspended from the arm of a "Lowe" release connected through conduit with an actuator placed near the risk.



Figs. 1 and 2.—Illustrating the "Alfite" carbon dioxide system of fire protection.

In Fig. 2 is shown the head used in another method of operation. When an outbreak occurs a current is passed through the fuse wire shown, by automatic or semi-automatic means. Immediately this wire breaks, a weight in the cylindrical portion of the head drops, and depresses the cutter of the valve, so piercing the disc. In addition to "Alfite" permanent installations, in which each cylinder may have a capacity of 50 lbs., Foamite Firefoam, Ltd., supply portable extinguishers containing about 7 lbs. of liquid gas. These are recommended for fires involving telephone switchboards.

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SOUTH MIDLAND I.E.E.

Inspection of the Electrical Equipment in Use at the Port of Bristol.

ABOUT 120 members and friends of the I.E.E., South Midland Centre, on July 2nd, spent an instructive day studying the application of electricity to the loading and storage of foodstuffs, and harbour engineering generally, at that very favourable locality, the Port of Bristol. The party was efficiently conveyed from Birmingham by the Great Western Railway in special dining-cars, in which lunch was served on the way down and dinner on the return journey; while local transport to Avonmouth and Clevedon was afforded by an excellent fleet of charabancs.

Attention was particularly directed to the Eastern Arm Extension of the King Edward Dock, on which are situated the great granaries and cold stores that were opened by H.R.H. the Prince of Wales during May of last year. The Centre were the guests of the Port Committee, whose officials conducted the members about the wharves and equipment, every part of which was thrown open for inspection.

Electrical Applications.

A start was made at the frozen meat stores, where electrically driven ammonia refrigerators and long distance electrical thermometers were first demonstrated. The latter were especially interesting, the temperatures throughout the great building being at once indicated on a dial, by the resistance method, upon the pressing of one of a large battery of push buttons, corresponding to the various parts of the structure. The electric goods lifts were employed for the conveyance of the visitors, who had the novel experience of plunging from the warmth of the West Country summer to the cold of midwinter, and of then wandering among thousands of carcases of New Zealand mutton and pork that were awaiting distribution.

The grain is unloaded from the ships by suction conveyors, assisted by electric capstans and cranes, the whole requiring over 3 300 H.P. of induction motors. These have been installed by the English Electric Co. and are almost all of the squirrel cage type; but the majority are of the high torque pattern. The operation of the cranes, which is more usually carried out by direct current, is notable in that two-speed squirrel cage machines are employed, controlled by Igranic contactor gear, almost entirely by means of direct switching and pole changing.

The enormous capacity of the grain stores, as well as the convenience and economy of the transport equipment, excited the admiration of the visitors. The actual storage is accomplished in tall compartments known as silos, each of which is 4 ft. square and 90 ft. high. Numerous belt conveyors of about one third of a mile in length are responsible for the horizontal movement of the grain.

Thanks to the courtesy of the local staff, the modern equipment and methods were inspected in a very pleasant manner; and the gratitude of the Institution was voiced by the Chairman, Mr. S. H. Holden, at the conclusion of the complimentary tea provided by the Harbour Committee, at which Mr. Hartley Hodder formed the genial host.

After leaving the docks, the conveyances took the party through the picturesque environs of Bristol, reaching the sea coast at Clevedon, where a halt of about an hour was made, the return to Temple Meads Station being effected by a different route.

The Midlanders were much impressed by the fine architecture both of the public and domestic buildings in the district through which they passed, in every way worthy of a city which was second in importance only to the capital in the days when architecture was a living art. The Gloucester and Somerset scenery through which the route to Avonmouth and Clevedon lay was looking its best in the pleasant weather. Hay meadows alternated agreeably with wood-clad hills and old-world villages; while the rural distribution activities of the Somerset Electric Power Co., though sufficiently unobtrusive, were a constant reminder that our Western colleagues are not neglecting their opportunities.

On a grander scale were the limestone gorge of the Avon and its suspension bridge, which were inspected both from below and from above. The staff work was excellent throughout the day, and it was a highly satisfied band that reached Snow Hill in the evening.

A selection of reproductions from snapshots illustrating various phases of the tour is printed on the opposite page.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Mains Operated Wireless Sets.

[TO THE EDITOR.]

SIR,—Your correspondent, Mr. W. I. Jones, in your issue of June 21st, states that "every wireless set, whether mains operated or not, clicks when a light is switched off or on." That is a very sweeping statement, and it would be interesting to know whether Mr. Jones attributes such pick-up to (1) the aerial, (2) the set, or (3) the earth. If it *is* due to any of these why is the click so much more pronounced on a mains operated set than with a battery set? Assuming that the noise or click is due to a spark when the switch is made or broken, surely such "transmission" should be received at equal strength on either set, always providing that the same type of circuit is used.—I am, etc.,

ANOTHER CONTRACTOR.

Weymouth.

The E.T.B.I. Competition.

[TO THE EDITOR.]

SIR,—I note with interest that the Electrical Trades' Benevolent Institution is to launch a competition with the object of increasing its funds, and the purpose of this letter is not only to wish the organisers of the competition every success, but to express disappointment in the fact that such means of raising money are necessary. I suppose the electrical industry may be regarded as one of the most prosperous, and its principals among the wealthy, yet here we have a thoroughly deserving institution finding it necessary to run competitions in order to raise the wherewithal to meet the demands upon its charity.

During the last few years the funds of the E.T.B.I. have been the subject of print in many of the electrical papers, and though my reading extends also to trade papers outside the electrical industry, rarely, if at all, have I seen any editorial reference to similar institutions in other industries. It may, of course, be argued that the trade Press of other industries is not so sympathetically inclined towards charities, but the facts of the case are that other trades make sure that such sympathy is not required.

The E.T.B.I., as everyone knows, has done considerable good, and everyone connected with the industry should not only enter the competition, but should make their donation as much above the 2s. 6d. asked for as they can possibly afford.—I am, etc.,

COMMERCIAL.

Harwich.

Concrete Pole Problems.

[TO THE EDITOR.]

SIR,—In his article on concrete poles printed in THE ELECTRICIAN of June 28th, Mr. W. T. Taylor gives a table which sets out the first cost and annual expenses of wood, steel and concrete pole lines. These tables appear to show that reinforced concrete is undoubtedly the most economical form of construction, but in the absence of details regarding the basis of his estimate of first cost and the manner in which the annual expenses are calculated, it is not possible to make a critical examination of Mr. Taylor's conclusions.

The total figures given apparently include all costs incidental to the erection and maintenance of a line of a certain length, but to appreciate the part played by the type of pole used there should be some splitting up of the over-all figure into poles, wires, etc., and details of the annual expenses would be particularly welcome.

Mr. Taylor's statements on such a matter are of considerable weight, and in view of the importance of this subject perhaps he could be prevailed upon to expand the figures.—I am, etc.

S. C. B.

London.
July 9th.

"Steam Turbines." By T. M. Naylor. (London: Chapman and Hall). Pp. viii+207. 12s. 6d. net.

"Kempe's Engineers' Year-Book for 1929." 36th edition. Compiled and edited by R. Kempe and W. Hanneford Smith. (London: Crosby Lockwood and Son). Pp. xxv+3,289. 30s. net.

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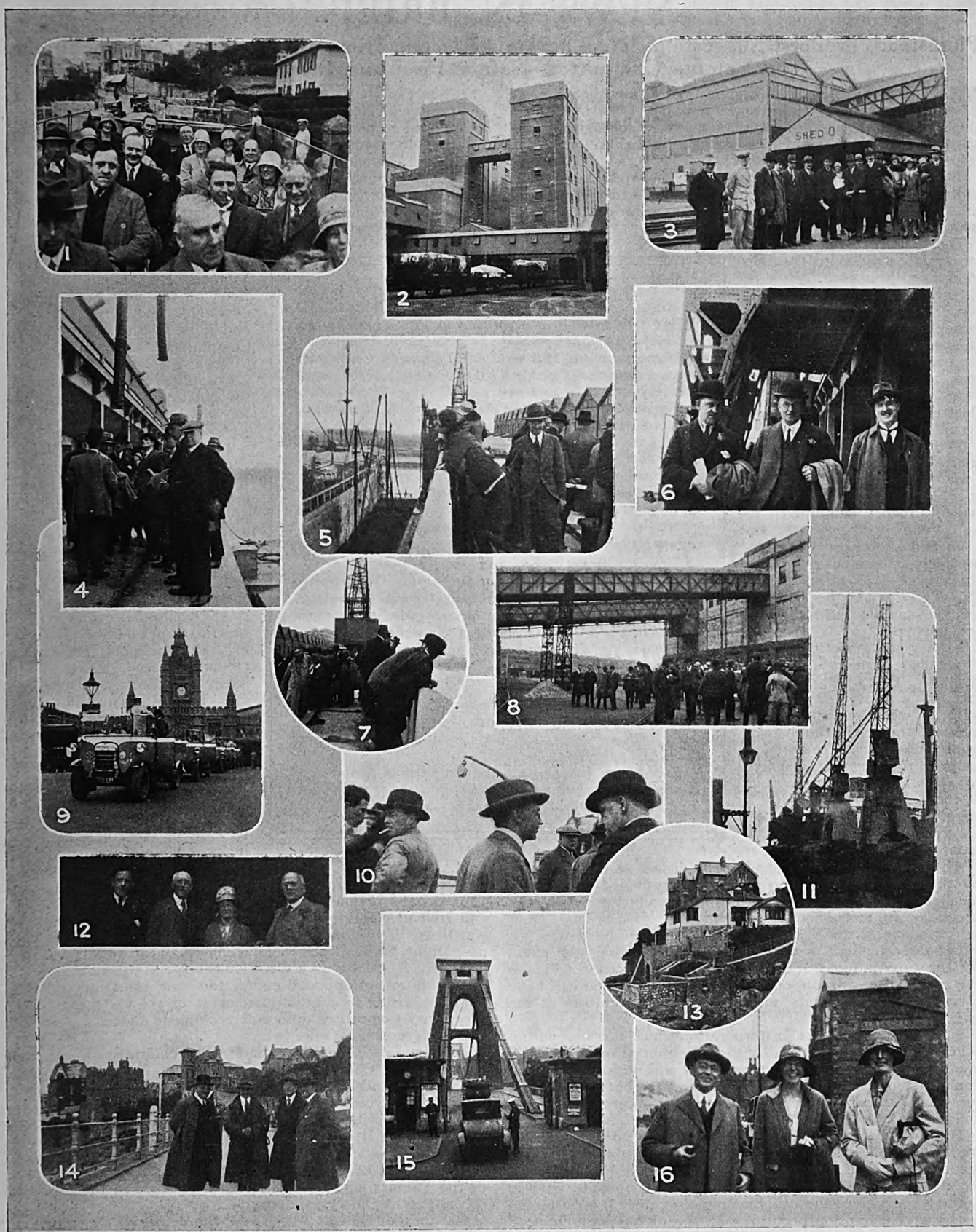

SOUTH MIDLAND I.E.E. TOUR.

THE accompanying snapshots, taken during the tour organised by the South Midland Centre of the I.E.E. show:—(1) *The party leaving Clevedon;* (2) *One of the new granaries at the King Edward Dock;* (3) *A group at the refrigerating sheds;* (4) *Examining the suction grain elevator;* (5) *Watching coaling operations from a wharf shed;* (6) *Capt. Hooper (hon. secretary), Mr. S. T. Allen, and Mr. Parkinson;* (7) *On the roof of a granary among the electric cranes;* (8) *By the cold stores, two meat conveyors are seen in the background;* (9) *The fleet at Temple Meads Station;* (10) *Dr. Jakeman and the hon. secretary by the sea;* (11) *Some of the electric cranes at Avonmouth:* (12) *Capt. Hooper, Mr. and Mrs. S. H. Holden, and Mr. Hodder, a member of the Port Committee;* (13) *Typical villas near Clevedon;* (14) *The chairman with friends at Clevedon;* (15) *Approaching the suspension bridge;* (16) *Dr. and Mrs. Jakeman and Mrs. Wilson.*

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NEWS IN BRIEF.

Plumstead Traders' Suggestion—Hackney and Electric Irons—I.E.E. Contract Conditions —The Patents Committee—Safety First and Insulating Tape.

MEMBERS of the Diesel Engine Users' Association visited Leatherhead electricity works recently.

Isle of Thanet Joint Hospital Board has decided to instal at the hospital at Haine an electric lighting plant at an estimated cost of £3 200.

The short circuiting of a battery in the recharging room of Messrs. A. R. and E. Wallis, wireless and electrical engineers, 41, Torquay Road, Paignton, resulted in a fire on June 27th, which did damage to the extent of £30.

The trunk telephone service was extended to the Isle of Man on June 28th.

Gravesend Town Hall Committee has considered schemes of heating the town hall by low pressure hot water and by electricity and has decided that a sub-committee should view a building heated by electricity before coming to a decision.

The daily average of electricity generated in Canada for Canadian use during December, 1928, and January and February, 1929, amounted to 43 746 000 kWh, 45 912 000 kWh and 44 622 000 kWh respectively, compared with 39 047 000, 38 588 000 and 38 858 000 kWh respectively for the same months of the previous year.

At a recent meeting of the Plumstead Traders' Association, Mr. C. G. Everett put forward a combined lighting scheme whereby the three hundred traders in the district using electricity could co-ordinate their lighting displays to attract extra custom and at the same time obtain their supply from the Council's electricity undertaking at a reduced cost.

An electrical laundry is to be established at Norris Green by the Liverpool Co-operative Society, provided the recommendation of the Liverpool Housing Committee to sell the necessary site to the Society is adopted.

The whole of the Vatican City is to be equipped with an automatic telephone system. Arrangements have been made for the International Standard Electric Corporation to make the installation as soon as possible. The exchange will have a capacity of 1 800 lines, and will have 500 numbers at the outset.

A revision of Manchester Corporation's hire-purchase wiring scheme has been agreed to by the Electricity Committee. A standard schedule price has been fixed, and it is open to any contractor on the National Register to carry out installations for which he can, by canvassing, obtain orders direct from consumers.

Hackney (London) Electricity Committee proposes to put into operation a scheme of hiring electric irons of British manufacture at 1s. a quarter. In the event of hirers wishing to buy their irons, a credit of 50% of the aggregate paid in rental is to be given towards the purchase price. It is estimated that the consumption per iron will be 50 kWh per annum.

Users of the Institution of Electrical Engineers' model forms of general conditions for contracts are reminded that revised editions have been issued as follows:—Form A (Home, with erection), April 1929; Form B1 (Export-delivery F.O.B.), December, 1928; Form B2 (Export, including erection or supervision of erection), December, 1928. In addition, there are available:—Form C (Sale of goods other than cables—Home, without erection), issued, April, 1924; and Form D (Sales of Cables—Home, without erection), issued, April, 1924.

Ripon Gas and Electricity Committee has passed plans of the proposed showrooms, and has decided to obtain tenders.

Nearly 200 persons, from Europe and America, have indicated their intention to be present at the congress of metallurgists in Düsseldorf from September 9th to 12th.

The new rural automatic telephone exchange which has been opened at Aughnacloy in the Clogher Valley, co. Armagh, is the first automatic telephone exchange to be completed in Northern Ireland.

Sir Herbert Baker has undertaken the design of the Victoria Embankment elevations of the new head office of Cables and Wireless, Ltd., and Imperial and International Communications, Ltd.

York Electricity Committee is to apply to the Commissioners for sanction to borrow £10 000 for domestic appliances and £2 000 for assisted wiring.

London County Council Education Committee recommends that, in view of the establishment of the new constitution of the University of London, consideration of the application for a grant of £10 000 towards the erection of a high voltage testing laboratory at East London College be postponed.

At the annual conference of the Institute of Public Cleansing, at Blackpool, Mr. C. L. O'Shaughnessy stated, in a paper on "Electrical Engineering in Modern Cleansing Work," that at Birmingham the major portion of the steam generated by means of the heat from the refuse incinerator was turned into electrical power. The efficiency of the electric refuse vehicle, with its ease of control, still gave it a pre-eminence in that field. A striking apparatus in the handling of house refuse was the electro-magnetic separator.

Associated Municipal Electrical Engineers of Great Britain and Ireland has informed Hammersmith B.C. that the salary which should be offered to the successful applicant for the position of borough electrical engineer and manager, according to the Association's scale, should be £1 415 per annum. In the invitation of applications for the post, the salary offered is £1 200, rising by annual increments of £50 to £1 400. The Electricity Committee does not recommend that the Association's suggestion be adopted.

The Patents Committee under the chairmanship of the Rt. Hon. Sir Charles Sargant has begun its investigations, and persons and associations who wish to submit suggestions or to give evidence before the Committee are invited to communicate with the Secretary, Mr. R. W. Luce, Industrial Property Department, Board of Trade, 25, Southampton Buildings, London, W.C.2. The Committee was appointed by the Board of Trade to report whether any amendments in the Patents and Designs Acts, or changes in the practice of the Patent Office, are desirable.

At an inquest last week into the death of an employee at the Derbyshire and Nottinghamshire Electric Power Co.'s works at Spondon as the result of a shock due to the deceased man having touched a cable joint, Mr. H. W. Swann, a Home Office expert, said the insulation tape commonly used by electricians was not safe, and it had been responsible for a number of fatal accidents. Drawn tightly over a sharp surface, it became brittle and the insulation was impaired. It would be better if the metallic sheathing of the cable were extended. He had known a case in which as many as eight layers of tape had proved ineffective.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *of July 12th, 1879:—*

Members of the International Telegraph Conference were entertained by Mr. John Pender, M.P., at a garden party at Foots Cray.

The need for some sort of standardisation in electrical terminology was receiving attention.

The death was announced of Sir William Fothergill Cooke, who was described in our memoir as "literally the father of English electric telegraphy, and in a not very remote sense, the father also of electric signalling throughout the world."

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN, *dated July 15th, 1904, recorded that:—*

Four out of the 14 clauses of the Supply of Electricity Bill had been passed by the House of Lords Committee.

Bradford Corporation was recommended to purchase 30 500 lamps for free distribution to consumers.

Tenders for wiring a West Ham school ranged from £320 to £960 10s.

* * *

FIFTEEN years ago, it was stated in THE ELECTRICIAN *for July 10th, 1914, that:—*

Dr. Oliver Heaviside was granted an additional Civil List pension of £100.

Explosions in bitumen mains were the subject of the report of a Departmental Committee, of which Sir T. Edward Thorpe was chairman.

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PERSONAL.

MR. J. McAnaney has been transferred by the Electricity Supply Board from Dublin to Waterford.

Mrs. May M. McDowell has joined the Liverpool electricity showrooms in Whitechapel, as a demonstrator.

Mr. D. M. Pitt has relinquished his post with the Cambridge Instrument Co., Ltd., to return to the domestic side of the industry as London sales engineer to Electrical Utilities, Ltd.

Estate of the gross value of £20 755, with net personalty £19 796, was left by the late Major-General Reginald Henry Mahon, deputy chairman of the Calcutta Electric Supply Corporation.

Mr. Joseph Dickson, post office sectional engineer, Llandudno, has retired after 46 years' service with the Post Office. At a farewell gathering of his colleagues he was presented with a handsome piece of furniture.

The Albert Medal of the Royal Society of Arts for the current year has been awarded to Sir Alfred Ewing, Principal and Vice-Chancellor of the University of Edinburgh, "for his work on magnetism and his services to technical education."

The marriage was solemnised at St. John's Church, The Height, Salford, on June 26th, of Mr. Harry Brooks, a contract engineer with W. T. Glover and Co., Ltd., and Miss Muriel Clarke.

Mr. C. W. Charlesworth, works manager for Marconi's Wireless Telegraph Co., Ltd., at Chelmsford, who is leaving to take up another appointment, has been presented by the staff with a gold cigarette case, together with a gold vanity case for his wife.

Mr. J. D. Peattie, distribution development engineer in the Manchester electricity department, having resigned to take up a position with the Central Electricity Board, the following new appointments have been made:—Mr. H. Hawkins, distribution development engineer; Mr. P. T. Fowler, h.t. mains engineer; Mr. A. W. Crompton, assistant distribution development engineer.

Arrangements have been made for Mr. S. R. Mullard to relinquish his position as managing director of the Mullard Wireless Service Co., Ltd., and the Mullard Radio Valve Co., Ltd., in order to devote more of his time to other interests. Mr. Mullard will retain his offices as chairman of the Mullard Wireless Service Co., Ltd., and director of the Mullard Radio Valve Co., and will be general adviser to the companies.

Mr. H. Francis White, marine contracts manager of the Radio Communication Co., has been appointed manager of that company. After 17 years with the Marconi International Marine Communication Co., Mr. White entered the service of the Radio Communication Co., in 1920, as their agent in the Newcastle area. Two years later he was appointed marine contracts manager at their head office, a position which he has held until his present appointment.

The sequel to Mr. W. H. Peak's resignation as managing director of the Relay Automatic Telephone Co., Ltd., is to be found in the appointment of Mr. B. B. Johnson and Major W. Burningham White as joint general managers. Mr. B. B. Johnson has been associated with the company for many years, and has for the last four or five years been chief engineer. Major W. Burningham White created the sales department of the company and has developed the present sales organisation.

At the conclusion of the summer meeting of the Institution of Mechanical Engineers, honorary degrees of Doctor of Science were conferred by Manchester University upon Mr. Daniel Adamson, president, and Sir Henry Fowler, a past president of the Institution. Sir Henry Fowler is well known as the chief mechanical engineer of the Midland Railway. Mr. Adamson was responsible for the design and construction of the first three-motor electric overhead travelling crane ever built in this country.

At the last meeting of the Pretoria Town Council, Mr. L. L. Horrell was appointed electrical engineer and manager at the Electricity Department, at a salary of £1 200 to £1 375 per annum. Mr. Horrell has been connected with the department as assistant electrical engineer for the last twenty years. Before going to South Africa, Mr. Horrell may be remembered being on the staffs at Bedford, Coventry, and Walsall electricity undertakings. His early mechanical training was gained at the old Great Northern Railway works at Peterborough.

Mr. D. Wyles, late chief of the radio department of the National Electric and Engineering Co., Ltd., of New Zealand, has been presented by the Electrical Federation of New Zealand with four bound volumes of gramophone records as a mark of appreciation by the trade for his work in connection with the improvement of local radio trade conditions. The presentation was made at an official farewell gathering prior to Mr. Wyles sailing for Melbourne to take up the position of sales promotion manager of Philips Lamps (Australia), Ltd.

Mr. A. J. Railing, who has been asked to become joint-managing director of the G.E.C.

One of the most interesting statements made by Sir Hugo Hirst at the general meeting of the G.E.C. last week was that expressing his intention to ask Mr. A. J. Railing to become joint-managing director. Mr. Railing has held his present office of general manager for the last 18 years, having been with the G.E.C. for 38 years. During the absence of Sir Hugo in Australia with the Government Mission, much additional responsibility rested upon Mr. Railing, and Sir Hugo, when making the announcement of the impending appointment, paid tribute to the success with which the work of the company was carried on. Much of the company's progress is attributable to the outstanding capabilities which Mr. Railing has brought to bear, the expansion of the company both at home and overseas making the office of general manager increasingly arduous. It is fitting, therefore, that such abilities should be given greater scope, and though the position he is shortly vacating has shown to advantage the courage and rare capacity for detail which are not the least of Mr. Railing's qualifications, still greater success may attend the new appointment.

The Council of the Institution of Electrical Engineers has made the following award of Students' premiums for papers read before the Students' Sections during the Session 1928–29: PREMIUMS OF THE VALUE OF £10 EACH: E. J. Evans, "Food Heating by Extracted Steam in Generating Stations"; R. C. Henniker, "The Commercial Testing of Power Transformers"; F. Roberts, "Errors in Current and Voltage Measurements at High Frequencies." PREMIUMS OF THE VALUE OF £5 EACH: V. E. Connor, "The Manufacture and Testing of Submarine Telegraph and Telephone Cables"; T. A. Long, "The Loading of Transformers on a Thermal Basis, with Special Reference to Temperature Indicators"; V. P. Mackay, "Power Factor Correction"; C. F. J. Morgan, "The Resonance Method of Wave-Form Analysis"; H. H. Taylour, "Electric Welding"; and D. J. Watkins, "Electric Locomotives."

Obituary.

Mr. ALEXANDER D. GOODALL, aged 72 years. He was for 40 years in business as an electrician at 4, East Norton Place, Edinburgh.

Mr. RICHARD FREDERICK CLARKE, on June 25th, aged 52 years. Mr. Clarke was in business as an electrician at 10A, Park Lane, Folkestone.

Mr. SIDNEY O. ALLEN, district manager of the North-Western area of the Post Office telephones. He resided at Westmorland Road, Southport.

Mr. WILLIAM WILD SMITH, on June 10th. He was in the Engineering Department of the Post Office and was an associate member of the Institution of Electrical Engineers.

Mr. WILLIAM SYMES ANDREWS, on July 1st, at Schenectady, aged 81 years. Mr. Andrews was a pioneer in electrical engineering, and was for many years assistant to Edison. He constructed the first Edison chemical electric meter, and was responsible for patents in connection with X-rays. He was a martyr to scientific progress, his death being traceable to X-ray burns. He was born at Saltford, Somerset, and went to America, where, in 1881, he became superintendent of testing at the Edison Machine Works, New York. He was afterwards chief electrical engineer of the Edison Electric Construction Co., general superintendent of the Marr Construction Co., vice-president of the Leonard and Izard Co., superintendent of the Edison Manufacturing Co., New York; technical assistant at the Edison General Electric Co., superintendent of the Peterborough Works of the Canada General Electric Co., and general manager of the Edison Electric Illuminating Co., Lancaster. Since 1894 he had been with the Edison General Electric Co.—during recent years as consulting enginneer.

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LEGAL INTELLIGENCE.

The Barton Station—Trade Name Injunction —Loud Speaker Patents.

THE petition of Erewash Electric Wire Co., Ltd., for a compulsory order to wind up Telephones and Accessories, Ltd., was dismissed by Mr. Justice Eve in the Chancery Division on July 3rd.

Mr. Johnston said it was a judgment creditors' petition which had stood over on two occasions to enable the parties to come to terms. They had done so, and he asked that the petition should be dismissed without costs.

Mr. Justice Eve: Your request is granted.

Alleged Nuisance.

Adverse judicial decisions upon alleged nuisances arising from the emission of fumes from the Barton power station of the Manchester Corporation came this week, in the House of Lords, for review and final decision, in the appeal of the Manchester Corporation *v.* Mr. Arthur Farnworth. Mr. Justice Talbot, before whom the matter first came, decided in favour of the Corporation, but the Court of Appeal set aside his decision and entered judgment for the respondent. The Corporation now appealed to the House of Lords.

Electric Lamp Patents.

Judgment in default of defence was entered by Mr. Justice Clauson in the Chancery Division on Tuesday in actions by the British Thomson-Houston Co., Ltd., against Charles Marks, trading as the Standard Supply Stores, Higher Broughton, Manchester, and J. Howard, Temperley Road, Balham, to restrain infringements of their patents relating to improvements in incandescent electric lamps.

Edison Accumulators *v.* Edison Storage Batteries.

In the Chancery Division on July 2nd Mr. Justice Clauson heard a motion on behalf of Edison Accumulators, Ltd., against Edison Storage Batteries, Ltd., for an interlocutory injunction to restrain the defendant company from carrying on business under their present name or any name calculated to lead to confusion.

The Hon. Stafford Cripps, K.C., for the plaintiffs, said the Accumulator and Storage batteries were the same. The defendants were an English company which had been promoted by an American company of the same name. In 1913 an agreement was entered into between the American company and the Edison Accumulators, Ltd., plaintiffs' predecessors in title, when the American company had a number of patents in this country for protecting the manufacture of their accumulators. Those patents had since lapsed, and the effect of the agreement was to give plaintiffs' predecessors sole selling rights of Edison accumulators except the sales to Government. The agreement continued in force until March, 1925, when it was substituted by another agreement for a period of five years, with a provision for 90 days' notice to terminate in the event of any breach.

In July, 1929, the original Edison Accumulators, Ltd., split themselves into two companies—Britannia Batteries, Ltd., and Edison Accumulators, Ltd., the last-named to have the benefit of the agreement of March, 1925. On March, 19th, 1929, after the present plaintiff company had been registered, notice was received from the solicitors to the American company purporting to terminate the agreement on the ground that there had been breaches. On April 8th, 1929, the defendant company was registered as a private company to carry on business of, amongst other things, selling accumulators in this country. What really had happened was that the American company cancelled the agreement, on the allegation that there had been breaches which were denied, and had formed the defendant company to carry on the same business in this country. There were two considerations: one was whether, apart from the agreement, the American company could register a private company and carry on business under a name which was identical with the plaintiffs' name, and whether in view of the agreement they were stopped from so doing. Counsel submitted that the name of the defendant company so closely resembled plaintiffs' that there was bound to be confusion, and the plaintiffs were entitled to the injunction.

Sir Duncan Kerly, K.C., for defendants, submitted that there would be no confusion. The name and description of the goods which were sold and the mere use of an honest description of goods could not be stopped.

His Lordship, granting an interlocutory injunction in the terms of the notice of motion, said he was satisfied that it would be impossible for defendants to trade under their present name without causing some confusion.

On the application of Sir Duncan Kerly, his Lordship suspended the injunction pending notice of appeal.

Lektophone *v.* S. G. Brown.

The Court of Appeal, consisting of the Master of the Rolls and Lords Justices Lawrence and Russell, heard on Monday an appeal by the Lektophone Corporation, of Exchange Place, Jersey City, U.S.A., from a judgment of Mr. Justice Tomlin in the Chancery Division in an action brought by the appellants against S. G. Brown, Ltd., of Victoria Road, Willesden Lane, London, W., to restrain an alleged infringement of their patent, No. 16602, granted in 1914.

Mr. Trevor Watson, who appeared for the Lektophone Corporation, explained that the defence of the action was non-infringement and invalidity, and Messrs. Brown counter-claimed for revocation.

The case was one of considerable importance, because there was large commercial activity to-day in the wireless loud speaker, which was the type of machine Messrs. Brown had put on the market, and which the Lektophone Corporation alleged was an infringement of their patent.

The Lektophone Corporation complained that Messrs. Brown had sold a loud speaker called "The Mascot" at the National Radio Exhibition in September, 1927, which was alleged to be made in accordance with the appellants' specification.

Mr. Justice Tomlin held that the appellants' specification referred to sound regenerating machines called talking machines and phonographs operated by a stylus and records, and without a horn or trumpet, and not to loud speakers in the modern sense for transmission of wireless sound waves.

His Lordship held that "The Mascot" did not infringe the appellants' patent and upheld the validity of the patent. He accordingly dismissed the claim and counter-claim. From that decision the Lektophone Corporation now appealed and Messrs. Brown cross-appealed.

Mr. Trevor Watson dealt in detail with the factors which govern sound and the methods employed to produce it, and said that his general criticism of Mr. Justice Tomlin's judgment was that his lordship dealt with the matter too exclusively upon the wording of the specification without paying sufficient regard to the evidence which had been given as to the state of the art and as to the problems with which the inventor was really dealing.

Hearing adjourned.

IN PARLIAMENT.

Electrification Schemes amongst Works Proposed by Government to Relieve Unemployment.

IN the course of the debate on the Address, in the House of Commons on July 4th, the Chancellor of the Duchy of Lancaster (Sir O. Mosley) said the Liverpool Street Station electrification scheme, if it went through, would involve orders of between £75 000 000 and £100 000 000, which would go very largely to the steel trade. The present Government was setting to work again the Lord St. Davids Committee, on a basis in which it could properly function. If the Committee sanctioned schemes of public work at the same rate as formerly, it would mean that 150 000 men would be employed annually.

Sir L. Worthington-Evans questioned the accuracy of the figures of £75 000 000 and £100 000 000.

Sir Herbert Samuel said with regard to the Liverpool Street Station scheme, they had been told that the Government were proposing to allot a sum for that purpose of from £75 000 000 to £80 000 000.

Mr. J. H. Thomas said they did not intend anything of the kind. If a proposition of that kind could be self-supporting in one, two, or three years, it would be madness for any Government to give a guarantee for ten or fifteen years.

Replies to Questions.

The following are points from recent answers to questions in the House of Commons:—

The Electricity Commissioners are in communication with the Law Society with a view to the provisional settlement of a draft of a proposed form of wayleave agreement, and they propose to submit the draft to associations of the electricity supply industry, and to landowners and farmers and other interested parties.

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I.E.C. DINNER.

Delegates of the International Electrotechnical Commission in London.

THE British National Committee in association with the Steam Turbine Section of the B.E.A.M.A., gave a dinner at the Hyde Park Hotel, London, on July 4th, the guests of honour being the delegates of the Advisory Committee on Steam Turbines of the International Electrotechnical Commission, now in London.

Mr. CHARLES P. SPARKS (chairman), in proposing the toast, "The Visiting Delegates," said that the I.E.C. was now supported by the committees of 25 nations, the latest supporter being Portugal. The latter country was considering schemes of electrification and as a potential purchaser saw the advantage of being in direct touch with this parliament of electricians and following the debates. Having been connected with the activities of the I.E.C., since its first meeting in London in 1906, he expressed a word of warning to the effect that the electrical field internationally was in danger of becoming confused owing to too many international congresses and conventions. The multitude of congresses was bound increasingly to lead to overlapping. Moreover, it was a heavy tax on both the manufacturing and professional interests to send representatives to attend these innumerable meetings and yet they were forced to do so as they were bound for their own interests to maintain touch with international opinion. Some co-ordination was necessary in the general interests. The I.E.C. had taken the initiative in forming a Comité d'Entente, which was a clearing house for dates of international meetings and the exchange of ideas on the various programmes of work. This, however, was not far enough and it was hoped that some definite steps would eventually be taken towards bringing about a solution of this growing overlapping of efforts. The I.E.C. had now won its position as the official channel for promulgation in national recommendations in all matters relating to standardisation in electrotechnics.

PROF. CLARENCE FELDMANN, President of the International Electrotechnical Commission, in responding to the toast, said that he was fully aware of the danger of the existence of so many independent international organisations in the same field, which approach each other sometimes, and sometimes trespass on each other's work. The Comité d'Entente had done much, and it was hoped would do more, to prevent overlapping of dates of international meetings, but it could not go very far. The men delegated to attend these meetings were always men of high standing, specialists and experts, and neither Governments, municipalities, nor indeed industry itself, were able to give these people so much leave as would be necessary for them to visit the majority of the international meetings. If we went on in the way that we were going we should have a new type of man coming into being who attended all international meetings, and did nothing else.

The I.E.C. and the B.E.S.A.

Mr. MAURICE WILSON, Chairman of the British Engineering Standards Association, stated that he believed that the I.E.C. owed its inception to Col. Crompton who suggested its foundation some 25 years ago. The B.E.S.A. was founded somewhere about the same time by Sir John Wolfe Barry, and the two bodies have grown up in close and friendly relationship for more than a quarter of a century. The B.E.S.A. took the keenest interest in the work of the I.E.C. and recognised that body as the official channel through which international recommendations regarding electrotechnical matters were promulgated.

Dr. W. F. DURAND, leader of the delegates for the United States of America, in reply to the welcome, said that though he had heard references to the first meeting of the I.E.C. in London in 1906, members in the United States had been taking an agreeable satisfaction in believing that the birthplace of the organisation was at St. Louis in 1904. There was a rather simple explanation of the reason why engineers were able to act as pioneers in the development of international understandings and organisations. Fundamentally the engineer the world over thought in terms of the same basic units and ideas. There might be differences of language, terminology and symbols, but the ideas at the bottom were the same.

On Friday, July 5th, members and friends numbering about 60 in all, and including about 25 foreign delegates, and a number of lady visitors, had an enjoyable all-day outing, which began by a train journey to Oxford and was followed by visits to some of the Colleges; an excellent luncheon at the Carfax Assembly Rooms, and a motor coach jaunt to Hurley Lock. Here the party embarked for a delightful four-hours' trip to Windsor, at which place the motor coaches were in waiting to complete the journey back to London.

After the luncheon, at Oxford, Mr. Pyk, a Swedish turbine designer, expressed the foreign delegates' admiration of the wonderful results that had been reached at the recent conferences. He and his compatriots, he said, would be much honoured to receive the conference in Sweden next year, and they would look upon this meeting as an example of the things to be arranged, and would do their best to make and carry out similar arrangements.

BUSINESS ITEMS.

IN the King's Cup air race, 22 of the 23 machines completing the course were fitted with B.T.-H. magnetos.

The GENERAL ELECTRIC CO., LTD., announces that the price of the "Gecophone" portable screen grid 4-valve receiver has been reduced.

The address of the NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO., secretarial, accountants and transfer offices, has been changed to Northmet House, Cannon Hill, Southgate, London, N.14.

Messrs. G. W. WATSON AND SON, of Turl Street, Oxford, carried out electric lighting effects for the commemoration balls at Merton, University, Trinity, Brasenose, Wadham and Exeter colleges.

The CONCORDIA ELECTRIC WIRE CO., LTD., points out that the new London offices and stores at 81, Milton Street, Sydney Avenue, London, E.C.2, referred to on page 27 of our last issue, are already opened.

At the Herts Royal Agricultural Show, which took place recently, stands were occupied by the NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO., LTD., and Messrs. GIFFENS, electrical engineers, of St. Albans.

BRUCE, PEEBLES AND CO., LTD., Edinburgh, have appointed Mr. George E. Whitehead, of 102, St. Mary Street, Cardiff, as their representative for South Wales and the counties of Gloucester, Somerset, Devon and Cornwall.

The ANGLO-GALVANISING CO., LTD., Abbey House, Victoria Street, London, announces that A. LEE AND SONS, LTD., of Bessemer Road, Sheffield, have entered into an agreement for galvanising strip with the "Bianco" process of electro-galvanising.

Messrs. BASTIAN AND ALLEN, of Farnham Road, Trading Estate, Slough, announce that there may be seen at their works a "Mascarini" 300 kW 460 V 3-phase electro steam boiler, capable of producing approximately 900 lb. of steam per hour. This notice is in response to numerous applications to see this boiler in action, and arrangements have been made for demonstrations.

The MULLARD WIRELESS SERVICE CO., LTD., announces that the sales and accounts departments have been transferred from Nightingale Lane, Balham, to the company's new premises in Charing Cross Road.

The ENGLISH ELECTRIC CO., LTD., has received an order from the Maidstone Corporation for seven six-wheel, double-deck, top-covered trolley omnibuses; each vehicle will have seating accommodation for 56 passengers. The equipment will consist of an 80 H.P. motor with standard camshaft foot-operated controller. These vehicles complete will be built at the company's Preston works.

The Race Course Betting Control Board has selected "Kathanode" batteries for operating totalisators, and an order has been placed with the D.P. BATTERY CO., LTD., of Bakewell and London, for six 100 V, 500 Ah batteries, which will be mounted on lorries for transport to and from different race courses. Similar batteries are also being adapted by London and provincial omnibus proprietors for bus lighting, as the construction renders them particularly suitable for this class of work.

We are asked to announce that Mr. JAMES DUNCANSON, 29, Waterloo Street, Glasgow, C.2, has been appointed sole representative for Scotland for ALFRED GRAHAM AND CO., LTD., and the ARTIC FUSE AND ELECTRICAL MANUFACTURING CO., LTD., in succession to Messrs. John Bentley and Co., who have relinquished these agencies owing to their having taken over the Glasgow office of the now associated companies Messrs. Lawrence Scott and Electromotors, Ltd. Mr. Duncanson will continue to represent Messrs. CALDWELL AND CO., Glasgow.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

SALFORD CORPORATION.—Sub-station and pit type single-phase transformers. Specifications from the City Electrical Engineer.

STOKE-ON-TRENT CORPORATION.—Overhead wiring and services to 230 houses at Vivian Road and Warrington Street, Fenton, 28 at Marlborough Street and Evelyn Street, Fenton, and 20 at Shelton New Road, Basford. Specification from the City Electrical Engineer, Stoke-on-Trent; deposit £2.

BIRMINGHAM GUARDIANS, July 12th.—Electric light installation at the Quinton Hall Institution. Specification from the Clerk, Union Offices, Edmund Street, Birmingham; deposit £2 2s.

CARLISLE CORPORATION, July 12th.—Supply and erection of switchgear for use in 11 000 V, three-phase, 50 cycle sub-station. Specification, etc., from Mr. C. W. Salt, city electrical engineer; deposit £2 2s.

11 000 V Switchgear.

ILKLEY URBAN DISTRICT COUNCIL, July 12th.—Supply and erection of 11 000 V combined cubicle and truck type switchgear, transformer kiosk, 300 kVA and l.t. feeder gear; and 11 000 V feeder and l.t. distributors. Specifications from Mr. S. H. Fowles, Electricity Offices, Chantry Drive, Ilkley; deposit £1 1s. for each.

RIVER AVON JOINT COMMITTEE, July 15th.—Electrically-operated and controlled sluice gates at Tewkesbury. Specification, etc., from Mr. T. Hindmarsh, land drainage officer, Shire Hall, Gloucester; deposit £1 1s.

STIRLING COUNTY EDUCATION AUTHORITY, July 15th.—Electrical installation in new school at Callendar Road, Falkirk. Schedules, etc., from Mr. A. N. Malcolm, Old Burgh Buildings, King Street, Stirling, until July 15th.

BANGOR (N. IRELAND) CORPORATION, July 16th–23rd.—Ironclad and cubicle switchgear, 6 600 and 400/230 V; three-phase transformers, 200 and 100 kVA; underground cables for 6 600 and 400/230 V; and meters. Specification until July 16th from the Town Clerk; deposit £1. Tenders are invited from British manufacturers only.

HULL CORPORATION, July 16th.—Installation of electric lift at Central Public Library. Specification from the City Architect, Guildhall, Hull.

RENFREWSHIRE EDUCATION AUTHORITY, July 17th.—Electrical installation in gymnasia at Camphill Secondary School, Paisley, and gymnasium at Renfrew High School. Schedules, etc., from Mr. J. H. Pullar, County Education Offices, 16, Glasgow Road, Paisley; deposit £1.

WEST HAM GUARDIANS, July 18th.—Additional electric lighting installation in 26 wards at Whipps Cross Hospital, Leytonstone. Specifications from the clerk, Mr. L. E. Fraquet, Union Road, Leytonstone, London, E.

METROPOLITAN ASYLUMS BOARD, July 20th.—Alterations and additions to electric lighting installation at Grove Park Hospital, Lee, S.E.12. Specification, etc., from the Board's Office, Victoria Embankment, London, E.C.4; deposit £1.

CENTRAL ELECTRICITY BOARD, July 22nd.—Supply and erection of central indicators and telephones in connection with the Central Scotland Electricity Scheme. Specification (C.S.-S.S. 15) and form of tender from Mr. R. H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

HINDLEY URBAN DISTRICT COUNCIL, July 23rd.—Erection of two electric motors and two centrifugal pumps at Strangeways pumping station. Specification from the Surveyor, Council Offices, Hindley; deposit £1 1s.

GAINSBOROUGH URBAN DISTRICT COUNCIL, July 24th.—Electric motors and pumps. Further particulars from Mr. S. W. Parker, waterworks engineer, Council Offices, Gainsborough; deposit £2 2s.

DOWN COUNTY REGIONAL EDUCATION COMMITTEE, July 25th.—Electric light installation in Newcastle Technical School. Specifications, etc., from Mr. Castor J. Love, 5, Wellington Street, Belfast; deposit £1 1s.

EPPING GUARDIANS, July 25th.—Electric power installation, for laundry and well at the Institution. Specification from the Clerk, Union Offices, High Street, Epping; deposit £1 1s.

CENTRAL ELECTRICITY BOARD, July 27th.—Supply and erection of 132 000 V overhead transmission lines, in connection with the Mid-East England Electricity Scheme. Specification (No. M.E.E.-P.L. 1), etc., from Mr. R. H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, W.C.2; deposit £2 2s.

CARDIFF RURAL DISTRICT COUNCIL, July 29th.—Supply, etc., of sub-station equipment, underground cables, overhead lines, etc., in parish of Radyr. Forms of tender, etc., from Mr. R. Howard Fletcher, 3, Park Place, Cardiff.

DUNDEE CORPORATION, July 30th.—Electric light installation in connection with Fleming Trust housing scheme. Particulars from Mr. G. Baxter, 91, Commercial Street, Dundee.

MANCHESTER GUARDIANS, July 30th.—Circulating pumps and electric cable, at Crumpsall Institution. Specification from Superintendent of Works, Union Offices, All Saint's, Manchester.

NEWCASTLE ENDOWED SCHOOLS, August 24th.—Electric light installation in a new wing to be erected at each of two schools, viz.: Newcastle-under-Lyme High School, and Newcastle-under-Lyme Orme Girls' School. Specifications, etc., from Messrs. Cramp and Frith, 1, Dickinson Street, Manchester; deposit £3 3s. in respect of one contract, or £6 6s. in respect of both contracts. Tenders are invited only from firms on the National Register of Electrical Installation Contractors.

COMMITTEE OF VISITORS OF GLOUCESTERSHIRE MENTAL HOSPITALS, August 26th.—Electric wiring of Wotton and Coney Hill Mental Hospitals, on "Stannos" earthed concentric system. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

CHILEAN MINISTRY OF MARINE, July 12th.—Supply and erection of two aerial towers for new wireless station at Arica, the aerial to consist of 8 phosphor bronze cables, 200 metres in length. (Reference A.X. 8 134.)

INDIA STORE DEPARTMENT, July 12th.—Supply of three continuous wave wireless transmitting sets (580 to 3 000 metres). Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

EGYPTIAN STATE RAILWAYS, July 13th.—Supply of underground, lead-covered, paper core telephone cables (approximate value £E.25 000).

AUCKLAND ELECTRIC POWER BOARD, July 15th.—Supply of 22 000 V cable and accessories. (Reference B.X. 5 414.)

EGYPTIAN MINISTRY OF THE INTERIOR, July 15th.—Supply and erection at Mena power station of one Diesel engine driven a.c. generating set of 250 kVA. (Reference B.X. 5 331.)

VICTORIAN ELECTRICITY COMMISSION, July 15th.—Two 750 kVA transformers and spares (No. 29/42). (Reference B.X. 5 325.)

FREDERIKSBERG (DENMARK) MUNICIPALITY, July 16th.—Two 10 000 kVA transformers. (Reference B.X. 5 435.)

INDIA STORE DEPARTMENT, July 16th.—Supply of 6 500 special electric lamps for signalling purposes, etc. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 23rd.—Telegraph instruments (schedule C. 436). (Reference B.X. 5 323.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 23rd.—Adhesive insulating tape (schedule C. 457). (Reference B.X. 5 459.)

VICTORIAN RAILWAY COMMISSION, July 24th.—Electric overhead travelling cranes, spare motors, and down shop trolley wires (contract No. 42 672). (Reference A.X. 8 092.)

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., July 26th.—Supply of electric overhead travelling cranes,

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etc. Forms of tender and specification (£1, not returnable) from Mr. S. G. S. Young, Secretary, 91, Petty France, Westminster, S.W.1.

MIDDLEBURG (S. AFRICA) MUNICIPALITY, July 29th.—Supply and erection of steam raising plant, steam driven alternator, condensing plant, 6 600 V transmission line and switchgear. (Reference B.X. 5 348.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 13th.—Water turbine driven generating sets and switchgear for Waitaki power development (section 2). (Reference B.X. 5 278.)

PIETERSBURG (TRANSVAAL) MUNICIPALITY, August 13th.—Supply of h.t. and l.t. cable, lamps and sundries, in connection with extensions of the electricity undertaking. (Reference B.X. 5 312.)

PIETERSBURG (TRANSVAAL) MUNICIPALITY, August 13th.—Supply and erection of steam raising plant, engine, alternator and switchgear (contract A). (Reference A.X. 7 983.)

SOUTH AFRICAN RAILWAYS AND HARBOUR, August 15th.—Electrically-driven plate bending and flattening machine (tender No. 1 498). (Reference A.X. 8 164.)

CHILEAN STATE RAILWAYS, August 16th.—Material for overhead lines, underground cable and cable boxes (Group 41); and material for lighting of locomotives and carriages (Group 43). (Reference C. 3 069*.)

CHILEAN STATE RAILWAYS, August 16th.—Telegraph and telephone materials, including copper wire and cable, switches, table telephones (Ericsson type), telephone cords, etc. (Reference C. 3 072*.)

CHILEAN STATE RAILWAYS, August 16th.—Supply of instruments of staff or tablet type, for installation at 36 stations between Alameda and Talca, locking apparatus for switches, batteries and telephone combinations. (Specification C. 3 070*.)

AUCKLAND ELECTRIC POWER BOARD, August 19th.—Single-phase transformers. (Reference B.X. 5 324.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 22nd.—Extension magneto bells, bell sets, condensers, magneto generators, central battery switchboard, tumbler switches, wall and table telephones, etc. (Reference B.X. 5 415.)

GREY ELECTRIC POWER BOARD, August 27th.—Supply and erection of generating plant, for the Arnold river hydro-electric scheme. (Reference B.X. 5 422.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 27th.—Supply of cord type switchboards (schedule C. 448). (Reference B.X. 5 428.)

NEW ZEALAND GOVERNMENT RAILWAYS, September 4th.—Supply of motor generator (specification 287). (Reference B.X. 5 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 7th.—Supply of v.i.r. wire. (No. P. and T. 151/1 573.) (Reference B.X. 5 416.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 10th.—Two-conductor cords (P. and T. 151/1 600). (Reference B.X. 5 462.)

LOURENCO MARQUES PORT AND RAILWAYS, September 11th.—Battery tractors and trailers. (Reference A.X. 8 172.)

BULAWAYO MUNICIPALITY, September 13th.—Supply of h.t. overhead transmission lines, stepdown transformers, pumps with motors, etc. (Reference A.X. 8 181.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General, Victoria House, Strand, London, W.C.; deposit, £2 2s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

Tenders Accepted.

OLDHAM CORPORATION.—Ferranti, Ltd., supply of two transformers.

POPLAR (LONDON) BOROUGH COUNCIL.—Siemens Bros. and Co., Ltd., supply of cables, £738.

LANCASTER CORPORATION.—Stirling Boiler Co., Ltd., installation of two water-tube boilers at electricity works, £25 765.

CHESTERFIELD CORPORATION.—English Electric Co. Ltd., transformer and switchgear, in connection with work at Whispering Well, £275.

GOVERNORS OF ROBERT GORDON'S COLLEGES.—Bell and Robertson, Ltd., electrical work in connection with erection of Gordon College Hall, £350.

CHERTSEY GUARDIANS.—Woking Electric Supply Co., Ltd., electrical installation at the Institution, Ottershaw, £525. There were 36 tenders, the highest being £1 600.

EAST HAM CORPORATION.—Enfield Cable Co., Ltd., pilot cable, £256 9s. 6d. net per 1 000 yds.; English Electric Co., Ltd., supply of two 1 000 kW convertors at Church Road sub-station, £5 499 10s.

CAPE TOWN CORPORATION.—S. A. General Electric Co., Ltd., supply of 112 flambeau brackets and fittings, £1 103 4s.; Peel Electrical and Engineering Co., Ltd., cable for Muizenberg pavilion, £334 11s. 8d. (Both recommended.)

STAFFORDSHIRE EDUCATION COMMITTEE.—W. G. France, installing electric light and power installation at New High School for Girls, Bilston, £1 033 5s. 5d., and electric light installation at Girls' High School, Stafford, £539 8s. 6d.

LEEDS.—Hackbridge Electric Construction Co., Ltd., supply of works' transformers, £2 170. Cables: W. T. Henley's Telegraph Works Co., Ltd., £2 450; Enfield Cable Works, Ltd., £3 084; Macintosh Cable Co., Ltd., £5 225; Hackbridge Cable Co., Ltd., £905 18s.; Greenwich Cable Works, Ltd., £2 743 0s. 6d.

LONDON COUNTY COUNCIL.—J. Briggs, Ltd., installation of wiring and fittings for electric lighting at new elementary school, Marvel's Lane, site No. 1, £365. Also tendered: Malcolm and Allan (London), Ltd., £369; A. Dean and Co., Ltd., £371; Stegman and Co., £375; Electrical Installations, Ltd., £386; H. J. Cash and Co., Ltd., £419.

HACKNEY (LONDON) BOROUGH COUNCIL.—Stirling Boiler Co., Ltd., three boilers, each with maximum evaporative capacity of 150 000 lb. per hour, coal handling and ash removal plant, etc., £310 679. (Recommended.) Also tendered: Babcock and Wilcox, Ltd., £312 766; Underfeed Stoker Co., Ltd., £314 729; Vickers Boiler Co., Ltd., £317 300. Herbert Morris, Ltd., 100-ton crane, with electrical equipment, and supplementary lift of 2 tons to handle smaller parts, £3 040. (Recommended.) Also tendered: Vaughan Crane Co., Ltd., £3 115; Ransomes and Rapier, Ltd., £3 595; Babcock and Wilcox, Ltd., £3 928 5s.; Stothert and Pitt, Ltd., £4 170.

THE NATIONAL REGISTER.

A Further Thirty-Seven Names Added to List of Registered Contractors.

At a meeting of the Executive Committee of the National Register of Electrical Installation Contractors on July 5th, 48 applications for registration were received from electrical installation contractors. Of this number, two applications were withdrawn and nine were declined. The names and addresses of the successful applicants are as follow:—

Hough Electric Motor Co., Ltd., 231, Drake Street, Rochdale.
Sheath, W. J., 19, Southfield Road, Edgbaston, Birmingham.
North Electrical Co. (1929), Ltd., 63B, North Street, Leeds.
Pock Azer, 16, Cross Stamford Street, Leeds.
Donkin, Norman H., 27, Hyde Park Road, Leeds.
Dickinson, Fred, 68, Hough Lane, Bramley, Leeds.
Prior, Herbert, 53, Westfield Road, Leeds.
Huggard, S., and Son, 46, Chapel Lane, Headingley, Leeds.
Ramsden, S., 19, Pleasant Terrace, Holbeck, Leeds.
Marsden, William, 45, Beverley Terrace, Dewsbury Road, Leeds.
Whitaker, John W., 26, Victoria Road, Holbeck, Leeds.
Westfield Electrical Co., 40, West Street, Leeds.
Bedford, J. E., and Son, 116-118, Harrogate Road, Chapel Allerton, Leeds.
Smith, Fred, 51, Harrogate Road, Leeds.
Phillips and Sons, 2, Wortley Road, Armley, Leeds.
Raper, Herbert 154, Holderness Road, Hull.
Pearson, George E., Nethercape Works, Farsley, Leeds.
Mohan, Edward, 5, Wilton Street, Holderness Road, Hull.
Pepper Samuel, 34, Wellington Grove, Stockport.
Contractors (Stanningley), Ltd., Bennett's Yard, Lidgett Hill, Pudsey, near Leeds.
Clark and Wilson, 15, Friars Court, Carlisle.
Thompson George (Leeds), Ltd., 35, Park Square, Leeds.
Rigby, Thomas, 136, Woodhouse Lane, Leeds.
Good Bros., 35, South John Street, Liverpool.
Mortlock, C., Ltd., 30, Station Road, Penge, London, S.E.20.
Vanstone, Charles P., 33, Daniel Street, Bathwick, Bath.
Hellaby, W. T., and Co., Ltd., 80, Dale End, Birmingham.
Pickup, Wilfred, 4, Mill Lane, Blackburn.
Ward, Harold F., 1202, Stratford Road, Hall Green, Birmingham.
Thacker, Ernest J., 67, Hamstead Road, Handsworth, Birmingham.
Brooke, John E., 24, Dragon Road, Harrogate.
Barkers Electric Service, 21, West Street, Gateshead.
Guthrie, John M., 90, Hartington Road, Stockton-on-Tees.
Central Electrical Co., York Passage, High Street, Birmingham.
Braine and Parris, 44, Seaside, Eastbourne.
Hodgetts and Le Maistre, New Town Buildings, David Place, Jersey.
Cannock Urban District Council, Electricity Department, Wolverhampton Road, Cannock, Staffs.

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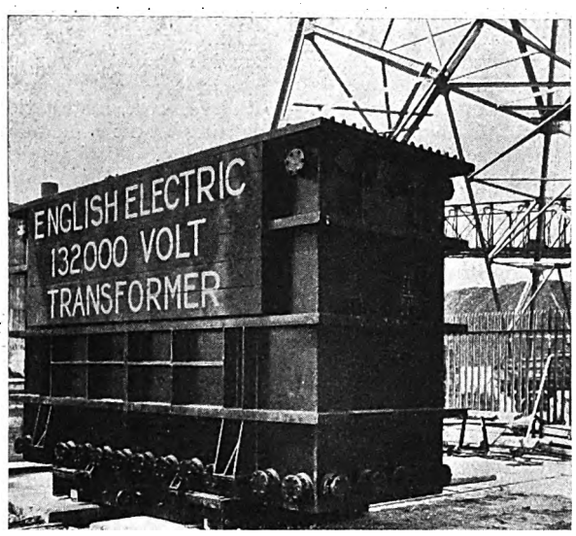
ELECTRICITY SUPPLY.

American Capital for British Undertakings—The North-East England Scheme—Report of the South-West Midlands Advisory Committee.

MR. W. M. Selvey has been asked by Torquay T.C. to report upon a scheme for the supply of electricity to ten parishes in Totnes rural district, at a fee of 50 guineas.

Electricity experts are to be invited by the Publicity Committee of Torquay T.C. to submit for consideration a scheme of coloured floodlighting for the Waldon slopes and gardens.



THE English Electric Co. has in hand for the Central Electricity Board a number of transformers for connection to 132 000 V transmission lines, and also other units for lower voltages in connection with the secondary transmission lines. The accompanying photograph shows a 15 000 kVA, 132 kV transformer which has recently been delivered to the Yoker sub-station in the Central Scotland area. The view was taken shortly after the unit was unshipped from the railway, and, of course, before the radiators, the cooling fans and the unload tap-changing gear had been fitted. Our readers who have studied the paper read before the I.E.E. by Messrs. Johnston, Wright and C. W. Marshall will recall that the Yoker sub-station adjoins the power station of the Clyde Valley Electric Power Co. on the north bank of the Clyde, and is situated immediately adjacent to one of the special towers which carry a double circuit across the river. The base of this tower, which is 270 ft. high and 60 ft. square at the ground level, can be seen in the photograph. The span across the river is 980 ft. and the tower on the south bank is 283 ft. high.

Chippenham R.D.C. will offer no objection to the proposal of the Wessex Electricity Co. to carry an overhead and underground electric line from Cirencester to Cricklade.

Mr. R. Borlase Matthews has informed Kettering R.D.C. of his intention to apply for an Order to supply electricity to practically the whole of the parishes in the northern part of the Council's area.

It is stated that Clitheroe's electrical undertaking will be extended into adjoining rural districts during the next winter. The Ministry of Transport has approved the scheme for supply to Waddington, West Bradford and Grindleton.

An agreement for the sale by Dalkeith T.C. to Lothians Electric Power Co., of the whole of the Dalkeith electricity undertaking for £30 966, was signed at a meeting of the T.C. on Monday. It was stated that the Electricity Commissioners and the purchasers had agreed to this price, as fixed by the auditor.

The chairman of the Electricity Board, Sir Andrew Duncan, and two of the prominent officials, visited Sunderland on Tuesday and conferred with Coun. Speeding, chairman of the Electricity Committee, and Mr. A. S. Blackman, the electrical engineer, respecting the proposals of the Electricity Board for the grid system in the North-East regional area.

Bristol Electricity Committee is to seek sanction to borrow £50 000 for sub-station buildings, £70 000 for sub-station plant and £80 000 for mains.—The Committee has arranged to proceed with the seventh section of the scheme for the change over of supply from single-phase alternating to the standard three-phase system, at an estimated cost of £56 277. This section embraces Bedminster, Temple Gate, St. Philip's areas, and a part of the city.

The electricity supply to Midhurst was switched on by the Midhurst and District Electricity Co. on July 3rd. Bulk supply is taken from Portsmouth Corporation by underground cable at 11 000 V, 3-phase, *via* Singleton and Cocking, villages en route, which also receive a supply. The h.t. feeder from Portsmouth, the l.t. distribution in Midhurst, Singleton and Cocking, and all transformers and switchgear, were supplied and installed by Johnson and Phillips, Ltd. The J. and P. wiring system is being largely used for the installation work.

Newbury Board of Guardians has decided to accept an offer for the supply of electricity by the Urban Electric Supply Co., when it is reported that repairs of the battery comprised in the Guardian's own installation are necessary. The running costs of the Guardians' plant are £130 per annum, and it is reported that necessary alterations to enable it to supply the new casual wards would entail an expenditure of £600, and an engineer would have to be employed at a cost of not less than £150 per annum. The company offers to supply the institution at a fixed charge of £80 per annum, plus 3d. per kWh consumed.

Bradford Corporation electricity department has opened a temporary showroom in connection with a circular which has been issued announcing that distributing mains are being extended to the Pudsey and Drighlington areas, and pointing out that the specially low rates offered are such as to render the cost of electricity quite reasonable when compared with the present cost of gas, that in many cases a change over may be effected at no increased cost, and that in some instances a reduction can be obtained. The number of domestic consumers on the Bradford supply is 20 000 and the increase is over 3 000 per annum. Some consumers, on the domestic rate, enjoy a charge as low as ¾d. per kWh. See page 64.

The South-West Midlands Advisory Joint Committee, of which Coun. Beale of Birmingham has been chairman since it was established in 1923, has just issued its annual report to the Electricity Commissioners. The district covers an area of upwards of 1 300 sq. miles. The report indicates considerable activity during the year, particularly in the hitherto undeveloped parts of Worcestershire and Warwickshire. The generating plant capacity in the area is 256 500 kW. The electricity sold shows an increase of 12¼% at 422½ million kWh. The kWh sold per head of population have increased from 191 in 1926–7 to 228 in 1927–8, and 255 in 1928–9, the number of consumers having increased during the past year by 20%.

The "Daily Telegraph" publishes a statement by the Mayor of Smethwick and the chairman of Oldbury Urban District Council, in which they refer to the recent offer of the Utilities Power and Light Corporation of Chicago, acting through the Greater London and Counties Trust, Ltd., to purchase the whole of the ordinary shares of the Shropshire, Worcestershire and Staffordshire Electric Power Co. at 50s. per £1 share. The statement proceeds: "The gravest aspect of the matter is not its repercussions in financial circles, but its effect on British trade and industry. The avowed object of the post-war Electricity Acts is to make available for the salvation of British industry and the health and welfare of the British public a cheap and abundant supply of electrical energy such as more fortunate nations already enjoy. How can that object be possible of achievement if, on the very threshold, the industry be loaded with inflated capital charges, the burden of which must inevitably fall upon the consumers of power and light and heat? If the powers and functions of the Central Electricity Board are not adequate to bring about such unification of control they could readily have been extended. If further capital was, in fact, required for genuine development of the industry the Shropshire company and the other concerns could most certainly have raised it here, without recourse to Chicago, and by methods consonant with prudent finance."

Smethwick and Oldbury Councils have passed resolutions of protest, and steps are being taken to lay representations before Parliament on this matter.

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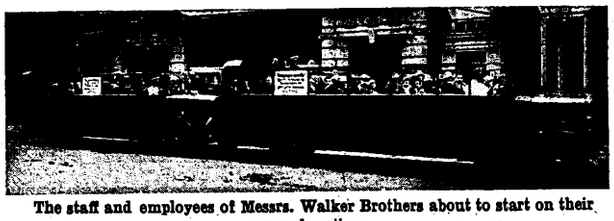
THE SOCIAL SIDE.

MESSRS. Walker Brothers, Quality House, Temple Row, Birmingham, held their sixth annual outing on June 22nd. A party of sixty employees journeyed by charabanc, via Bromsgrove, Droitwich, Worcester, Bromyard, Leominster



The staff and employees of Messrs. Walker Brothers about to start on their annual outing.

Ludlow, to Church Stretton. Lunch was taken at The Hotel, Church Stretton, after which sports were held during the afternoon in Carding Mill Valley. The return journey was made after tea via Much Wenlock and Bridgnorth.

The following are the results of matches shot during June in the Electricity Supply Rifle League, together with the draw for the next round of the knock-out competition:—

1ST DIVISION.

Shoreditch A. (S. Thomas 99) ..	581	County A. (Martin 98)	563
City B. (Crouchman 100)	584	County A. (Brown 97)	569
City A. (Harlow Smith Matthews 99)	586	County A. (Coleman 99)	568
City A. (Jackson Matthews 98) ..	578	City B. (McNeil 98)	570

	Shot.	Won.	Lost.	Scores. For.	Against.	Points.
Central A.	4	4	0	2 331	2 293	8
City A.	4	3	1	2 318	2 292	6
City B.	4	2	2	2 311	2 303	4
Shoreditch A.	4	1	3	2 294	2 307	2
County A.	4	0	4	2 276	2 335	0
B. and K.	0	0	0	—	—	0

2ND DIVISION.

Shoreditch B. (Harvey 96) ..	547	Hackney (Matthews 92)	483
Barking (Hawkesmouth 94) ..	525	St. James' (Andrews 97)	566
St. James' (Andrews 99)	578	Hackney (Mathews 92)	506
City C. (Jones 97)	568	Shoreditch B. (Perry 96) ..	541
St. James' (Andrews 97)	572	K. and K. (Bonden 98)	560
Greenwich (Heath 96)	554	Hackney (Sandford 93)	502
City C. (Bindon 95)	557	Hackney (Sandford 96)	506
K. and K.	558	Hackney (Herrin 94)	528
St. James' (Andrews 97)	573	Central B. (Bowers 98)	569
City C. (Driver, Jelly Cornerford 97)	574	Greenwich (G. Coveney 98) ..	573
Greenwich (R. Coveney 97) ..	567	Shoreditch B. (Draper 96) ..	555

	Shot.	Won.	Lost.	Drawn.	Scores. For.	Against.	Points.
St. James'	7	6	0	1	4 004	3 801	13
City C.	7	5	1	1	3 971	3 837	11
Greenwich County	7	5	2	0	3 925	3 843	10
Central B.	6	4	2	0	3 404	3 346	8
K. and K.	6	2	4	0	3 356	3 332	4
Shoreditch B.	6	1	5	0	3 252	3 327	2
Barking (County)	4	0	4		2 107	2 264	0
Hackney	5	0	5	0	2 525	2 794	0

KNOCK-OUT COMPETITION.
Result of 2nd Round.

Winner.		v.	Loser.	Disqualified.
City D.		v.	County C.	Disqualified.
K. and K. 1	299	v.	Central 6	299
Central 2	300	v.	Central 5	298
Central 3	300	v.	City A.	299·5
Central 1	300	v.	County A.	299
St. James' 2	300	v.	K. and K. 2	298
City B.	299	v.	Shoreditch B.	294
St. James' 1	300	v.	County B.	299

Ties settled with graduated gauge, disqualification for shots outside scoring rings

Draw for the 3rd Round.
Central 2 *v.* St. James' 1.
K. and K. 1 *v.* Central 1.
City B. *v.* Central 3.
St. James' 2 *v.* City D.

The Birmingham and Midland District Engineers' employees and staff of Callender's Cable and Construction Co., Ltd., journeyed from Birmingham on June 29th to London and Erith for their annual picnic, and picked athletes from the section took part in the general sports of the parent club at the playing fields of the company adjoining the Erith Works, Belvedere. They were accompanied by a large deputation of engineers from the Birmingham Electric Supply Department, for which corporation Callender's Co. acts as the mains department under contract. The Corporation party left Birmingham by special reserved carriage on the 8.40 train, and arrived at Euston 10.40, when a drive was taken around the parks and noted buildings in the West End of London, and arrived at the Erith Works at 1.15, when luncheon was served in the board's dining-room, Mr. Watson, Mr. F. Callender, Councillor Ramsden, Mr. Massey, Mr. Hill and Mr. Dodd joining the party. This is the first time at which a representative gathering from the Birmingham Section of the Callender Athletic and Social Club has attended and participated in the firm's annual sports, the occasion being taken to celebrate the commencement of the 40th anniversary of the company's operations in Birmingham.

SHOEBURYNESS SUPPLY.

Inauguration of Supply—Opening of Sunshine Home by Prince George.

PRINCE GEORGE declared the Sunshine Home, Shoeburyness, open on Monday, and, as a portion of Shoeburyness Council's electricity plant is on the premises of the Home, the chairman of the Council, Coun. Boosey, turned on the current to the town and the Home immediately before the opening ceremony. The town is supplied by means of h.t. 3-phase underground feeders from the War Department power station. After conversion by means of transformers, the l.t. supply to consumers is by means of underground, 4-wire, 3-phase distributor cables. The system is standard in every way, high pressure is 3 000 V, low pressure 400 and 230 V, and a frequency of 50 cycles. Where a branch is taken from the h.t. main an above-ground disconnecting kiosk is erected for convenience of testing and sectionalising.

At each transforming point a controller pillar is fixed, containing the h.t. supply to the transformer and the l.t. circuits coming from the transformers. On the top of each transformer, in an extension of the case, are tapping switches that can be operated under load, regulating the pressure. The chamber is fitted with three ammeters, a voltmeter, and an inspection lamp, and is to all intents and purposes a self-contained sub-station without, however, any building, covering, roof or other protection.

The two principal advantages are ready removal of the transformer in case of necessity and substitution of another, reducing cost, due to the absence of any building, and improved cooling effect of the transformer, due to there being no enclosure of the transformer windings beyond the tank containing the cooling and insulating oil.

The undertaking has commenced with about 120 consumers. Practically all the houses erected are now wired by the builders.

The new sewage system which is being installed by the Council will be driven by automatically-controlled electric motors.

The Chairman of the Electricity Committee is Coun. A. Farrow, the Council's electrical engineer is Mr. R. H. Holmes, and the consulting engineers for the scheme are Messrs. A. Hugh Seabrook and Partners. The contractors for electric cable and switchgear are the Pirelli-General Cable Works Ltd.; for transformers, the Foster Engineering Co., Ltd.; and for meters, Messrs. Chamberlain and Hookham, Ltd.

TRADE PUBLICATIONS.

WE have received from the ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2, a special publication dealing with power equipment for all industries, publication No. 41B describing "Fullagar" oil engines, and publication No. 471 A, dealing with truck type switchgear. All three issues are fully illustrated.

The MULLARD WIRELESS SERVICE CO., LTD., Mullard House, Charing Cross Road, London, W.C.2, has issued a new leaflet No. W.A.22 illustrating the Mansbridge condenser, for insertion in the company's catalogue between the W.A.6 and W.A.15 leaflets. A revised leaflet No. V.T.13/1a, illustrating valve type RO/2.5 kW, has been issued in the place of No. V.T.13.

METRO-VICK SUPPLIES, Trafford Park, Manchester, have issued a new folder dealing with fans for the summer season, which is available for distribution by the trade, overprinted with contractor's name and address if desired. The cover design is symbolic of sport, and will link up with the company's series of advertisements depicting various forms of sport, which are appearing at the present time.

Messrs. ISTRUMENTI DI MISURA, "C.G.S." of Monza (Italy), have issued a well illustrated brochure dealing with the history of the works and the production of C.G.S. meters. The publication contains illustrations and descriptions of switchboard indicating instruments, moving coil volt and ammeters, single element electro-dynamic wattmeters, double-element induction type wattmeters, sector pattern volt and ammeters, edgewise pattern instruments and a wide selection of switchboard recording instruments. Particulars are also given of instrument transformers as well as details of a single-phase induction type watthour meter. The British agent for the firm is Mr. O. E. MALINVERNO, 37, Walbrook, London, E.C.4, who will be pleased either to supply copies of the brochure or give other information.

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COMPANY NEWS.

Shannon Board Purchases Clones Co.'s Shares—Scottish Power Co.'s Increase of Capital—Sale of Fife Tramway, Light and Power Co.'s Undertaking—Telephone Manufacturing Co. Ceases to Compete for Unremunerative Orders—General Electric Meeting.

THE feature of the week in the electrical share market has been the commencement of dealings in the new Cable and Wireless stocks, taking the place of Marconi's and the cable telegraph securities absorbed in the big merger. Opening at about 93, the price of the 7½% "A" ordinary stock nearly touched 100, afterwards relapsing a point or two. The "B" ordinary from 70 advanced to over 95. Marconi's International Marine shares at 60s. are 2s. 6d. down. Electric Construction issues have relapsed, the ordinary 2s. 6d. to 16s. 3d., and the preference nearly 2s. to 20s. 7½d. Ever Readies and Siemens are each 1s. 3d. lower, while Henley's have lost half-a-crown. Underground Electric Railways ordinary shares have shed sixpence.

Last Annl. Divd.	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
%	**Electricity Supply.**				
(*d*)	Brompton & Kensington Ord. ..	26/–	26/–	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/–	24/3
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	" " " " " 6% C.P.	23/–	23/–	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	56/–	56/–	68/6	25/9
6	" " " " 6% C.P.	23/–	23/–	24/–	21/3
(*e*)	Kensington & K'bridge Ord. (£1)	26/6	26/6	27/6	23/9
1/9⅝	Lon. Elec. Sup. Ord. (£1) ..	28/–	28/–	37/6	23/–
1/9⅝	Metro. Elec. Sup. Ord.	47/6	47/6	53/–	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	30/–	31/9	17/6
1/25	N'castle-upon-Tyne Elec. Sup. Ord.	26/10½	26/10½	30/3	19/3
6	N Metro. Elec. 6% C.P.	23/–	23/–	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord (£1) ..	27/6	27/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	—	—
1/9 1/2	W'minster Elec. Sup. Ord. (£1) ..	26/–	26/–	52/9	24/–
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/6	37/–	38/9	24/6
6	" " " 6% C.P. ..	24/–	24/–	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	128½	128½	152	117
7·67	" " " 6% Pf. Stk.	128½	128½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4	" " " 4% Deb.	80	80	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	73½	75½	42½
4	" " " " 4% Pf. Stk.	73	73	77	68
4	" " " " 4% Deb. ..	78	78	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams. 1st Deb.	60	60	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	71	71	73½	62
5	" " " 5% Deb. ..	67½	67½	70½	65½
3½	Met. Rly. Cons. Ord. Stk.	59½	60	81	54½
3½	" " " 3½% Pf. Stk. ..	63	63	67	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	75½	76	77½	52½
4½	" " " 4½% 1st Pref. ..	81½	81½	84	74½
6	" " " 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	70	64½
7	Underground Electric Rlys. Ord.	22/6	23/–	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P. ..	13/9	13/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	86/3	56/–
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	23/–	23/–	24/9	19/7
7	" " " 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk.	135	135	153½	120
15	Callender's Cable Ord.	77/6	77/6	91/3	66/–
6½	" " 6½% C.P. ..	25/–	25/–	25/9	22/–
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	" " 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	25/7½	25/7½	13/–	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	16/3	18/9	32/6	23/6
7	" " 7% C.P. ..	20/7½	22/6	22/9	21/–
—	English Elec. Ord.	6/3	6/3	15/9	5/–
—	" " 6% C.P. ..	7/6	7/6	18/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	20/–	21/3	92/3	18/1
6	Ferranti 6% Pref.	18/–	18/–	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	51/3	51/3	46/6	26/6
25	W. T. Henley's Ord.	130/–	132/6	120/–	69/3
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/–
7½	Lon. Elec. Wire. & Smith's Pref. ..	23/9	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	28/9	30/–	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23½	23½	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
10	Eastern Ord. Stk.	270½	266½	273	135
3½	" 3½% Pref. Stk.	65½	65½	70½	59
4	" 4% Deb.	78½	78½	81½	74
10	Eastern Extension Ord. (£10) ..	27½	26½	27½	14
22	Gt. Northern Telegraph (£10) ..	30½	31	43½	26
10	Indo-European (£25)	50½	50½	48½	30
20	Marconi's Wireless T. Ord. ..	—	75/9	84/4	12/–
15	" Int. Mar.	60/–	62/6	90/–	16/6
10	Western Tel. Ord. (£1)	27½	26½	27½	12½

(*a*) 19.9d. per share. (*b*) 1s. 9·93d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share.

TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD.—Intm. div. of 6s. p. sh., tax free, will be payable on July 18.

YORKSHIRE ELECTRIC POWER CO.—Intm. div. at rate of 6% p.a., less tax, or ord. shs. for half year will be payable on August 1.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.—Intm. div. at rate of 9% p.a., less tax, on ord. shs., for half-year will be payable on August 1.

CLONES ELECTRIC LIGHT AND POWER CO., LTD.—The Shannon Electric Supply Board is to purchase the shares of this co. at £1 11s. p. £1 sh.

CENTRAL STATES ELECTRIC CORPORATION.—Common stk. bonus div. of 200% will be payable to common stk. hldrs. on July 25. Stk. div. of 100% was made last April.

GREAT NORTHERN TELEGRAPH CO.'S HOLDING CO., LTD.—Directors propose to distribute for first financial year, ended June 30, total div. of 20%, to transfer £5 556 to res. and to carry fwd. £5 062.

WEST GLOUCESTERSHIRE POWER CO.—Resolutns. will be submitted at an extraord. mtg. on July 15, increasg. cap. from £600 000 to £685 000 by the creatn. of 85 000 6½% participatg. pref. shs. of £1 ea., the new shs. are to be at disposal of directors.

SCOTTISH POWER CO., LTD.—An extraord. gen. mtg. will be held on July 15, when resolutn. to increase authorised cap. from £2 500 000 to £4 000 000 will be submitted. It is proposed to create 1 500 000 new shs. of £1 ea. Resolutn. permits these shs., subject to discretn. of directors, to rank ahead of present shs. and to be issued either as pref. or ord., provided proportn. of issued pref. to issued ord. does not exceed eight to five.

PETTERS, LTD.—Net pft. for year ended March 31, 1929, after provisn. for depreciatn., etc., £32 891, plus £25 545 brt. in. Int. on fundg. certs. for year endg. July 15, 1929, £1 581; div. on pref. shs. at rate of 7% for year, £12 000; to fundg. cert. redemptn. fund, £919; div. on ord. shs. 6% for year, £5 400; to res. £10 000; fwd., £28 536. Result of year's tradg., having regard to prevailing conditns. in engineerg. industry, has bn. satisfactory.

FIFE TRAMWAY LIGHT AND POWER CO., LTD.—Directors have issued a circular to shhldrs. intimatg. that they have provisionally accepted an offer from the Scottish Power Co. to purchase undertakg. of Fife Co. for £1 025 000. Amt. is payable in cash, and purchase is to be dated as from July 1. Scottish Power Co. will provide finance necessary for the power and lighting undertakg., includg. repaymt. of advances to the Fifeshire Power Co., amtg. to £300 000. Fife Tramway Light and Power Co. owns all issued sh. and loan cap. of Fife Electric Power Co.

CABLES AND WIRELESS, LTD.—It is intimated by the co. that transfers of assented stk. and assented shs., as defined in deposit agreemt. referred to in merger plan, will not be certified by the Bank of England after July 12, 1929. This does not affect the intimatn., already published by co., that persons who still are desirous of acceptg. offer contained in plan should apply in writg. to the co. who will give them permissn. to accept (subject to such adjustmts. as may be necessary, with regard to divs,). Permissn. will be withdrawn by advertisemt. The co. also states that from correspondence received, it would seem that some of those who have not accepted the offer contained in the plan are under the impressn. that by withholdg. their assent they may obtain better terms than those contained in the plan. The co. desires to state that this assumptn. is entirely without foundatn. Amt. of ord. stk. and ord. shs. in the three cable co. and of shs. in the Marconi Co. agreed to be exchanged is in the case of each of these cos. largely in excess of the percentage necessary to make plan operative. Requisite control of the four cos. is therefore assured.

Company Meetings.

BERRY'S INSULATING AND BUILDING PRODUCTS, LTD.—Mr. A. F. Berry, presiding at the statutory meeting on June 27th, said shareholders would be interested to know that some of their best customers had recently received orders of unprecedented magnitude for electrical machinery to be used in connection with the Government's electrification scheme,

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and that their company in turn had now received orders to their full capacity for their highest grade insulations—for which they had a long-established reputation—for use in important sections of this machinery. Additional plant had had to be ordered to execute this class of work, with which it would appear they would be profitably employed for the next two years or more.

The temporary showroom which has been opened by the Bradford Electricity Department in the Pudsey and Drighlington areas. See page 60.

Telephone Manufacturing Co., Ltd.—Mr. F. T. Jackson, chairman and managing director, presiding at the meeting on Monday, said: The gross profit of the British installation companies for the year shows a slight decrease, being £76 386 compared with £77 563, and net profit £37 928, compared with £41 405. As far as our British installation companies are concerned, the fact that the profits for the past year have decreased slightly is no indication of the path which will be followed in the future. The position is a strong one. Our Australian company has had a most successful 1928. The company showed a profit of £13 184, and there is every reason to anticipate that this profit will be substantially increased. The Paris and Brussels subsidiares have been entirely reorganised, and the new business being done is on a satisfactory basis. I will now deal with the accounts of the parent company. The profits for the year amount to £20 220, compared with £35 234 last year. This result is disappointing, especially when taking into consideration the fact that the turnover of manufactured goods during 1928 showed an increase of 80%, yet the total overheads on the larger output were only increased by about 1½%. Unfortunately, so far as Post Office telephone work is concerned, and which comprises by far the majority of the turnover, prices are not fixed by ourselves but by the competition. Competitors are cutting prices to such an extent that they are unremunerative. We were of opinion that the Post Office would give us support in their own interests, but that support has not been forthcoming to such a degree as would enable us to carry on without losses, consequently your directors feel that they are not justified in continuing to compete for business at prices which only cut into profits made by the installation side of the business. We have a scheme under consideration by which the subsidiary company business will be divorced from the manufacturing side. We propose to separate the factory from the installation side and thus enable shareholders to get some return on their shares. The profitable side of our business is expanding, and you can see that the profits earned last year would pay a moderate dividend of, say, 5% on the whole of our capital and carry forward a substantial sum. Reverting to our manufacturing policy, we hope that if we carry this out it will at any rate be a very definite move towards creating a more stable position and more remunerative prices in the telephone manufacturing industry. We shall not cease tendering for business at fair prices, but we shall, most definitely, cease competing at the unremunerative prices ruling to-day. If you proceed on the lines indicated in our report and my speech we should be able to pay an interim dividend in the last three months of this year.

General Electric Co., Ltd.—At the general meeting, on July 4th, Sir Hugo Hirst, chairman and managing director, said the profits for the year were some £26 000 better than last year, which was a very small increase considering the increased turnover in most of the departments. For a variety of reasons, mainly over-production in the industry and foreign importation, prices during last year had shown a tendency to drop, and it had required efforts to obtain a much greater volume of business to maintain the earning capacity of the company. The results of the year had added to the company's material strength. The number of branches and depots in the United Kingdom had been increased, to give better service to the ever-increasing number of people interested in the purchase of electrical products. The great virility with which the Electricity Board had taken up its functions under the new Electricity Act had created a new outlook on electricity supply, and whilst during the period of the creation of that authority the industry had suffered a distinct hold-up, sufficient indication had now been given as to future requirements, and the board had been able to rearrange all the company's works accordingly. At their Fraser and Chalmers works they had had to build bigger units than in the past. They had developed an overhead distribution system which had met with the approval of the Electricity Board, and had been successful in obtaining a contract—three-quarters of a million pounds—for overhead distribution for London and the South of England. They also had in hand orders for the Electricity Board for the whole of the switchgear for 130 000 V sub-stations for the Central England area. In partnership with Messrs. Pirelli, the company owned the very important Pirelli-General Cable Works at Southampton, and had received a contract for 52 miles of 132 000 V Pirelli oil-filled cable, the first installation of the kind in Great Britain, and the largest in the world. The cable industry was extremely busy, and the company shared in that demand by having obtained other important contracts, including one for 25 miles of 66 000 V cable, and another for the Municipal Council of Sydney for 60 miles. For telephone cables they had in hand not only important contracts for the British Post Office, but also for the Dominions and other overseas countries. Their Coventry telephone works, in which they produced automatic exchanges for the British and Dominion Post Offices, were also actively engaged, in conjunction with their valve works, in the wireless industry, and studies concerning the combination of radio and gramophone. Their experience with automatic telephones had led to considerable orders in connection with the installation of the totalisator on race-courses, and other studies had equipped them for entering the speaking film business from the equipment point of view. On the electric lighting side they were continuing the study of better and cheaper lighting. The Thames Embankment lighting scheme just being completed was one of the results. They had further developed their specialised factories for ebonite glass lamp caps, moulded insulation material, and others which supplied essential raw materials in their industry, and last, but not least, he desired to dwell on the progress which they were making in the domestic appliance department. It was his intention shortly to ask Mr. M. J. Railing to be a joint managing director with him. The report and statement of accounts were adopted.

New Companies.

H. J. Brooks and Co., Ltd.—Cap., £4 000. Electrical, heating and radio engineers, etc. Reg. Office: 136, Old Street, London, E.C.1.

John E. Matkin, Ltd.—Cap., £1 000. Electrical contractors, engineers and wireless dealers. Reg. Office: Co-operative Chambers Carts Lane, Leicester.

General Charging Stations, Ltd.—Cap., £1 000. Accumulator and battery chargers, electrical engineers, wireless dealers, etc. Reg. Office: 150, Southampton Row, London, W.C.1.

Electric Welders (Slough), Ltd.—Cap., £2 000. Electric welders and manufacturers of welded products and structures, electricians, etc. Solicitors: E. L. Reynolds, 11, Mackenzie Street, Slough.

Ayling and Co. (Brassfounders), Ltd.—Cap., £1 500. Brass-founders, manufacturers and workers of and dealers in electric light fittings, electrical engineers, etc. Reg. Office: 63, Charlotte Street, London, W.1.

Wood Auto-Electrical Co., Ltd.—Cap., £4 000. To acquire business of automobile, electrical and radio engineer carried on by R. Wood at 6 and 8, Half Moon Street, Huddersfield, as "Wood the Battery Man."

Magnetic and Electrical Alloys, Ltd.—Cap., £1 000. Metallurgical engineers, manufacturers of and dealers in metals, alloys and metallic substances, etc. Reg. Office: Sunnyside Road Works, Sunnyside Road, Ilford.

Electric Power Finance Corporation, Ltd.—Cap., £100 000. To carry on business as bankers, financiers, capitalists, contractors for public and other works, to participate in electric railway and other works, etc. Reg. Office: Winchester House, Old Broad Street, London, E.C.2. (Public Co.)

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PROGRESS TRADING AND MANUFACTURING CO., LTD.—Cap., £100. Particulars same as those in Grant Baker, Ltd. (see next col.).

H. J. POOLE, LTD.—Cap., £500. To carry on agency business and that of electrical and mechanical engineers, etc. Reg. Office: Aldwych House, Aldwych, London, W.C.2.

LINLEY AND CO., LTD.—Cap., £20 000. Merchants, shippers, railway and tramway proprietors, shipowners, etc. Reg. Office: River Plate House, Finsbury Circus, London, E.C.2.

HARRIS ENGINEERING CO., LTD.—Cap., £3 000. Consulting, electrical, and general engineers, contractors, etc. A provisional director: F. M. Thompson, 5, Newstead Road, Lee, London, S.E.12.

COALISLAND AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Cap., £2 000. To carry on at Coalisland, Co. Tyrone, and elsewhere, business of an electric light and power company, etc. Reg. Office: Coalisland, Co. Tyrone.

RAPID ELECTRIC ARC WELDING AND METALS CO., LTD.—Cap., £500. To carry on business of welding metals by means of electricity, welding of steam and other boilers, furnaces, etc. Reg. Office: 60, Castle Street, Liverpool.

CHUBBS AUTOMATIC MANUFACTURING CO., LTD.—Cap., £75 000. Electricians, switchboard makers, makers of switches and motor pumps, etc. Solicitors: Wetherfield, Baines and Baines, 6, New Burlington Street, London, W.1. (Public Co.)

CHROMIUM AND GENERAL PLATERS, LTD.—Cap., £1 500. To carry on business of electro-platers and electro-depositors of metals; electrical, wireless and general engineers, etc. A first director: J. A. Peters, 30, Caldecote Street, Newport Pagnall, engineer.

"K.K." SYNDICATE, LTD.—Cap., £100. To acquire invention No. 16 360 of 1929 relating to electric storage batteries and the like, and to carry on business of electrical and general engineers and manufacturers, etc. A first director: B. Quint, engineer, of 19, Cousin Lane, London, E.C.4.

MERSEY ELECTRICS, LTD.—Cap., £3 000. To acquire business of electrical and mechanical engineers carried on by James Scott and Co., Knowsley Electrical Works, Brasenose Road, Bootle, to carry on the said business and that of boiler makers, founders, etc. Reg. Office: 64, Brasenose Road, Bootle, Lancs.

ALFRED H. HUGHES AND CO., LTD.—Cap., £1 000. Importers, exporters and manufacturers of, agents for and dealers in apparatus and accessories for wireless telegraphy, telephony, or television, or in connection with generation, accumulation, supply, distribution and employment of electricity, etc. Solicitor: M. J. Whitehead, 131, Norfolk Street, Sheffield.

GRANT BAKER, LTD.—Cap., £1 000. To acquire and turn to account patents, licenses and concessions conferring right to use information as to production, treatment, storage, application, distribution and use of electricity; to carry on business of makers of and dealers in electrical apparatus and materials, etc. Reg. Office: Kingston Bridge Works, Hampton Wick.

EDMUNDSON'S ELECTRICITY CORPORATION, LTD.

Continued Increase in Consumption—Capitalisation of Reserves—Capital Increased by Creation of 1 500 000 Ordinary Shares.

THE thirty-second ordinary general meeting of Edmundsons' Electricity Corporation, Ltd., was held on Friday, July 5th, 1929, at Broad Sanctuary Chambers, Tothill Street, Westminster, Sir James Devonshire, K.B.E. (chairman of the company), presiding. The Secretary (Mr. C. H. Jones) having read the notice convening the meeting and the report of the auditors, the Chairman said:

Gentlemen, the report of the company's business for the past year is satisfactory.

The undertakings with which the company is connected have again increased their connections by over 6 000 kW, and I am pleased to be able to state that reductions of charges for electricity were made in a number of undertakings during the year.

I have a few words to say about the report and accounts. You will see by reference to the balance sheet that the profit, with the amount brought forward from last year, is £188 660, and, compared with £149 388 for the previous year, shows an increase of £39 272, which is partly accounted for by the income tax provision in the profit and loss account being £8 931, compared with £19 234, and partly by the fact that during the year the first mortgage debenture stock, amounting to £328 077, outstanding at the beginning of the year, was redeemed, so that there was not a full year's debenture charge

After deducting the interim dividends paid last January, there is £139 660 1s. available for disposal, and we propose to make the appropriations set out in the report, namely:—£8 501 in writing off cost of increase of share capital, £25 000 to reserve, £14 000 in payment of preference share dividend, £55 000 in payment of a final dividend of 4½ % (making 8 % for the year) on the 1 000 000 ordinary shares, a half year's dividend of 4 % on the 250 000 ordinary shares issued last autumn, and £3 000 to the staff benevolent fund, leaving £34 159 1s. to be carried forward.

Preference Shareholders' Position Improved.

The ordinary share capital was increased during the year to £1 250 000. 600 000 shares were issued by way of capitalisation of reserves, in accordance with the resolution confirmed at the extraordinary general meeting on September 10th last, and 250 000 shares were issued for cash, the latter being to provide funds for the redemption of the debenture stock. The debenture stock having been redeemed, there is now no prior charge on the assets ranking in front of the preference shares, so that the preference shareholders' position has been improved.

The schedule of investments and advances which accompanies the balance sheet shows an increase of £222 975 additional shares in the Cambridge, Guernsey, Isle of Wight, Ilfracombe, Melton Mowbray, Ramsgate, Salisbury, Surbiton, Urban, Wycombe and Yeovil Companies having been taken up.

Before concluding I am sure that the shareholders would be glad that I should remind them of the most efficient and loyal work of the staff during the past year, and that the shareholders would wish to associate themselves with the directors in an expression of appreciation and thanks to the staff.

I now beg to formally move: That the report of the directors and statement of accounts for the year ended March 31st, 1929, be and are hereby adopted.

Sir Douglas Newton, K.B.E., M.P., seconded the resolution, which was then put to the meeting and carried unanimously. The retiring directors, Sir James Devonshire, K.B.E., Sir Douglas Newton, K.B.E., M.P., and Mr. A. Winterbottom, were re-elected, and Messrs. Annan, Dexter and Co. reappointed auditors. A vote of thanks was accorded to the chairman and directors.

Increase of Capital.

An extraordinary general meeting immediately followed. The Secretary read the notice convening the meeting, and the following resolution:—

"That with a view to the acquisition of not less than 90 % of the issued share capitals of the East Anglian Electric Supply Company, Limited, and the Wessex Electricity Company, and with a view also to the acquisition of investments in certain other electricity supply companies, the capital of the company be increased to £3 150 000 by the creation of a further 1 500 000 Ordinary shares of £1 each."

The Chairman said: Gentlemen, the resolution which you are asked to pass is for a substantial increase in our capital, and you may like to have some further information.

The transactions which render necessary the increase of our capital arise from the fact that the Greater London and Counties Trust, who hold the ordinary share capital in Edmundsons, have acquired a controlling interest in certain other electricity supply undertakings, and these interests they are transferring to us for the purpose of management and development.

The shares are being transferred at cost, and the whole transaction is internal between Edmundsons and the Trust, and has no other object than the closer co-ordination and management of a large number of properties of a similar nature.

The Greater London and Counties Trust have other electricity supply interests which they are not transferring to us; those to be transferred are of the type in which we have specialised and for which we have built up a system of management as the result of thirty years' experience.

Practically the whole of the interests now being transferred to us are operating in areas where we are already established, and it is expected that substantial benefits will eventually accrue from a closer amalgamation, not only to the shareholders but to the consumers of electricity.

I now beg to move the resolution set out in the notice convening the meeting.

Sir Douglas Newton, K.B.E., M.P., having seconded the resolution, it was then put to the meeting and carried unanimously.

The proceedings then terminated.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

AVENT, Albert Robert, Spa Radio Stores, 16, Clarence Street, Cheltenham, wireless specialist. £19 5s. May 28th; and £38 18s. 6d. May 27th.

COULSON, F. A., Mr., 273, Archway Road, Highgate, electrical dealer. £10 17s. 1d. May 1st.

CRESSY, T. W., Mr., Waterloo Street, Market Rasen, electrical dealer. £10 1s. 4d. May 13th.

DAVENPORT AND CO., 11, King Street West, Deansgate, Manchester, electrical engineers. £11 12s. May 31st.

GOODINOUGH AND CO., 59, High Street, Barnstaple electrical engineers. £13 13s. 5d. May 29th.

GREEN, Frederick, 22, Battersea Park Road, S.W., gramophone and wireless accessories dealer. £17 18s. May 9th.

HAMBLING, CLAPP AND CO., LTD., 21, Garrick Street, W.C., wireless factors. £21 6s. June 1st.

HINKLEY, Bert A. Romance, Meadrow, Godalming, wireless dealer. £44 0s. 1d. May 31st.

LEGGE, Mr. J. W., 1, Campden Street, W., electrical engineer. £13 14s. 6d. June 1st.

SEWELL, L. C. AND SONS, 25, Catford Hill, Catford, wireless dealers. £13 13s. 2d. May 13th.

TAYLOR, Sidney, 116, Streatham Road, Mitcham, wireless dealer. £35 10s. 11d. May 10th.

THORNTON, Eliza Jane, Miss (trading as E. G. PERRIN), 9, College Street, Northampton, electrician. £11 14s. 6d. May 7th.

WENDER, Eugene, 129, Wardour Street, W., electrician. £125 14s. 7d. May 8th.

Deeds of Arrangement.

BARON, Frederick, Edgar Street and 33, Beach Street, Accrington electrical engineer. Dated June 28th, filed July 3rd. Trustee, J. D. Hopkinson, Market Chambers, Blackburn Road, Accrington, C.A. Secured creditors, £350; liabilities unsecured, £519; assets, less secured claims, £159.

GILPIN, Mrs. Madge (widow), trading as GEO. GILPIN AND SON, 6A, Alfred Street, Blackpool, electrician. Dated July 1st, filed July 5th. Trustee, J. Todd, 18, Birley Street, Blackpool, C.A. and another. Liabilities unsecured, £281; assets, less secured claims, £225.

WALSH, Patrick William, trading as WALSH AND DOUGLAS, 26, Spring Hill, Birmingham, electrical engineer and wireless dealer. Dated July 1st, filed July 4th. Trustee, W. W. Freeman, 3, Cherry Street, Birmingham, certified accountant. Liabilities unsecured, £458; assets, less secured claims, £42.

WHITE, Arthur Ernest, late trading as REDCLIFFE WIRELESS CO., 76, Redcliffe Street, Bristol, and now residing at 52, Monk Road, Bishopston, wireless dealer. Dated June 27th, filed July 3rd. Trustee, A. J. Rawlings, 51, Quantock Road, Bedminster, cashier. Liabilities unsecured, £280; assets, less secured claims, £59.

Receivership.

CUNNINGHAM SLATER, LTD. (formerly HARRAWAY BROS., LTD.). W. Nicholson, of 12, Wood Street, E.C., was appointed receiver on June 24th, 1929, under powers contained in debentures issued January 15th, February 3rd, and March 10th, 1914.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

ATHERTON, Walter E., trading as ATHERTON AND HALL Claremont Works, General Street, Blackpool, radio engineer. A meeting of the creditors of the above was held on July 4th, at Blackpool, when the representative of Messrs. Ellis and Mort, Ltd., was elected to the chair. The statement of affairs showed liabilities of £754, all due to unsecured creditors. There was a fully secured creditor for £3, holding security valued at £50. After allowing £88 for preferential claim the net assets were £329, or a deficiency of £425. The assets consisted of cash at bank £4; stock at cost £228, estimated to realise £114; fixtures, fitting, etc., £8; life policy, £12 10s.; motor car, £12; book debts, £315, valued at £220; and surplus from fully secured creditors, £47. In addition to the liabilities shown on the statement the debtor's wife was a creditor for £189. The secured creditor was the Marconi Co., who held a deposit of £50 against royalties. The meeting had been called as three creditors had commenced proceedings. The debtor commenced trading in 1923, in partnership, the joint capital being £315. The debtor's share of the capital was borrowed from his wife. The partnership was dissolved last November, when it was agreed that the debtor should continue the business, and the outgoing partner took over the charging plant. The dissolution was duly "Gazetted." The present position was attributed to lack of capital, and a fall in the turnover.

A resolution was passed in favour of a deed of assignment being executed.

The following are creditors: Bell, J. R., Blackpool, £42; Firth and Price, Blackpool, £36; Ellis and Mort, Ltd., Blackpool, £280; Hollingdrake, Henry and Son, Ltd., Stockport, £171; Kremner, L., Manchester, £37; Docking, J. W., Blackpool, £12; Rothermel Radio Corporation, London, £69; Stephenson Bros., Blackpool, £44.

ENTERPRISE MANUFACTURING CO., LTD., wholesale electrical and wireless suppliers, Electric House, 83, 85 and 87, Merton Road, Wimbledon, London, S.W.19. In response to a circular letter issued by the company, a conference of the principal creditors, was held on July 3rd at Johnston's Rooms, 13, The Broadway, Wimbledon. Mr. Leask, of Messrs. Leask, Clemens and Co., C.A., the company's auditors, occupied the chair. It was stated that at the end of May the liabilities of the company inclusive of a debenture were £9 378, against assets of £9 432, and the company was solvent. The company was registered in July 1917 with a nominal capital of £5 000, divided into shares of the face value of £1 each, and it acquired a business which up to that date had been carried on at Gun Street, Bishopsgate. The assets acquired by the company were valued at £3 000, and shares to that amount were issued as fully paid to the vendor. Later the business was transferred to Grape Street, Holborn, and later to its present address. It was pointed out that the removal took place in order to reduce the overhead expenses, and there had been a saving of something like £2 000 effected since September of last year. The company had suffered through burglaries at Grape Street and Wimbledon. The company was insured, but, in the absence of detailed stock sheets, it was not possible to prove the full extent of the loss. The issued capital of the company stood at £4 452 and a number of shares had been issued for cash. The debenture was issued in favour of the bank in the early part of the present year. During the last six months of 1923, there was a loss on trading of £107, but in the following half year there was a net profit of £577. The company was able to trade successfully up to June 1926, profits being regularly earned, but during the 12 months to June 1927 there was a loss of £1 165. During the period from June 1927 to September 1928 there was a small profit earned, but since the latter date there had been a net loss of £200. The heavy loss during the year to June 1927 was accounted for by the fact that at that time the company was occupying premises at Grape Street, where the overhead expenses were very heavy, having regard to the turnover. The last balance sheet was dated March 31st, 1929, and it disclosed liabilities of £8 991, and the debenture of £2 000. The assets, however, were substantial and included book debts estimated to realise £5 453, stock £3 852, furniture and fittings £504, motor cars, etc., £808, goodwill £1 631, and amounts paid in advance £550. The company had a substantial turnover, and was able to earn a satisfactory rate of gross profit.

In the course of the discussion, it was stated that the bank were sympathetic, and it was suggested that the creditors should accept a composition of 10s. in the £, payable by four instalments of 2s. 6d. each, over a period of 12 months. It was pointed out that what the company really required was a moratorium. It was understood that the bank would assist the company further, provided the creditors agreed to a moratorium, and to accept the offer.

A resolution was unanimously passed agreeing to accept the company's proposals, and an informal committee was appointed consisting of the representatives of Messrs. Mullard Wireless Co., the Ever-Ready Co. (Great Britain), Ltd., E. M. I., Ltd., Siemens Electric Lamps and Supplies, Ltd., and Marconiphone Co., Ltd.

London Gazette, etc.

Company Winding-up.

EARLSDOWN RADIO SUPPLIES, LTD. Meetings of creditors, July 20th, 11 a.m.; and contributories, July 20th, 11.30 a.m., Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham.

Companies Winding-up Voluntarily.

CHARTERS ELECTRIC SUPPLIES CO., LTD. By reason of its liabilities, June 25th. J. L. Watchurst, chartered accountant, Market Gate Chambers, Warrington, appointed as liquidator.

SAUNDERS ELECTRICAL CO., LTD. By reason of its liabilities, June 28th. R. B. Leech, 23, Warwick Row, Coventry, Chartered Accountant, appointed as liquidator for the purposes of such winding-up. Meeting of creditors at the offices of the liquidator, July 18th, at 12 noon.

Bankruptcy Information.

AUSTIN, Clifford, 97, Domestic Street, Leeds, trading as C. AUSTIN AND SON, and "AUSTINS ACCUMULATOR AND RADIO SERVICE," wireless accessories dealer. First meeting, July 15th, 11 a.m., Official Receiver's Office, 24, Lower Bond Street, Leeds. Public examination, August 13th, 10.30 a.m., County Court House, Albion Place, Leeds.

STRATHDEE, Andrew Knox Ewart, 923, Romford Road, Manor Park, trading as EMSCO RADIO, electrical engineer. Receiving order, July 6th. Debtor's petition. First meeting,

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July 18th, 11.30 a.m., and public examination, August 13th, 11 a.m., Bankruptcy Buildings, Carey Street, London W.C.2.

TEMPEST, Colonel, 4, Manns Court, Bradford, electrician, Receiving order, July 3rd. Debtor's petition.

Notice of Intended Dividend.

HYDE, Hubert Algernon, 148, Weston Park, Crouch End, North London, lately 2, East Street, Bromley, Kent, wireless dealer. Last day for receiving proofs, July 20th. Trustee, T. Gourlay 29, Russell Square, W.C.1.

Partnerships Dissolved.

READ BROS. (Joseph Henry READ and Harold BOLTON). electrical engineers, 100 and 240A, High Street, Erdington, Birmingham, by mutual consent as from April 15th, 1929. Debts received and paid by J. H. Read.

WHITFIELD AND GALT (William WHITFIELD and John Anderson GALT), dynamo and magneto repairers, Douglas Street, Glasgow, June 30th, 1929, by the retiral of John Anderson Galt. W. Whitfield has acquired the assets of the firm, and will discharge its liabilities.

Bankruptcy Proceedings.

HENDERSON, John Arthur, trading as HENDERSONS, electrical contractor, 28A, Basinghall Street, London, E.C. A sitting for the public examination of the debtor was held in the London Bankruptcy Court on Friday of last week before Mr. Registrar Warmington. The statement of his affairs discloses liabilities £4,501, of which £3,834 are returned as expected to rank for dividend, and net assets £243. It appeared that for some years before 1914 the debtor carried on business as an electrical contractor at his private address. Afterwards he acted as managing director of a limited company at a remuneration of £4 a week until 1925. In that year with a borrowed capital of £100 he resumed business as an electrical contractor, and he traded under the style of "Hendersons," at 2, Little Essex Street, Strand, W.C., until last October. In that month he removed to 28A, Basinghall Street, City. During the past two years, however, the business had not been a success, and eventually in consequence of pressure by creditors he filed his petition. The debtor attributed his insolvency to bad trade and to lack of capital.

The examination was concluded.

The following are creditors: Alliance Wholesale Electrical Co., London, £168; British Insulated and Helsby Cables, Prescot, £44; Bennett and Fountain, London, £58; Bisseker, H., Ltd., Birmingham, £85; Ball, S., London, £120; Battley, J., London, £50; Bell, A., London, £30; Barclays Bank, London, £330; Crossley Bros., London, £26; Cameron, J., London, £35; Edwards, J., London, £66; Ovens, D. C., and Co., London, £62; General Electric Co., London, £67; Garrett and Son, J., London, £88; Greenwood, B., London, £50; General Cable Manufacturing Co., Ltd., Leatherhead, £250; Heys and Co., Wigan, £48; Henley's Telegraph Works, London, £155; Highgate Cable and Engineering Co., Ltd., London, £16; Holborn Electric Co., London, £10; Higgs, F. and H. F., Herne Hill, £556; James, H., jun., Mansfield, £30; Laws, W., London, £50; Lightfoot, J., Ltd., Manchester, £81; Mackintosh Cable Co., Derby, £20; Peckham, G., and Co., London, £18; Rowell, J. B., London, £25; Sanders and Co., Wednesbury, £132; Surrey Engineering Co., London, £50; Tate, S., London, £101; Truslove and Co., London, £88; Wright, J., Ashtead, £701; Walsall Hardware Co., Walsall, £82; Z Electric Lamps, London, £76.

METAL AND CHEMICAL PRICES.

TUESDAY, July 9th

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£75 0 0	—	10s. 0d.
Electro Wirebars .. .. „	£84 10 0	—	—
H.C. Wires, basis .. .. per lb.	11⅝d.	—	—
Sheet .. .. .. „	11 11/16d.	—	—
Phosphor Bronze—			
Wire (Telephone) basis .. per lb.	1s. 2⅝d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet „ .. .. .. „	10¼d.	—	—
Wire „ .. .. .. „	11⅛d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£24 5 0	—	10s. 0d.
Foreign or Colonial .. .. „	£22 17 6	—	10s. 0d.
Tin—			
Ingot .. .. per ton	£204 12 6	£2 7 6	—
Wire, basis .. .. .. per lb.	2s. 8¼d.	¼d.	—
Aluminium Ingots .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£25 10 0	5s. 0d.	—
Mercury .. .. .. per bottle	£22 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
Sodium Bichromate—Per lb. 3½d.

Rubber—Para fine, 11½d.; plantation, 1st latex, 11½d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

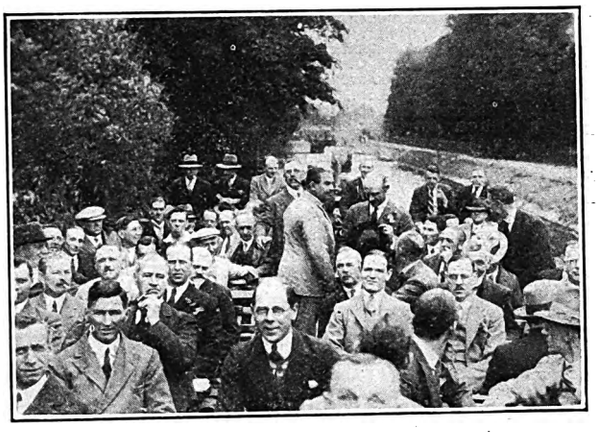
The lead market opened steadier last week and, according to James Forster and Co., values were 1s. 3d. per ton higher all round. Prices later gave way 5s. a ton, followed by a fall of 7s. 6d. Closing prices on July 5th were £22 16s. 3d. for all positions, showing a fall of about 10s. per ton on the week.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

PATHFINDER.—498 136. Class 8. Wireless telephonic apparatus. Essex Radio Supplies, Ltd., 35, Norton Folgate, London, E.1; wireless factors. December 15th, 1928.

ELECTRACHORD.—501 380. Class 8. Talking machines. The Duophone and Unbreakable Record Co., Ltd., 6, Martin Lane, Cannon Street, London, E.C.4; manufacturers. March 28th, 1929.



G.E.C. travellers afloat on the s.s. "Grand Duchess" on their annual river trip to Reading.

SOLINK.—500 322. Class 13. Electric lighting fittings, junction boxes, fusible cut-outs, switches and circuit breakers, all being metal goods. Donovan and Co., Safuse Works, Northcote Road, Stechford, Birmingham; manufacturing electrical engineers. February 23rd, 1929.

VIGILUS (SIGN).—494 440. Class 8. Wireless telephonic apparatus and recording instruments. The Thompson Manufacturing Co., Ltd., Water Lane Works, Water Lane, Richmond, Surrey; scientific and electrical instrument makers. August 24th, 1928.

"EMITTA."—499 224. Class 8. Electrical accumulators. William Henry Holbird, 9, Blenheim Grove, Rye Lane, London, S.E.15; electrical manufacturer and factor. January 21st, 1929. User claimed from September, 1925.

VOLUVERNIA.—501 933. Class 8. Philosophical instruments and apparatus. Gambrell Brothers, Ltd., Merton Road, Southfields, London, S.W.18; manufacturers. April 18th, 1929.

MIC.—479 196. Class 8. Components of telegraph, telephone and radio apparatus. Micanite and Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, London, E.17; manufacturers. March 26th, 1927. To be associated with No. 420 136 (2 292) l.

TOBIS.—497 628. Class 8. Apparatus for use in connection with talking films, wireless telegraphy and telephony, talking machines and sound records and cinematograph films prepared for exhibition. Tonbild-Syndikat Aktien-Gesell, Jägerstrasse 6, Berlin, W.8, Germany; manufacturers. November 30th, 1928.

"SI-MEN-SEH" (Chinese lettering).—498 402. Class 50. Electrical insulating substances and materials. Siemens and Halske Aktien-Gesell., 101 to 110, Nonnendamm-Allee, Berlin-Siemensstadt, Germany; manufacturers. December 21st, 1928. To be associated with Nos. 475 014 (2 564), 475 521 (2 565) and others.

Opposition to the registration of the following trade marks can be lodged up to July 26th, 1929.

TONBYS.—499 543. Class 8. Apparatus for use in connection with talking films; wireless telegraphy and telephony; talking machines and sound records; and cinematograph films. Tonbild-Syndikat Atkien-Gesell., Jägerstrasse 6, Berlin, W.8, Germany; manufacturers. January 30th, 1929. To be associated with No. 497 628 (2 673).

CELEBRO.—499 818. Class 8. Wireless telephonic instruments and gramophones. Celebritone, Ltd., Commerce House, 72, Oxford Street, London, W.1; manufacturers. February 7th, 1929. To be associated with No. 491 264 (2 626).

SILVER-CHIMES.—501 556. Class 8. Wireless telephonic receiving apparatus. Louis Kremner, 49A, Shudehill, Manchester; manufacturer and merchant. April 6th, 1929.

VICTONELLA.—502 631. Class 8. Wireless telephonic apparatus and gramophones. J. J. Vickers and Sons, Ltd., 70, Royal Hill, Greenwich, London, S.E.10; manufacturers. May 9th, 1929. To be associated with No. 502 632 (2 674) ix.

VOLUSTAT.—502 709. Class 8. Electrical resistances. Harlie Brothers, 3, Balham Road, Lower Edmonton, London, N.9; manufacturers and merchants. May 11th, 1929.

NERON-VITALUX.—501 749. Class 13. Electric lamps. Osram Gesellschaft mit Beschrankter Haftung Kommandit-Gesellschaft, Ehrenbergstrasse 11 to 14, Berlin, O.17, Germany; manufacturers. April 12th, 1929. To be associated with Nos. 457 992 (2 466) and 469 922 (2 522).

SUNBEAM.—479 619. Class 8. Fitted electric switchboards and induction coils for ignition purposes and batteries, all being parts of motor cars and other motor vehicles (except motor cycles and side cars). The Sunbeam Motor Car Co., Ltd., Moorfield Works, Upper Villiers Street, Wolverhampton; manufacturers. October 5th, 1926. To be associated with No. 484 295 (2 665) vi. and another.

FLEXSTONE.—501 961. Class 8. Cells for electric batteries. J. Stone and Co., Ltd., Brass, Copper and Iron Works, Abinger Road, Deptford, London, S.E.14; engineers. April 19th, 1929. To be associated with No. 501 962 (2 675) xl.

DYSONIA.—501 601. Class 8. Philosophical and scientific instruments. Hardyson Radio, Ltd., 13, Market Street, Huddersfield; manufacturers. April 9th, 1929. To be associated with No. 501 602 (2 675) ix. (By consent.)

MAGNAGRAM.—502 494. Class 8. Radio receiving sets; and radio receiving sets in combination with gramophones. Burne-Jones and Co., Ltd., 296, Borough High Street, London, S.E.1; radio manufacturing engineers. May 6th, 1929.

SUNBEAM.—473 620. Class 13. Electric switches, lamps, horns and sparking plugs, all being parts of motor cars and other motor vehicles (except motor cycles and side cars). The Sunbeam Motor Car Co., Ltd., Moorfield Works, Upper Villiers Street, Wolverhampton; manufacturers. October 5th, 1926. To be associated with No. 484 295 (2 665) vi. and another.

LYRIC.—500 550. Class 13. Electric lamps (ordinary), switches (ordinary), fuses, contacts and terminals, fusible cut-outs and lighting fittings, all being goods or ordinary metal. Max Weinbaum, 419 to 423, Commercial Road, London, E.1; merchant. March 1st, 1929. To be associated with No. 500 551 (2 675) xv. and another.

UNIFLEX.—502 065. Class 50. Electrical insulating materials composed principally of mica and sold in sheet or tape form. The Sterling Varnish Co., Fraser Road, Trafford Park, Manchester; and Hayesville, near Pittsburg; manufacturers. April 23rd, 1929.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

311 196 S. Sokal (Kalle and Co., A.-G.). Manufacture of light-sensitive materials. (7/1/28.)
311 351 S. G. S. Dicker (N.V. Philips' Gloeilampenfabrieken). Voltage-regulating means. (9/1/28.)
311 352 P. H. Hull and Imperial Chemical Industries, Ltd. Process and apparatus for effecting chemical reactions in gases by means of electrical discharges. (10/1/28.)
311 199 F. Berg. Drumstick fastening for suspension insulators. (30/1/28.)
284 706 Siemens and Halske A.-G. Thermionic valve circuits. (5/2/27.)
287 544 Allis-Chalmers Manufacturing Co. Electric switchgear. (24/3/27.)
311 201 English Electric Co., Ltd., and C. J. Chaldbeck. Power generation and transmission systems. (2/2/28.)
311 253 United Water Softeners, Ltd., and E. B. Higgins. Electrolytic production of sterilizing-agents, germicides, and the like, and processes of applying such agents. (6/2/28.)
311 254 S. G. S. Dicker. (N. V. Philips' Gloeilampenfabrieken). Electric rectifiers. (6/2/28.)
311 303 W. Haddon and J. M. Burnett. Electrical accumulators. (6/2/28.)
311 356 F. Oliver. Wireless receiving apparatus. (7/2/28.)
311 209 W. Rogers and Wingrove and Rogers, Ltd. Variable condensers. (7/2/28.)
311 214 H. C. Hodges. Apparatus for charging and discharging electric storage batteries. (7/2/28.)
285 901 Siemens-Schuckertwerke Akt.-Ges. Charging stations for storage batteries. (25/2/27.)
311 262 W. A. Coates, and Associated Electrical Industries, Ltd. Electrical ontrol switchboards. (8/2/28.)
311 305 L. G. H. Cantle. Electric reproduction of sound. (8/2/28.)
311 307 General Electric Co., Ltd., and C. C. Garrard. Apparatus for indicating electrically the value of a quantity at a remote point. (9/2/28.)
285 045 E. W. Buquet. Mounting of lamps. (9/2/27.)
311 309 Associated Telephone and Telegraph Co., and A. E. Hudd. Train-control systems. (9/2/28.)
285 048 Soc. Belge Radio-Electrique. Adjustment devices suitable for use with variable electric condensers. (9/2/27.)
285 089 M. Surjaninoff. Arrangements for generating a progressive movement of a body susceptible of being subjected to the influence of electromagnetic fields. (11/2/27.)
311 445 Associated Electric Industries, Ltd. (Westinghouse Electric and Manufacturing Co.). Electrical control systems for elevators, hoists, and the like. (11/2/28.)
290 239 Electrical Research Products, Inc. Acoustic devices such as loud-speakers. (11/5/27.)
311 449 C. S. Franklin. Aerial systems. (11/2/28.)
311 450 S. Richardson. Employment of wireless apparatus. (11/2/28.)
311 451 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). High-frequency signalling over wires. (11/2/28.)
311 452 C. R. Cook. Electric couplings, terminals, and the like. (11/2/28.)
311 460 Automatic Telephone Manufacturing Co., Ltd., W. H. Paulett, and C. Gillings. Telephone systems. (13/2/28.)
311 464 W. L. Spence. Electromagnetic brakes. (16/2/28.)
311 466 W. S. Smith and N. W. McLachlan. Audio-frequency thermionic amplifiers. (16/2/28.)
311 469 British Thomson-Houston Co., Ltd., and W. H. Lawes. Electric relays and like electroresponsive devices for use, for example, in electric protective systems. (17/2/28.)
311 476 G. W. Parr. Electromagnetic-drive units for loud-speakers and the like. (20/2/28.)
311 485 N. Bonavia-Hunt. Wireless receiving apparatus. (27/2/28.)
311 486 British Thomson-Houston Co., Ltd., and R. D. Parry. Electromagnetic acoustic devices for the interconversion of mechanical and electric oscillations, such as loud-speakers. (27/2/28.)
286 202 Felten and Guilleaume Carlswerk Akt.-Ges. Manufacture of magnet cores for pupin coils and the like. (26/2/27.)
311 502 Drysdale and Co., Ltd., and W. Drysdale. Electric-motor-driven centrifugal pumping units. (15/3/28.)
287 927 British Thomson-Houston Co., Ltd. Systems for producing high-frequency electric oscillations. (30/3/27.)
288 313 A.C. Spark Plug Co. Temperature compensators for use in magnetic measuring instruments. (8/4/27.)
311 524 E. H. Sumner. Wireless receiving apparatus of the crystal type. (12/4/28.)
311 526 H. P. Hinton, and Associated Electrical Industries, Ltd. Wireless receiving apparatus. (13/4/28.)
311 528 Edison Swan Electric Co., Ltd., and F. Shergold. Electric switches. (17/4/28.)
311 552 H. O. Hill, and Riter-Conley Co. Transmission towers. (9/5/28.)
311 558 H. R. G. Moore, and L. C. B. Johnson. Electric relays and contact makers. (16/5/28.)
293 851 R. Bosch Akt.-Ges. Electrical ignition system for internal combustion engines. (14/7/27.)
311 569 W. H. Crawford. Electrically-heated dispensing pumps. (31/5/28.)
311 572 G. Marr. Electric switches. (6/6/28.)
311 574 British Thomson-Houston Co., Ltd., and R. Dumas. Transformer radiators. (7/6/28.)
292 075 Akt.-Ges. Brown, Boveri et Cie. Mercury-vapour rectifier. (11/6/27.)
311 579 General Electric Co., Ltd., and E. L. Randall. Multi-lamp electric lighting apparatus. (16/6/28.)
293 039 International General Electric Co., Inc. Manufacture of commutators. (30/6/27.)
304 583 F. Pavlan. Variable electric condensers. (21/1/28.)
311 605 A. E. White (Indian Motocycle Co.). Electrical generating and distributing systems for internal-combustion engines. (30/7/28.)
294 966 J. Gize. Alternating current induction motors. (2/8/27.)
297 109 Maschinenfabrik Oerlikon. Turbo-generator plant employing st eam as motive power and hydrogen gas as cooling-medium. (15/9/27.)
299 013 International General Electric Co., Inc. Means for reducing the eddy current losses in the windings of alternating current machines. (19/10/27.)

Applications for Patents.

April 22nd.

12 477 R. Annan. Variable resistances.
12 437 British Thomson-Houston Co., Ltd. Apparatus for producing sound. (21/4/28, U.S.)
12 378 J. Davis and Son (Derby), Ltd., and W. Grafton. Miners' electric lamps.
12 467 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken).—Transmitting images.
12 468 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Thermionic valve arrangements.
12 469 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Push-pull thermionic amplifiers.
12 470 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric lamps.
12 438 Edison Swan Electric Co., Ltd. Coin-freed apparatus.
12 457 E. V. G. Electro-Vertriebs-Ges. and Emmrich and Co. Hand and face drying device. (12/11/28, Germany.)
12 483 B. Houri. Electrical reproduction of sound.
12 401 G. T. Hunt. Providing rubber-tyred vehicles with electrical earthing system.
12 374 J. W. Riddiough and E. H. Roberts. Combined wireless and gramophone sets, etc.
12 471 Sangamo Electric Co. Induction motors. (14/5/28, U.S.)
12 501 Staat der Nederlanden. Telephone systems. (23/11/28, Germany.)
12 390 A. M. Taylor. Electric power transmission.
12 489 H. Wade (Moffats, Ltd.). Electric heating elements.
12 476 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Submarine communication conductors.
12 508 D. Y. Wheatley. Impulse starters for magnetos.
12 425 F. G. Wood. Polarised light apparatus.

April 23rd.

12 588 Ateliers des Constructions Electrique» de Charleroi. Starting polyphase motors. (30/8/28, Belgium.)
12 626 S. von Bogdandy and L. Wamascher. Vacuum, etc., metallic vapour lamps. (14/5/28, Germany.)
12 573 British Insulated Cables Ltd., and H. H. Lord. Electric cables.
12 586 British Insulated Cables Ltd. Testing incandescent lamps, etc. (23/4/28, U.S.)
12 559 D. Dunnett. Electrically operated signals on motor cars.
12 551 G. Foggo. Generating power.
12 548 A. R. Evans. Charging systems for secondary batteries.
12 619 T. Hard (Telefonaktiebolaget L. M. Ericsson). Electric control of railway signals.
12 520 A. Marr. Telephones, gramophones, etc.
12 547 A. Marr. Cones for telephone transmitters.
12 629 J. Mehl. Flux-coated electrodes for electric welding. (23/4/28, Germany.)
12 616 N. V. Philips' Gloeilampenfabrieken. Sockets for electric lamps. (23/5/28, Holland.)
12 623 A. J. Stephens (Excelsiorwerk Metallwarenfabrik A.-G.). Electric motors.
12 592 R. Viesi. Electric balance for automatic transformation of alternate current.
12 658 H. Wade (Bakelite Corporation). Insulating materials.
12 610 A. E. White (Own Dyneto Corporation). Voltage regulators for electrical machines).
12 521 O. C. Wilder. Thermionic valve holder.

April 24th.

12 793 American Electric Co., Inc. Portable measuring sets for transmission lines, etc. (2/7/28, U.S.)
12 776 Associated Electrical Industries, Ltd., R. Brooks and G. H. Fletcher. Electric motors. (9/3/28.)
12 783 R. M. Balston. Circuit closing devices.
12 729 British Thomson-Houston Co., Ltd. Synchronous motors. (24/4/28, U.S.)
12 722 J. H. Broome. Alarm signalling systems.
12 769, 12 770 S. J. Bryce, W. R. Clements, H. Leicester, J. H. Roberts and A. E. Watson. Junction boxes for wiring systems.
12 740 R. Dubois, G. Gautier and L. le Bozec. Cathodes. (5/5/28, France.)
12 691 H. Garner and A. Hutchison. Electrically controlled cisterns.
12 698 J. Hollins and Imperial Chemical Industries, Ltd. Electrode position of metals.
12 665 R. Nettl. Electric ceiling roses.
12 794 L. Satchwell. Earthing resistances.
12 763 Elektrotechnisch Fabr. Ges. Schoeller and Co. Device for controlling electrical installations on motor cars. (26/1/28, Germany.)

April 25th.

12 923 P. Abrahams. Electric lamps.
12 917 E. Asch. Indicating, etc., a.c. voltages. (28/4/28, Germany.)
12 872 W. R. Bett and C. F. Earwicker. Thermo-electric regulation of artificial temperature.
12 834 Birmingham Electric Furnaces, Ltd., and A. G. Lobley. Heat fuses for electric furnaces, etc.
12 835 Birmingham Electric Furnaces, Ltd., and A. G. Lobley. Charging furnaces for heat treatment of metals, etc.
12 811 R. Bruni. Television apparatus. (25/4/28, Italy.)
12 879 D. A. Christian and Siemens Bros. and Co., Ltd. Telephone systems.
12 867 E. S. Ali-Cohen. Air insulated cables. (14/3/29, Holland.)
12 843 Coventry Automatic Telephones, Ltd., and C. W. Wilman. Automatic telephone systems, etc.
12 846 G. M. Daines, M. Glasscoe and R. H. Glasscoe and Co. Balanced arm for electric pick-up.
12 869 Dubilier Condenser Co. (1925), Ltd. (W Dubilier). Variable capacity condenser.
12 880 D.and H. F. Dugdell. Tubular swivel connections for electric light fittings, etc.
12 850 J. Engler. Cable-laying machinery.
12 912 A. H Midgley. Telephone transmitters, etc.
12 929 P. Pairard. Electric water level indicators for boilers.
12 816 J. R. Quain. Electric signs.
12 876 R. Schultz. Clamps for electric conductors.
12 866 Vereinigte Gluhlampen und Electricitats A.-G. Manufacture of oxide cathodes for discharge tubes. (14/5/28, Austria.)

April 26th.

12 972 Akt.-Ges. Brown Boveri et Cie. Mercury vapour rectifiers. (30/4/28, Germany.)
12 995 British Thomson-Houston Co., Ltd. Combined motion picture projectors and sound reproducers. (26/4/28, U.S.)
13 017 R. E. and S. S. Cramca. Variable electrostatic condensers.
12 976 F. G. Creed, and Creed and Co., Ltd. Telegraph reproducing apparatus.
13 010 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Combined gramophone and electrical amplifiers.
12 989 W. B. Erlebach. Connector for electric heating devices.
12 959 V. Hope. Electric fuse boxes.
13 021 I.G. Farbenindustrie Akt.-Ges. Accumulators. (12/5/28, Germany.)
12 957 J. Leadbetter. Battery eliminators for wireless instruments.
12 992 F. Livon. Glass containers for accumulator cells.
13 057 L. Martenet. Device for starting up current motors, etc. (28/4/28, Switzerland.)
12 948 L. J. Ransom and H. E. Sewell. Insulated conductors.
13 040 J. Robinson. Recording, etc., telephonic communications.
13 041 J. Robinson. Electric amplifying apparatus.
13 049 Siemens-Schuckertwerke A.-G. Electric control for steering ships, etc. (19/5/28, Germany.)
13 024 A. P. Welch. Carriers for accumulators, etc.

April 27th.

13 113 Cleartron (1927), Ltd., and J. R. Sinclair. Electron discharge devices.
13 085 E. W. Higgs. Electric switches.
13 100 J. W. Hofmann and Firm of J. W. Hofmann. Suspending devices for electric conductors.
13 101 J. W. Hofmann and Firm of J. W. Hofmann. Clamps for hollow electric cables.
13 102 J. W. Hofmann and Firm of J. W. Hofmann. Protecting devices for insulators.
13 103 J. W. Hofmann and Firm of J. W. Hofmann. Clamps for electric conductors. (10/8/28, Germany.)
13 104 J. W. Hofmann and Firm of J. W. Hofmann. Apparatus for damping oscillations of conductors.

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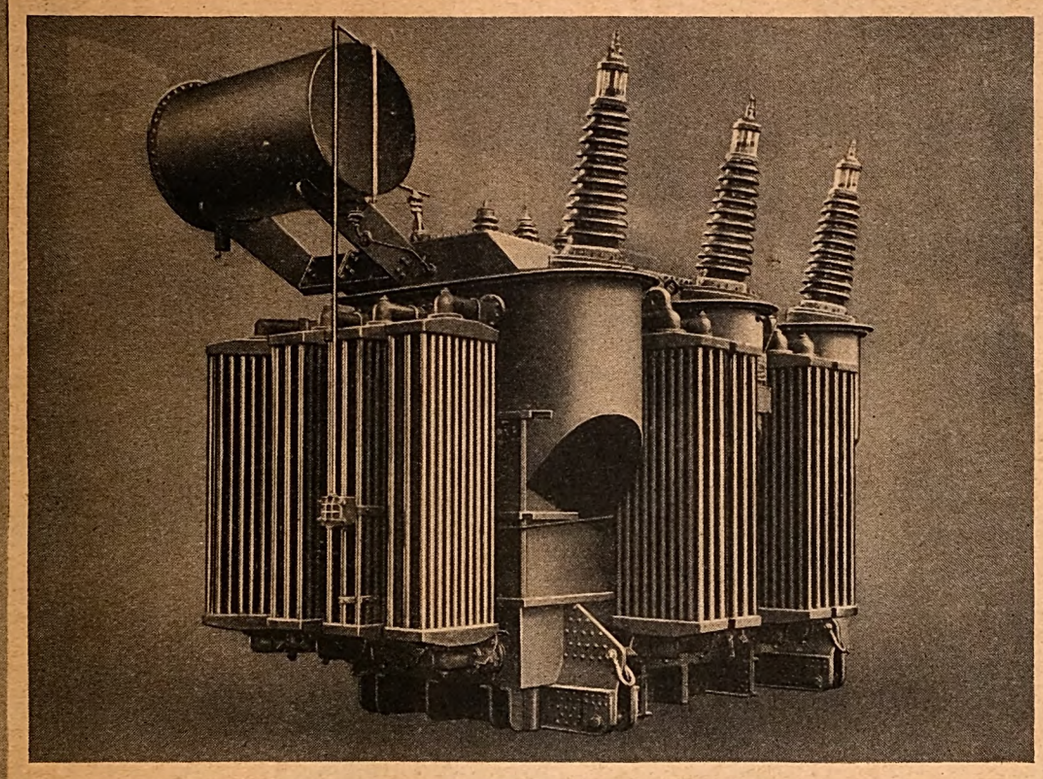

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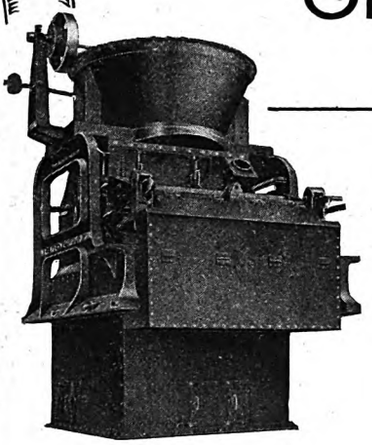

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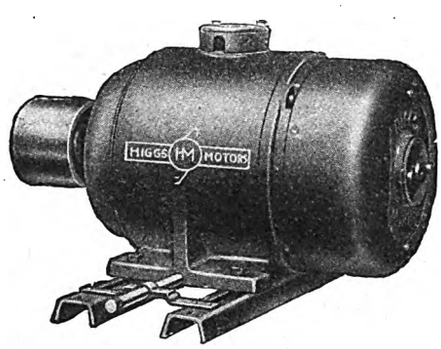

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Current Topics.

Telephony with Australia.

It is interesting to note that the re-broadcasting of the Westminster Abbey Thanksgiving Service throughout Canada by means of the new Marconi-Mathieu multiplex apparatus which enables telephone and telegraph services to be conducted simultaneously over a single "beam" circuit, was so good that the service was passed on to Australia over the Canada-Australia beam and was successfully re-broadcast in Australia. This in itself is no mean achievement, but on the same day two-way telephony was conducted between an engineer at Bridgwater, Somerset, and an engineer at Rochbank, near Melbourne, in such a way that results were as good as those associated with inland telephony. The distance between the speakers was approximately 13 000 miles, and the route was via the England-Canada and Canada-Australia beam services, using similar apparatus to that employed for relaying the Thanksgiving Service. A conclusion which may be drawn from this experiment is that if Marconi-Mathieu equipment were installed in Australia, similar conversation could be carried on direct without the intervention of the Canadian stations, and the circuit would become a normal method of telephonic communication with Australia open for public use. The establishment of such a service, which has been under consideration for some time, is a subject for arrangement between the Home and Commonwealth Governments and the wireless companies concerned. One would have thought that such an event, unique in the history of telephonic and telegraphic communication, would have been the subject of considerable publicity in the newspapers of this country, but so modest are we in these matters that even the lesser achievement of relaying the Thanksgiving Service to Canada resulted in many letters of congratulation being sent to the National Broadcasting Company—of America! Unless we are very careful, and unless we change our methods of showmanship, the credit for the "beam" system, the establishment of world-wide communication by radio telegraphy and telephony, the invention of the radio valve itself will soon be handed over to America. In much the same way that our claim to the invention of the electric lamp has been, to say the least, eclipsed by American publicity concerning the later design of Edison, so will our achievements in radio communication assume an American atmosphere until in time they may perhaps be presumed to be American in origin.

A Mistaken Policy.

In these days when advertising plays so great a part in the success or otherwise of commercial undertakings, modesty is out of place. Since the war Great Britain has been challenged in many of the world markets, and in some places where once we held a monopoly we now find it hard to retain our position. America's greatest slogan is "tell the world," and she does not hesitate to apply her own advice to whatever piece of showmanship she may be able to stage. We, on the other hand, with our natural dislike of self-advertisement, make secrets of our successes, in the belief that to shout them from the house tops is bad form. It may be conceded that there is something fine about our national reticence, but when that reticence means that others get both the glory and the business it is time for us to abandon our policy of modest silence and go in for a little trumpet-blowing.

Ultra-Violet Radiation in the Rubber Industry.

The use of ultra-violet radiation has now become a definite part of manufacturing technique in the rubber industry. Because of its wide adaptability, the quartz mercury vapour lamp is the instrument most used, and the method is divided into two main applications. Of primary importance is the identification of materials by the characteristic fluorescence which many substances exhibit when excited by ultra-violet radiation; while the application of the rapid photo-chemical reactions induced by exposure to this source of light is a development in which considerable progress has been made. Some work has also been done on the identification of materials, advantage being taken of the fact that many mineral substances continue to exhibit fluorescences of characteristic colour when mixed with rubber, both in the vulcanised and the unvulcanised state. Materials such as zinc-oxide can often be classified according to source of supply by examination under the mercury vapour lamp, and the presence or absence of a large number of powders and drugs in rubber mixers can be detected by this means. The photo-chemical reactions induced by exposure to ultra-violet light include fading of organic dyestuffs, darkening of certain white pigments and the rapid oxidation of rubber itself, which is often revealed by the appearance of large numbers of minute

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cracks on the surface of the sample. The colour-stability to sunlight of dyestuffs used in the proofing trade is another matter of considerable technical importance, and the apparatus known as the fadeometer, which consists essentially of a mercury vapour lamp, is in common use. In the same way, exposure tests are carried out to determine the resistance to sun darkening of white rubber loaded with such pigments as lithopone. Resistance to sun-cracking is a matter of much importance in the tyre industry, and accelerated ageing tests involving the use of the mercury vapour lamp are carried out in the laboratory to determine the relative values of various rubber compounds as far as this particular property is concerned. Originally, ultra-violet radiation was used solely in minor laboratory work, but it has now become a part of the working processes of the industry. Amongst users, the Dunlop Rubber Co. have two mercury vapour lamps at Fort Dunlop, and similar apparatus has been installed by all their subsidiary companies and is being used for one or other of the purposes indicated, while most of the large tyre manufacturing companies employ similar methods.

Worth Copying.

An innovation which should appeal to other technical bodies was made at the last meeting of the Electroplaters' and Depositors' Technical Society. This took the form of a general discussion on subjects chosen by the members themselves, and assumed the form of questions and answers. The meetings of scientific bodies are as a rule convened to hear papers which have been selected by their councils, with often only a vague reference to subjects on which the members themselves seek information, or would like to discuss. There are, of course, occasions when symposia are held by societies on some broad general subject, but the opportunity afforded to members of raising any subject they like, and informally discussing it amongst themselves is, we believe, quite novel, and differs entirely from the questions asked on a definite paper in the ensuing discussion, which, if not strictly relevant, would, of course, be out of order. That the discussion in question was chiefly confined to matters relating to nickel plating in no way affects the principle involved, namely, that any kind of question could have been asked. An "open night" of this kind would, we feel sure, be popular with the members of most societies, who would welcome opportunities of meeting together to exchange views on subjects of immediate interest to them, as distinct from some one specific subject which may appeal to a few only of those present.

Ancient and Modern.

We have often wondered why it is so often found necessary to house electrical enterprises in sham antique premises, and only a few days ago this wonder was revived when the Yarmouth Electricity Department opened its new electricity showrooms and offices in what is described as "a fine Tudor building." While the adaptability of electricity permits its dignified use in authentic period settings, such as are provided by many of our old country houses, churches and ancient public buildings, we cannot help feeling that its normal setting should be suggestive of modernity. Electricity is a force of the present, and still more of the future, and to deliberately choose to demonstrate its vitality in an archaic setting seems quite unnecessary. Modern equipment designed for use in modern homes cannot be seen to advantage in mediæval surroundings, and, in any case, the unnecessary admixture of ancient and modern seems logically indefensible. We appreciate that many business houses have adopted period designs for their showrooms and premises, but we cannot see any good reason why such practice should extend to our industry.

Our Overseas Trade.

June, 1929, was the first month since 1926 during which our overseas trade as a whole did not register £50 000 000 in exported goods. The May figures, which appeared to confirm the good prospects suggested by April, were apparently misleading, for exports during last month were down by £17 544 000 when compared with the returns for the preceding month, and down by £9 579 000 when compared with June, 1928. That trade was generally poor during last month is also indicated by a drop in imports of over £11 000 000 when compared with May, and over £8 000 000 when compared with June of last year. With regard to our exports, it may be noted, however, that the total for the second quarter of the year was £177 574 000 this year, £173 295 000 last year, and £171 868 000 in 1927. Commenting on the exceptionally low level of the June figures, "The Board of Trade Journal" states that the returns "may be the effect of variations in the promptitude with which, at different times, the returns of exports are furnished by the Customs authorities, and of the changes in dates of public holidays." In comparison with a year ago, the falling off in June was mainly due to a decrease of £9 642 000 in the value of exports of manufactured goods, but, notwithstanding these facts, the visible excess of imports over exports was not so high as might at first appear to be the case, the balance being £31 989 000 last month, as compared with £28 426 000 a year ago.

The Electrical Position.

So far as the electrical industry is concerned, the Board of Trade Returns, from which electrical details are published elsewhere in this issue, show that June, 1929, was no less unkind to our own trade, for exports of electrical machinery alone declined by £116 365 when compared with June, 1928, while electric wires and cables, including submarine cables, declined by £61 449. Imports of electrical apparatus and machinery during June increased by £147 544 by comparison with the same month last year, more than half this amount being accounted for by telegraph and telephone instruments, which item alone showed an increase of £76 164. A moderately satisfactory trade balance of exports over imports for the six months is still maintained, however, the amount being nearly six millions sterling, and though this is something like £500 000 less than the corresponding amount for last year, the electrical industry has lost less ground than many others. In a way, the low figures for June may subsequently prove a blessing, for they indicate to manufacturers as a whole, that unless the overseas markets are given proper attention, irrespective of shortage of staff due to summer holidays, and so on, the business quickly falls away and much spade work requires to be done all over again.

Imperial Communications.

Amongst the recommendations of the Imperial Wireless and Cable Conference, which were approved by the House of Commons last year, was one suggesting that a committee be set up to act in an advisory capacity with respect to telegraphic communications. The committee has now been formed, with the style the Imperial Communications Advisory Committee, and the body will be concerned with the policy of the new Imperial and International Communications Co. This latter company, another adopted recommendation of the same conference, will be responsible for services, rates, etc., and may be regarded as the operating company formed in connection with the merger of the Marconi and the Eastern and associated cable companies. A main feature of the scheme is that the Communications Company is to receive a net revenue of £1 865 000. After 12% of any excess of this amount has been paid to the Post Office, 50% of the balance is to be used for reduction of rates or for other purposes approved by the advisory committee. The remainder of the balance will then be distributed as additional dividend to Cables and Wireless, Ltd. It will, therefore, be appreciated that the work before the new committee is of considerable importance, and though the men forming such committee have wide and varied experience, their activities will be watched with more than usual interest, the reason, of course, being that though the investing public is concerned with Cables and Wireless, Ltd., it is the Communications Company which really decides the wisdom or otherwise of their investment.

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ELECTRICITY AND THE "TOTE."

Details of the Electrical Equipment of the Machinery—Electrical and Electro-Mechanical Operating Methods Explained—Some of the Constructional and Working Features of Three Types of Machine.

By D. H. N. CALEY.

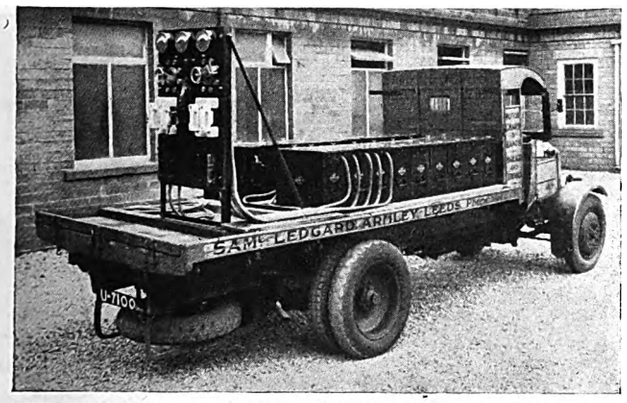
ON July 2nd, totalisator betting became possible on an English racecourse for the first time. This article aims to describe as fully as is possible at present the operation of the totalisator as viewed from an electrical standpoint. It must be realised in the first place that the machines used at Newmarket and Carlisle during the present month were not fully automatic.

Although the system of totalisator betting now being used is essentially the same in principle as that employed in the fully-mechanised "Tote" which is to follow, in the present machines some of the operations have to be performed manually, whereas in later totalisators each cycle of operations will be completed without any human intervention, once the key of a ticket-issuing machine has been depressed by a ticket seller.

Sequence of Operations.

In order that the totalisator may be more readily understood it will be well to say a little about the tasks which it is called upon to perform. When a bet is made the sequence of operations is as follows. (In the case taken here the bet is assumed to be of unit value for the sake of simplicity.) A ticket is stamped and produced from the ticket-issuing machine; the bet is registered, and added to the total of bets on the particular horse; the grand total of bets is also increased by one. The increments are immediately shown to the public on the two indicators giving respectively the total of bets made on the individual horse and the grand total. All makes of totalisator may be envisaged as consisting of three main parts: the ticket-issuers, which are installed in booths in various parts of the course; the adding machine, which is centrally situated; and the indicating boards, on which are displayed the numbers assigned to each of the horses, the number of bets made on each and the grand totals of bets, win and place. As bets are made and tickets are issued, the corresponding figures are immediately communicated to the adding machine, and thence automatically to the notice boards of the indicators.

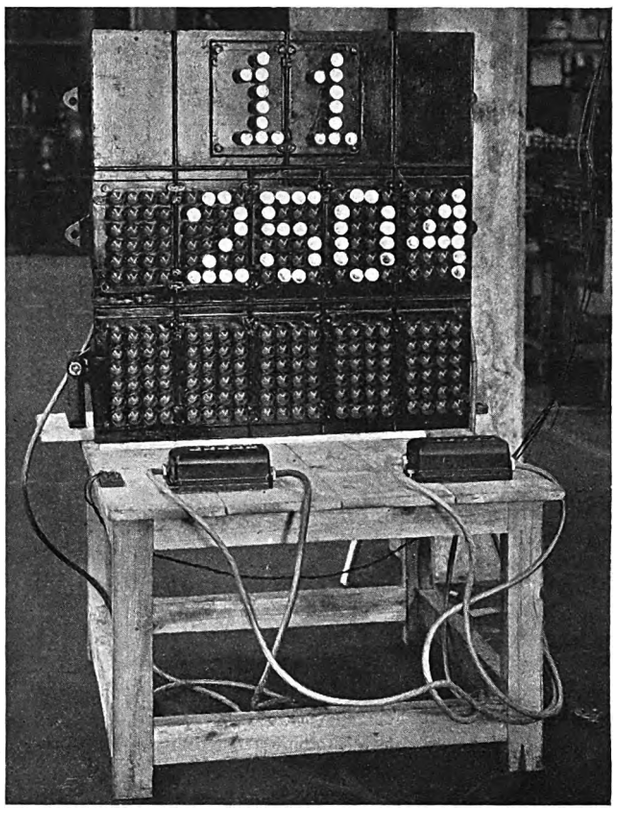
These processes may be effected either electrically or electro-mechanically. Moreover, the figures on the indicator boards may be displayed by the lighting of electric lamps on the principle of the Mason monogram used in sign work, or by means of revolving drums bearing the various figures. The all-electric system is chosen by the British Automatic Totalisator Co., who also make use of illuminated figures for the indicator



A 54-cell 500 Ah battery mounted on a lorry with the necessary switchgear for the first totalisator at Carlisle. Six of these batteries, made by the D.P. Battery Co., are to be used by the Racecourse Betting Control Board, and will travel round the country from meeting to meeting. In the Carlisle totalisator 10 000 lamps are used to indicate the numbers.

boards. The operation of the Lightning Totalisator is partly electrical and partly mechanical, and revolving drums are used for indication. Electro-mechanical working has been chosen for the Hamilton totalisator of Graham Amplion, Ltd., and monographic lighting is utilised on the indicators.

Two systems of ticket issuing have been adopted as standard in totalisators used abroad. In the first, separate tickets, similar to those used on railways, and partially pre-printed, are used. In the second, the tickets are guillotined off a roll, and entirely printed at the moment of issue. The ticket issuing machine used with the Lightning Totalisator in Australia is of the first class, which, by the decision of the Race-



Hand-operated electrical indicator in course of construction at the Amplion works at Slough.

course Betting Control Board, is not admissible in this country. The Lightning Automatic Totalisator Co. are therefore installing ticket issuing machines of the instantaneous printing type, manufactured by The British Automatic Totalisator Co., who are supplying similar machines to each of the firms manufacturing totalisators in England. It is now proposed to give some descriptive details of three makes of totalisator.

Electrical Indicators.

The Hamilton Totalisator, produced by Graham Amplion, Ltd., of Slough, and 26, Savile Row, Regent Street, W.1, has several interesting features. An accompanying illustration shows one of the hand-operated electrical indicators which are forerunners of the complete totalisator; these indicators are being used at various race meetings to be held in the near future.

Apart from the pre-selector switches of the Automatic Telephone Manufacturing Co.'s type, which take the place of a mechanical commutator in operating the lamps in each monogram, these indicators are comparatively simple. The operator sets the small rotatable drums of the switching device in such a way that the uppermost figures on the drums correspond to the total of bets made, and the lamps applying to the figures forming the total are thereby lighted. For example, the setting in the illustration, reproduced above, indicates that 2 504 bets have been made on horse No. 11. The switching devices—referred to above—may be seen resting on the wooden shelf in front of the indicator, linked by cables with the main selecting mechanism at the back. The pre-selectors each have six arms fitted with five blades. There are twenty-four lamps in each monogram.

The first fully mechanised totalisator is to be in use at Hurst Park on August 23rd, and it is much to the credit of Graham

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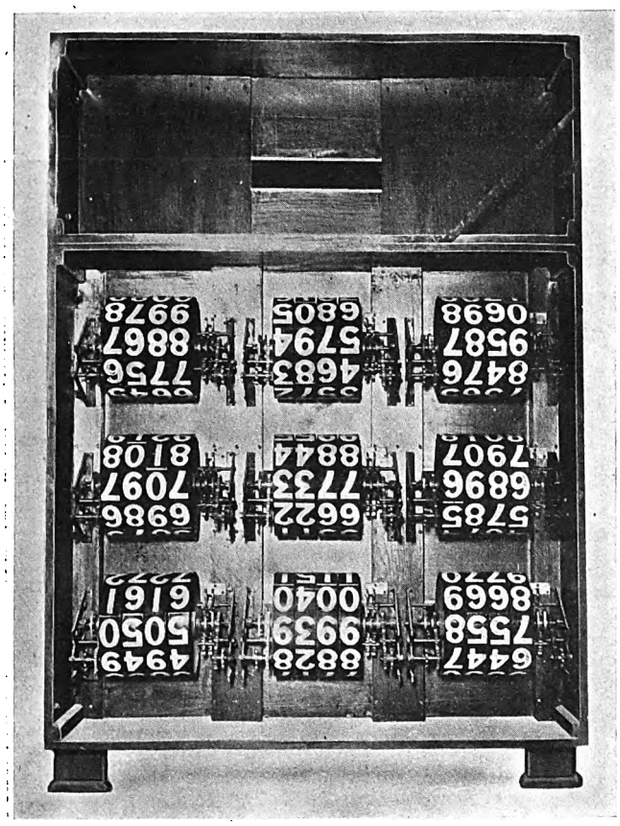
Amplion, Ltd., and the inventor, Mr. R. M. Hamilton, that this, the first complete " Tote " to be installed, will have been designed and constructed within five months. This quick progress was made necessary by the Hamilton " Super Totalisator " (described below), which was conceived earlier,



Back view of the individual horse adding machine (Lightning Automatic Totalisator).

not falling within the specifications of the Racecourse Betting Control Board.

The main totalisator building at Hurst Park will be about 30 ft. high, the actual integrating mechanism being in the upper story. The adding apparatus of the Hamilton Totalisator is shown to be quite compact by the fact that it is all contained in four boxes, size 12 ft. by 3 ft. The position chosen for the main building is one as far as possible removed from the main part of the crowd. Some 500 ft. from the totalisator itself, one of the principal indicator boards is placed; it is double-fronted so that the state of betting can be observed from both sides of the course. Selling stations, comprising ticket-issuing machines, are located in various suitable spots; station B, near Tattersall's, caters only for those desiring tickets of high denominations, and is comparatively small, while the other ticket-selling stations are of varying sizes, according to the demand anticipated in different places.

Safeguards Against Inaccuracy.

The sequence of operations in the Hamilton totalisator is as follows:—When the key of a ticket-issuing machine is depressed by the operator in the booth, a circuit is closed, and current through it actuates a solenoid. Movement of the solenoid core does two things—it imparts, by means of a ratchet mechanism, angular motion to a rotatable spindle corresponding to the horse backed, and it closes an independent circuit. Current in the latter drives the motor in the ticket-issuing machine, and the ticket is printed, guillotined, and ejected. (It is therefore impossible for the ticket to be issued unless at the same time the bet is recorded—any breakdown results in the second circuit remaining open, so that no ticket can be obtained from the machine involved. This point is an important feature of the design, as it obviates the chance of inaccurate odds being given.)

Meanwhile, impulses proportional to the angle through which the rotatable spindle has turned are passed on to a pre-selector switch belonging to the first bank of such switches, and as a result the figures corresponding to the new total are electrically illuminated.

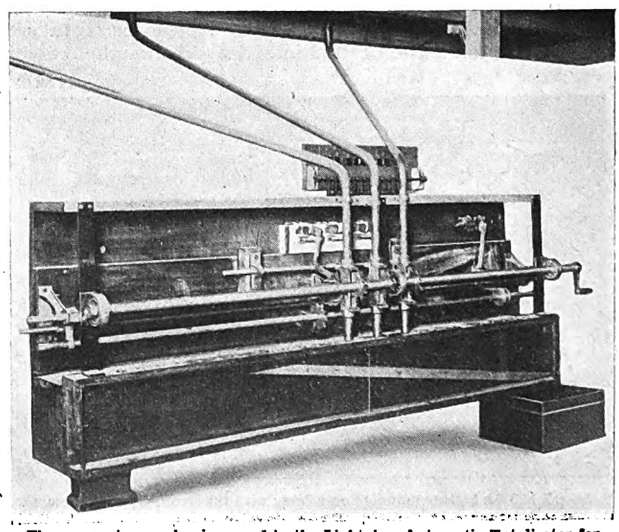
On its return path, the current also actuates the grand total solenoid, which is connected in series with all the solenoids belonging to each ticket issuer. The grand total solenoid imparts angular motion to a rotatable spindle through a ratchet mechanism, the arrangement being similar to that used in connection with the horse solenoids; the appropriate lamp circuits on the grand total indicator are thus energised by the action of a pre-selector. The cycle is then complete. Should, however, any electrical or mechanical breakdown have occurred in any part of the circuits, an ingenious system of subsidiary circuits will have ensured that the appropriate warning bells be rung, in order that errors in the totals may be avoided. Provision is also made for rapid tracing of the fault.

Especially noteworthy is the Hamilton mechanism for converting the initial electrical impulses from the ticket-issuing machines into mechanical motion with its magnitude proportional to the amount of the bets. Two things have to be achieved: (*a*) that the motion due to the bet made at one machine shall be proportional to the number of 2s. units represented by the amount of the bet, and (*b*) that the aggregate motion due to the various bets laid on the horse at different windows simultaneously shall be proportional to the total number of 2s. units represented by all these bets. These effects are achieved by arranging the solenoids in a straight line so that each imparts motion—through a ratchet mechanism—to the same spindle.

The core of each solenoid is connected with a driving pawl and a holding pawl, which work on a rotatable member which is also free to slide. The rotatable members are each in mechanical contact with the main spindle, the core of the solenoids being free to rotate, even while they are energised. Each impulse superimposes the angular movement of one ratchet tooth on to that caused by impulses given to solenoids positioned further back in the line. The angle through which the main spindle turns is the sum of the angles through which each of the rotatable members (referred to above) turns simultaneously.

Comparatively Simple Wiring.

So that the operators may know the state of betting at any moment, and be able to keep a record of the figures should temporary breakdown of any part of the machinery threaten the correctness of the " Tote's " calculations, dials are affixed to the pre-selectors which are controlling the indicators, and these are used to read the totals. An examination of circuit diagrams in the totalisator section of the company's Slough



The convertor mechanism used in the Lightning Automatic Totalisator for converting the varying denomination bets into a common denomination.

works showed that the Hamilton system enables the wiring to be made comparatively simple—an excellent feature from the point of view of total cost. The individual collector element is reduced almost to its bare essentials, and the number of lines of wire is small compared with some other systems, owing to the fact that the collectors do not require a prime mover, and can be placed close to a group of booths in much the same way as a telephone relay box is situated in a private branch exchange. The pre-selector switches used are manufactured by the General Electric Co., Ltd., at their Coventry Telephone Works.

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Returning to the Lightning Totalisator, its operation will be described as clearly as is possible with limited amount of information at the writer's disposal. This "Tote" is manufactured by the Lightning Automatic Totalisator Co., of Radlett; Mr. Thomas E. Ward is the inventor. When a bet is made the ticket seller depresses a key bearing the number of the particular horse, and thus, as in other makes of totalisator, closes a circuit. As soon as current passes, a steel ball of $\frac{5}{8}$ in. dia., is released from a receptacle contained in the main machinery in the chief totalisator building. It will be seen that, like the Hamilton, the Lightning Totalisator works electromechanically, the initial mechanical impulse of pressure on the key giving place to an electrical impulse, which is reconverted to the purely mechanical step comprised by the movement of the steel ball. It is claimed by the company that this practice of using steel balls as the main link between the selling and integrating sections of the machine gives greater assurance of positive action than a purely electrical cycle of impulses.

The released ball—or balls as the case may be—will represent a bet of a denomination of 2s., £1, £10, or £100; when released by the primary impulse which issues the ticket, they are free to travel under the action of gravity to the parts of the totalisator mechanism known as the convertor and the adding machine. Here their function is completed. A tube with a device for setting the ball in motion is provided to correspond with each of the keys in all of the ticket selling windows. The total number of tubes therefore equals the product of the number of horses by the number of selling windows.

The purpose of the convertor is to bring the varying denominations of the bets to a common denomination, so that final integration may be possible. The operation of the convertors and adding machines is similar in that in each there is one continuously driven shaft, operated by an electric motor, while both these machines can only perform their functions through the medium of the steel balls. In the illustration of part of the convertor mechanism on page 72 can be seen three of the tubes for conveying the balls.

After a ball has actuated the adding machine corresponding to the horse in which the bet was made, it passes on to the grand total adding machine. The Lightning Totalisator is stated to differ from all other makes in respect of all calculation and addition being effected mechanically (although the motive power is electrical). The process chosen is claimed to be quite certain in its action, very little power is required, and the amount of cabling necessary is relatively small. First cost and maintenance charges are said to be low. The voltage required is 20.

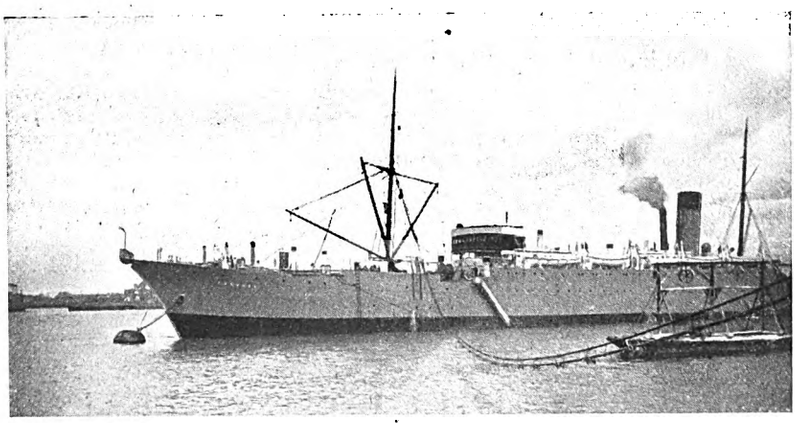
The transmission of the totals from the adding machines to the large indicator boards at various points on the course is made electrically. Hand control, however, is employed in the Lightning Totalisator, the reason advanced being that by this system the progress of betting—increasing by units, tens, hundreds or thousands at a time, according to the rate of betting—can be readily seen at any moment. It is said that if the alternative system of automatic recording were employed, it would not be possible for the public to have a clear vision of the indicator board corresponding to any particular horse when betting on that horse was heavy; if the increasing numbers of the bets were to be changed automatically, either by tens or units at a time, the number wheels would revolve so quickly as to be practically illegible. The advantage in the case of the grand total indicator would thus be even more marked.

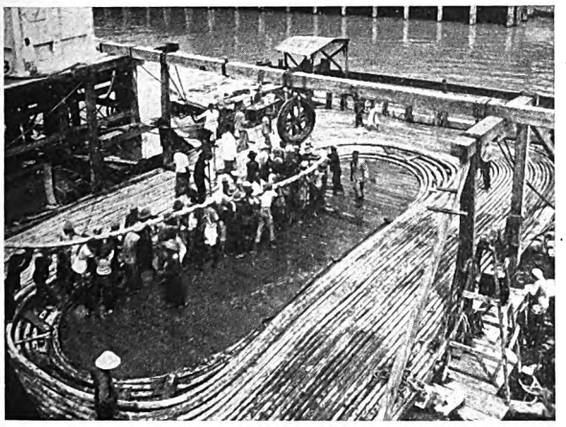
Since there is a separate circuit for each of the keys (at different windows) applying to the same horse, the load on the mechanism corresponding to that horse is no greater when the same backing is going on at many windows, than when one ticket only is being sold. Overloading is therefore impossible, and, indeed, the Lightning Totalisator is emphatically claimed to be entirely foolproof. Safeguards to prevent any jamming or overriding of the steel balls are provided. The machine is capable of issuing more than the 50 tickets per minute called for in the Control Board's specification, although in practice it is found that this rate of issuing is seldom achieved, even where there is a big run on a favourite.

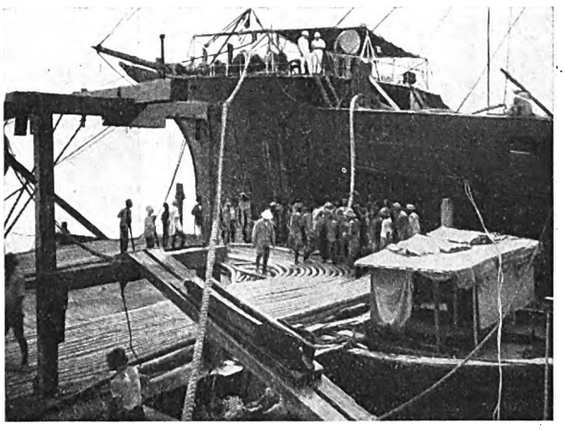
(*To be concluded*).

SUBMARINE TELEPHONE AND POWER CABLE—FROM WORKS TO USER.

PICTURESQUE scenes in the transport of British submarine cables are illustrated in these pictures. To the right the c.s. "Faraday" is seen off Siemens Bros.' Woolwich works loading up a submarine telephone cable. The pictures below show stages in the unloading, from the s.s. "Brenavon," of 54 000 ft. of Siemens extra high tension submarine power cable for laying across the Straits of Penang.







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"ELECTRICAL SECURITY."

A Valuable E.C.A. Publication for the Information of Architects and Electricity Consumers—The Value of Sound Electrical Installations Emphasised—Informative Examples of the Relative Cost of Good and Bad Work.

By A CORRESPONDENT.

"ELECTRICAL Security," the handsome 50-page booklet dealing with electrical installation work—good and bad—which has been produced by the Electrical Contractors' Association has already been the subject of favourable comment in THE ELECTRICIAN, but I have been asked to deal with the publication in greater detail, in view of its importance to all sections of the industry.

The work opens with a preface written by Mr. Walter Tapper, President of the Royal Institute of British Architects. In frankly acknowledging that the final touches of internal beauty and comfort in public building or private residence are provided by a well-planned electrical installation, he maintains that "no other system of lighting provides the same flexibility, adaptability, convenience and charm, while every day that passes witnesses an increasing use of electricity for a multitude of heating, ventilation, cleaning and other auxiliary power services in every type of building." It can hardly be gainsaid that many architects of to-day seem strangely ignorant of the possibilities of electricity in the home, and it is to be hoped that they will give earnest attention to the advice of Mr. Tapper and to the general contents of the booklet.

The introduction sets out in a clear and reasonable way the reasons why the architect and the public generally should take more interest in the electrical equipment of residential and other property. The reasons are summarised under two headings:

(1) Because electricity has already become something much larger and much more vital than a "lighting agent"; and (2) Because the public supply of electricity is passing through a period of substantial change and development, involving the replacement of direct current supplies at a low pressure by alternating current supplies at a higher pressure.

These points are briefly developed to lead up to an exhortation to architects and the public to concern themselves very seriously with the layout, quality and workmanship of the electrical installations coming under their care or use.

Choice of Wiring Systems.

In the first chapter wiring systems are discussed under the three main headings: steel conduit, hard metal-sheathed cables, and tough rubber covered wires. The comparative advantages of these methods are set out, and the reader is left free to make his own choice. The choice of a system is, however, dealt with in general terms in the next chapter, and on the cost basis the reader is told that if the total cost (labour and material) of a welded screwed steel conduit system is represented by the round figure of 100, then the cost of a grip-continuity brazed conduit system may be represented as 90, that of a metal-covered or lead-alloy system as 85, and that of a tough-rubber covered system as 80.

Next comes a chapter on "The Spirit of the 'Regulations,'" in which the I.E.E. Rules and their significance to the consumer are simply explained. Some of the cheap and hazardous "dodges" used by the shoddy worker who ignores the Regulations are set out, and the public are asked to demand that their installations are carried out in accordance with the "Wiring Regulations" of the I.E.E. It is also pointed out that the supply authority's test of installations preparatory to connection to the mains provides no guarantee that the work has been well done.

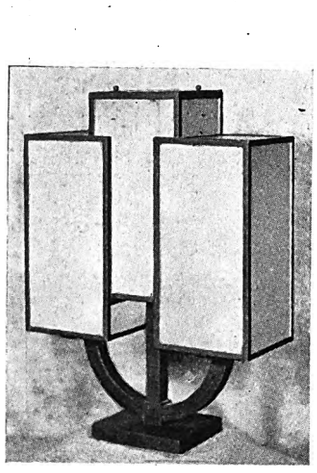
Earths and Earthing.

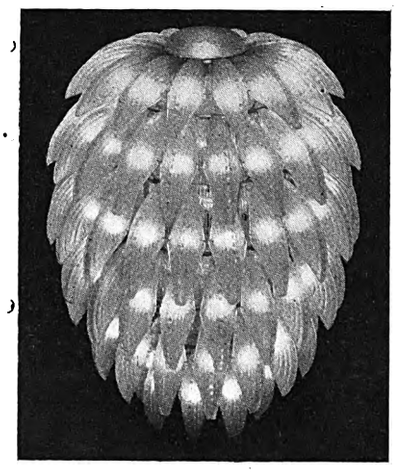
"'Earths and Earthing.'" the subject of the next chapter is still a subject of contention in the industry, but here the question is dealt with very fairly, and in a way well calculated to attract converts from the non-earthing school. The dangers consequent on the use of unearthed apparatus in certain situations at a.c. voltages of from 200 to 250 are clearly indicated, but the treatment is not on panicky lines.

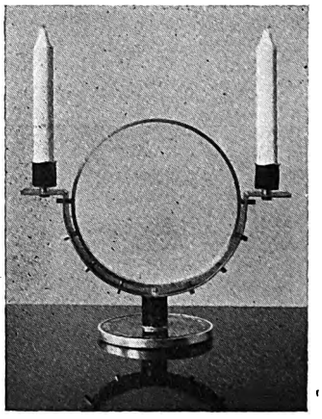
Little space is left for detailed survey of the remaining contents, which include a valuable chapter on "Modern Installation Work" with concrete examples on good and bad work, an architect's lighting, heating and bell plan for a small country house, and contrasted bills of quantity showing detailed costs of materials necessary for a good and a bad job respectively.

A further chapter is devoted to "Some Notes on the Components of a Wiring Installation and their Prices," and finally "Use and Maintenance" is discussed and attention given to amateur extensions and wireless, and electro-medical apparatus.

The booklet, which is well bound in stiff boards, contains no Association propaganda, and may be truly said to be a primer for the architect and consumer. A notice on the last page states that "where the professional or trade standing of any firm of electrical installation engineers is in question, reference should be made to the list of members of the Electrical Contractors' Association (Incorporated), 15, Savoy Street, Strand, London, W.C.2, and / or to the National Register of Electrical Installation Contractors, 1, Lincoln's Inn Fields, London, W.C.2."







FURTHER EXAMPLES OF MODERN LIGHTING FITTINGS DESIGN.

THESE fittings, illustrating recent tendencies in Continental designs, show (left to right) a table lamp of forged iron and opalescent glass designed by Georges Champion and produced by the Studio Gué; a crystal chandelier designed by Sabino (Paris), and candelabra, in red enamel with silver edges, designed and made by the Städt. Handwerker and Kungstgewerbeschule, Stettin. We are indebted to the proprietors of the "Studio" Year Book for permission to reproduce these designs.

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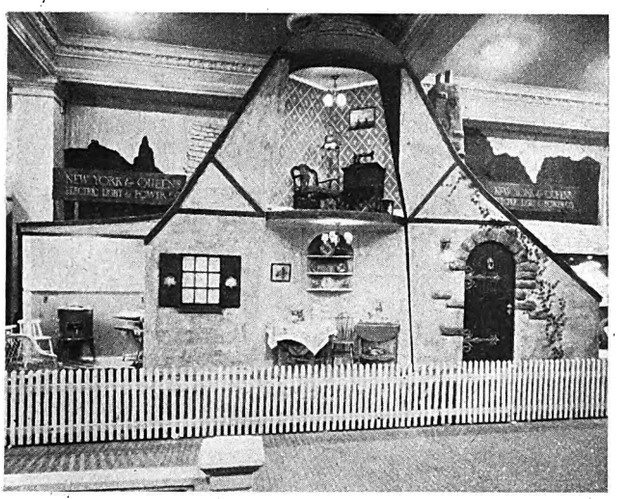
STAGECRAFT IN ELECTRIC HOME DISPLAYS.

Dramatising the Selling Story—Making the Best Use of Restricted Display Space—An Effective Turn-Table Exhibit—A Trade Procession Hint—Window Backgrounds.

By ERNEST A. DENCH.

ONE by one, stagecraft tricks are being tried out on an unsuspecting public. Not that there is any intent to deceve the consumer; the trickery is confined to the dramatisedi presentation.

After all, the true art of display—the pictorial mode of expression—is nothing else but a dramatised selling story, best unfolded with a theatrical atmosphere. The theatrical producer has an imposing stage on which to work, aided, too, by all the paraphernalia of his craft. The electrical retailer's "fighting line" includes the show window, the showroom,



A model revolving house exhibit on a small scale, the working of which is explained in the accompanying article.

possibly a converted truck for a demonstration car, or a small stand at an exhibition. Space limitations are present with all these display mediums, especially if the desire is to reproduce a series of model rooms equipped with every conceivable electrical outlet and device.

A few years ago the display man of a supply undertaking cried: "I have it," as though it was a remarkable discovery, one which would revolutionise display methods. The ingenious idea was a two-in-one painted background. One side was "summer," the other, "autumn," and the side shown to the public varied with the seasons. Yet we could never see much practicability in the plan, other than the saving of a strip of composition board.

If the display man had thought out such a seasonal presentation plan as that embodied in the layout of a millinery shop "down South," known as "That Hat Garden," he might have been in receipt of a bonus from his employers. Inside, this shop is "strictly rural"; the hats are arranged on small "trees" about tables spread with artificial grass mats for lawn. Cotton wool replaces the "lawn" in winter. The patron enters the store under a latticed arch, entwined with seasonal flowers and foliage. The rear, merging into the stockroom, is "blocked" with the false front of a country cottage. Here, too, the "atmosphere" is changed according to the time of year. The permanent features remain, the changes being matters of detail.

The Two-Tier Turn Table.

Now, every public utility undertaking and every electrical contractor has, at some time or other, found it hard to give a display exhibit "breathing space" within the compass of a local exhibition stand. The model home idea has meant the leasing of an actual suburban home in the vicinity, the disadvantage being its inaccessibility, apart from the separate staff needed.

The New York and Queen's Electric Light and Power Co. having found no solution to the problem, engaged a display service company to bring their special technique and resources to bear. The result was a realistic reproduction of a six-room house inside a stand, 44 ft. long by 20 ft. high. I admit the feat sounds impossible, but stagecraft carried it off in a convincing manner.

All you have to do (after viewing the accompanying picture) is to visualise the front wall of this modern house "broken away" to "cut" into the suite of six room interiors, which came into view, two by two, as the double-decked turn table (10 ft. wide) slowly moved into position and paused a couple of minutes before turning again, to bring the next two rooms into view. Beauty and utility were combined in these room lay-outs, as the following high lights will prove: The hand-carved mantel and relief coat of arms in the Tudor living room. The bathroom with walls painted to simulate the tropical environment beneath the ocean's depths; the rest of the bathroom was of cream-tinted tile, coloured fixtures and semi-indirect lighting. The blue-tiled kitchen had its share of admiration, while the dining room was equipped in Colonial style. Both the sewing room and bedroom were designed on pleasingly simple lines.

Off "stage," so to speak (meaning to the sides of the turn-table exhibits) were two stationary rooms. At the left, a green-tiled laundry nook, with its opportunity to display washing and ironing machines. At the right, a modern garage, completely equipped with electrical devices to conserve energy and facilitate comfort.

Modern Kitchen *v.* Dance Steps.

Space-conservation was not the goal aimed at by the Southern Colorado Power Co., Pueblo, Colorado, for the "float" they entered in the State fair "Parade of Progress." The spectators lining the streets several deep were in a mood for entertainment, so display manager T. A. Edmiston wisely played on this in arranging his utility display. This long float, mounted on a truck body, was especially colourful with its gay awning roof and the pleated vari-coloured drapes in "sun burst" effects around the chassis. The float platform was split up into three sections. The first, facing front, was where the public was regaled with entertainment by a group of five pretty girls recruited from the company's force, who played ukeleles and banjos. This section was enclosed at the back with vine-twined trellis, dummy columns and another "sunburst" of vari-coloured drapes. "Concealed" here was the driver. Facing the street at each side was a sign, cleverly comparing modern dances with electrical cooking:

> "You May Have Tried the ONE STEP AND THE TWO STEP
> —BUT—
> Do You Know the Third Step?—
> COOK WITH ELECTRICITY."

With an eye to dramatic effect, progressing, as you will note from strictly entertainment, thence to partial entertainment (the card) and thirdly to "strictly business"—the rear section of the float was arranged as a model white enamel kitchen, with every electrical device in place, from the modest iron to the pretentious refrigerator.

"Cook By Wire" read the sign over this section. For the night parade, white-frosted lamps supplied the illumination.

A Solid Background for Kitchen Setting.

Many model kitchen window display backgrounds lack substance. They are, to put it mildly, of the "jerry-built" variety. One push and the whole bag of tricks topples over. Make-shift devices to convey the room atmosphere are not very convincing, to say the least. Overhead costs are, of course, responsible for the cheese-paring. It is not to be expected that any business-like enterprise will incur a substantial outlay for an equally substantial background without a fair return.

The Illinois Power and Light Corporation recently spent £40 on a really substantial background, and found no cause to regret their thoroughness. The background, which was the interior of a model kitchen in green and white, was provided with doors and windows that looked as if they had been there for generations. The lower half of the walls was mosaic tiled, and mottled wallpaper was used for the top half. The rear right curved into a completely furnished breakfast nook.

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ADVERTISING FOR CONTRACTORS.

Necessity for Originality in Retail Trade Advertising—Knowledge of Human Nature Requisite for Success—Persistence and Continuity Recommended.

By "PUBLICITY CONSULTANT."

(*Continued from page 757, Vol. CII.*)

EVERYBODY is yelling for originality, and most people yelp with nervousness when it comes along. This observation, made by another writer in another connection, seems to apply with particular force to much of the advertising that appears in our provincial and suburban newspapers to-day. The possibilities open to the advertiser are enormous. Like the artist, he has, in his piece of white newspaper space, a canvas on which he can fashion something individualistic and eye-taking; something to linger in the minds of those who are fortunate enough to read it. Such opportunities, often as they occur, are rarely made use of, and the advertising of a retail advertiser in one trade is very much like that of his opposite number in any other trade. Originality, or anything approaching it, appears to be shunned like the plague, and "Safety First" and "Follow my leader" form the usual watchwords.

After a long study of the advertising of retailers, the writer has been driven to the view that the tameness referred to is due to sheer fright at the prospect of having to write advertising copy. No matter how well and convincingly the average trader talks to his customers when they are in his shop, he usually loses this faculty when he addresses them from the pages of the local newspaper. In the shop he will put the good points of a fire, an iron, or a washing machine in a way that is both interesting and convincing. In an advertisement—which, by the way, is really nothing more than a convenient way of "broadcasting" sales-talk to a wider circle than the solitary customer—he will forget all his arguments and selling points, and will, for some obscure reason, content himself with a laconic statement of his name and address coupled with a list of articles which may be obtained at that address.

Another curious feature is that while most of us know instinctively whether the "copy" of somebody else's advertisement is good or bad, we seem unable to detect the weaknesses in our own productions.

Readers will admit that success in retail selling is dependent to a very great extent on our knowledge of human nature. Such knowledge is equally necessary for success in retail advertising. We should analyse the working of the human mind, and find out, if we can, what other people think about our advertisements, about our goods, and about the way in which we sell, or attempt to sell, our wares to them.

If we can then combine with this qualification a sound knowledge of good business and a few simple facts about advertising we have the best possible equipment for success.

The great essential in the writing of advertising copy is the capacity for being natural. Some people have a gift for copy writing, but those who have not—or think they have not—need not despair. The best procedure in such cases is to write down exactly the sort of things you would say to a customer who entered your shop, and to whom you wanted to sell a certain article or articles. Write it all down, however much there is of it. Then go through it carefully and select what seems, on consideration, to be the very best of the selling points. By taking these, and eliminating all redundancies, you will have the material for an effective advertisement. After a time practice will render such a tedious procedure unnecessary. At first, however, the exercise provides really excellent tuition.

Some of my readers may have been induced to approach the writing of copy by the mistaken method under which the first paragraph *must* excite interest, and the next *must* create a desire for possession, this being followed up by convincing facts to inspire confidence. Finally the copy *must* impel action. I would not attempt to deny that an advertisement which can cause all the above-mentioned reactions in their logical order is entirely admirable, but generally impossible.

One can never count upon securing the reader's attention long enough to get his mind thinking in an orderly way; it often happens that many people will read an advertisement from beginning to end, but we should never assume such close interest. Our best assumption is that nobody has any particular desire to read any advertisement. The paper is usually bought for the news it contains, and advertisements will only be read if they are interesting and attractive.

But even if our newspaper announcements are made the last word in interest and attraction, there is no certainty that they will always influence people in the way we intend them to.

Let us take, for instance, the case of a man sitting down after breakfast on Sunday morning to read his paper. He is a good prospective purchaser of a shirt which is advertised on page six. But just as he has reached page four his wife calls and asks him to see what is the matter with the back door, as it won't latch. The dutiful husband naturally goes off to attend to the door, but he does not return to that section of the paper which was going to stimulate him to a purchase, so that all the thought, time, energy and money put into that advertisement is wasted—so far as this man is concerned.

Now, if there are enough broken back doors that Sunday morning, and enough husbands willing to play the rôle of handy man, the advertiser will conclude that his copy for his shirt advertisement was poor, or that the announcement was lacking in some other way. Actually, the copy may have been excellent, the value good, and the real fault may have been in advertising to men on Sunday when they are subject to distracting assignments in the domestic utility field.

This example may sound unduly pessimistic, but it is an undoubted fact that some distraction or other may completely neutralise all the advertiser's efforts to interest any particular person. Hence the need for persistence and continuity of advertising. The reader who failed to get as far as your advertisement on Monday may be in a more receptive mood on Wednesday.

A large, but fortunately declining, number of newspaper advertisers appear to think that very big, bold, black type is essential to successful advertising. Apparently the idea is

Fig. 1.—A terse announcement which offers no sales argument.

Fig. 2.—An example of over-crowding, and the uninteresting use of type.

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that the advertiser, in order to draw attention to his announcement, should use a type-face of such size and ugliness as to out-distance his fellow advertisers in an orgy of ugliness. The result is that the whole of the advertisements designed

Participation in local carnivals is a useful phase in contractors' advertising activities. The illustration shows the decorated car which Mr. B. L. Kay entered in the Colchester Hospital procession on July 11th.

on this assumption become insignificant, simply because of their multiplicity; on the other hand, the advertisements which are set up in less blatant founts of type, and which are at the same time tastefully arranged, achieve far more than their garish neighbours.

It should be pointed out, however, that in his desire to find type-faces of pleasing appearance, the advertiser must not lose sight of the fact that the type he chooses must be legible. However attractive his announcement may appear, it will lose much of its effectiveness if the public cannot read it with ease. Some types are notoriously tiring to the eye; people soon discover this for themselves, and the weary eye may pass over an otherwise good advertisement solely on this account.

Although the example reproduced in Fig. 2 is a fairly typical example, and no worse than scores of others, it well illustrates the need, to which I have referred, for care in the selection of type. Apart from the overcrowding of the space, the type, though legible, is ugly and uninviting.

The opening of the new showrooms and offices of the Yarmouth Electricity Department last week was made the subject of an attractive composite page of advertising in the "Yarmouth Mercury," which is reproduced in miniature in Fig. 3. It will be noted, however, that the page is supported exclusively by manufacturers. Without knowledge of the local conditions it is impossible for me to say whether local electrical contractors had the opportunity to occupy a portion of this special page. But even if participation in the all-electrical page had been impossible, one might not unreasonably expect to find a number of contractors' advertisements on other pages. Actually, a diligent search only showed one. This effort, reproduced in Fig. 1, is praiseworthy in its way, and its sponsors have evidently realised that the ready-made local interest in electricity, engendered by the opening of the electricity showrooms, can be directed into a practical channel, if only people are told where to go for their electrical requirements. From the copy point of view, Fig. 1 is capable of improvement. Mid-July seems a little late to talk about "Spring Cleaning," but as electric vacuum cleaners are to be included in the announcement, there is an opening for a reference to "Spring Cleaning Every Day." This could be followed by a short, reasoned paragraph about the work which is saved by electric vacuum cleaners, floor polishers, and such other labour-saving devices.

(To be continued.)

BOOK REVIEWS.

Whittaker's Electrical Engineer's Pocket-Book. Edited by R. E. Neale. (London: Sir Isaac Pitman and Sons.) Sixth edition. Pp. xiii+775. 10s. 6d. net.

This compact work is already so well known that detailed review of the sixth edition is really unnecessary, though it should be mentioned that this issue has undergone thorough revision and is larger by about 100 pages than its predecessor. In spite of the rigid compression necessary to keep a work of such encyclopædic character to anything like the dimensions of a pocket-book, the compilers have produced a useful and readable compendium. A. C. B.

"Swift" Percentage of Weight Reckoner. (London: Gall and Inglis.) Pp. 90. 4s. net.

No simple system has yet been devised for doing proportion sums, and those who have to be constantly working with varying ingredients do not always find the slide rule as definite as they wish. The "'Swift' Percentage of Weight and Weight Computing Reckoner" has been designed to give the varying percentages of weight from ½ oz. to 9 lb., and lbs. from 1 lb. to 150 lb., that have to be used in calculating the ingredients of any batch. This makes easy reckoning for Customs' Duties, proportioning quantities, varying ingredients, etc. A supplementary use of the tables enables the total weight of any number of articles, each weighing from ½ oz. to 9 lb. to be calculated out, and a consignment checked; or in stocktaking, the uncounted quantity of an article on hand to be found simply by taking the weights.

West Ham Corporation is about to apply to the Electricity Commissioners for sanction to a loan of £33 461 for sub-stations, transformers and equipment.

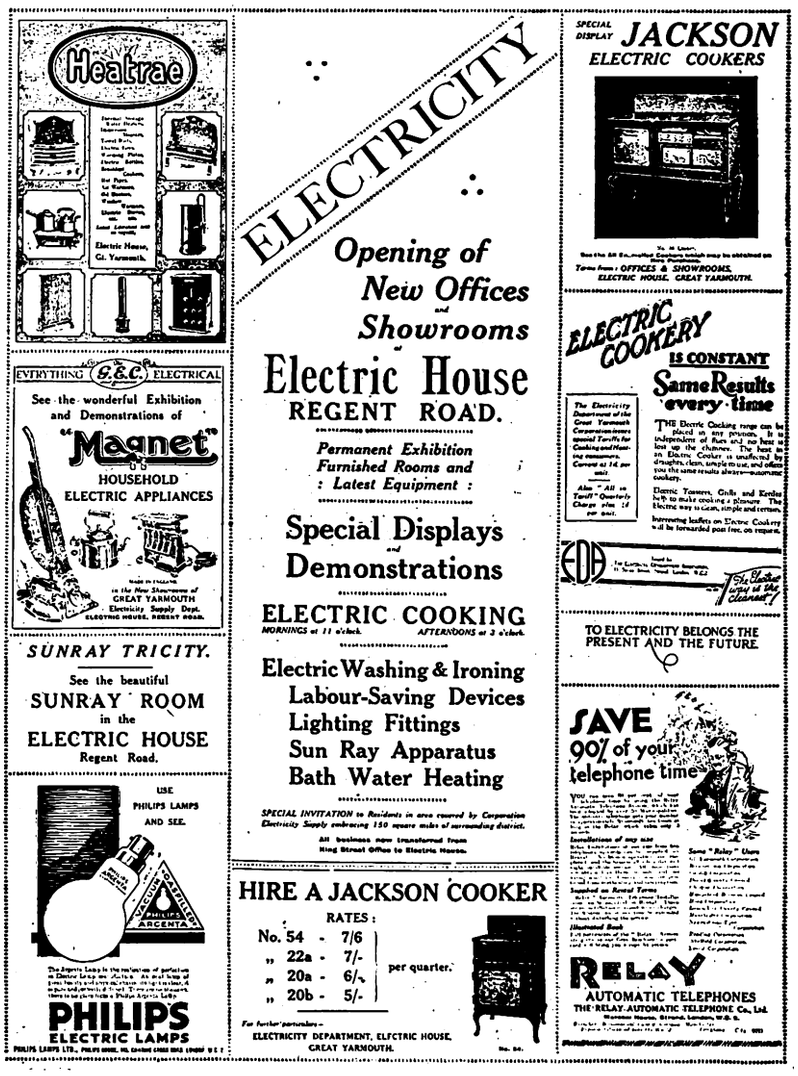

Fig. 3.—Miniature reproduction of full page advertisement synchronising with the opening of new electrical showrooms at Yarmouth.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Concrete Pole Problems.

[To the Editor.]

Sir,—Replying to the remarks of S.C.B. in your issue of July 12th, the writer desires to say that it was not expected to draw attention to annual costs of the different kinds of pole lines.

In view of the fact that the annual costs must account for interest on the first cost, life of pole line materials, cost of maintenance or upkeep (which must include relative expenses due to interruptions), it is logical to expect a wide difference of opinions and values from the different engineers. The cost items given were purposely condensed.

The range of depreciation annuities for wood poles is from 3 to 12% and for sawn timber (which should never be allowed in any wood pole line, for poles or struts) as high as 40%. The writer used a mean value of 6% for wood poles, and 4% depreciation annuity for the remainder of the line. This latter value applies also to the steel and the reinforced concrete pole lines, respectively. For the steel poles the writer has taken a depreciation annuity of 1.3%. For reinforced concrete we are quite justified in taking 0.5%, but the writer has almost doubled this value. Obviously, decreasing the number of poles per given length of line, or increasing the life of the materials, or increasing the interest on capital, will result in a decrease of depreciation annuities, and, for all these conditions, the wood pole is the least favourable.

In calculating the annual expenses, it is to be noted that the depreciation cost of wood pole lines should be figured from the cost of replacing the poles, and not from the first cost of a new wood pole line. It is always more costly to replace old poles than to erect new poles. The higher cost is due to such cost items as dismantling, tearing down, remounting, loss due to service interruptions, loss due to overtime and wasted-time expenses caused by irregularities, and so forth. For the case in point, the gross depreciation annuity of the wood pole line amounts to a replacement cost of from £3 to £4 per mile *plus* that amount resulting from the total number of poles and struts per mile *multiplied* into the depreciation annuity mentioned above—this item of cost amounts to approximately £6 per mile of line.

The operating expenses for the wood pole line are around £4 10s. per mile of line, as against £2 16s. per mile of steel pole line.

Included in the first cost is 15% for insurance, depreciation on equipment, supervising, miscellaneous supplies, danger signs, superintendence, and unforeseen expenses. For all the lines, the writer took 5% as the capital interest.

In the place of stays, the writer chose wood struts (not sawn timber), three every two miles. The costs refer to a highway, and include double insulators for the greater part of poles, in each case. The concrete construction enjoys advantages for medium spans, i.e., for spans ranging from 400 to 850 ft. Medium-span construction comes nearest to the ideal, and reinforced concrete construction of any weight (light rural lines or double circuit main transmission power lines) is the best and cheapest for medium spans.

If the Editor can arrange for space, the writer will endeavour to find time to draw up a series of reinforced concrete pole designs for standard three-phase 3-wire lines suitable for operating at voltages from 3 300 to 33 000. Engineers desiring to compare the costs of their own wood or steel pole lines with the reinforced concrete pole line can thus have the opportunity of doing so.—I am, etc.,

London, July 15th. William T. Taylor.

"Researches in Circuit Breaking."

[To the Editor.]

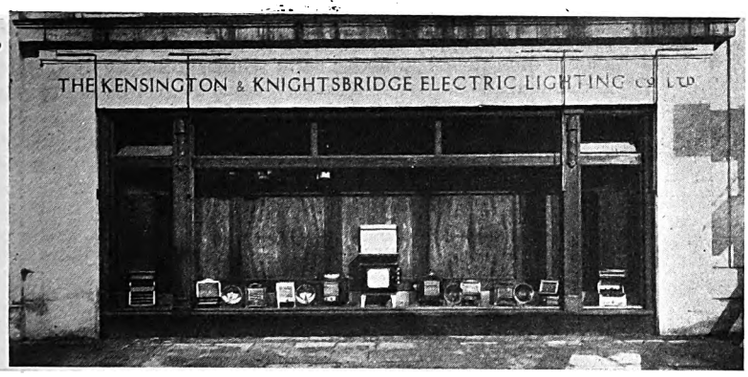
Sir,—When the Electrical Research Association paper on circuit breaking was read and discussed at Manchester, I remarked that the Association's method of estimating the electromagnetic force on a circuit-breaker crossbar was wrong in theory and misleading in practice. I was not contradicted at the time; but afterwards, in the "Journal" of the Institution of Electrical Engineers for May, 1929, the authors denied that the method in question was based on a wrong idea, and said that they still recommended it.

Yet I still contend that the method is wrong, and, in my opinion, may cause serious mistakes to be made by British manufacturers who adopt it.

The method recommended by the E.R.A. was described in "World Power," dated January, 1925. It is based on the idea that

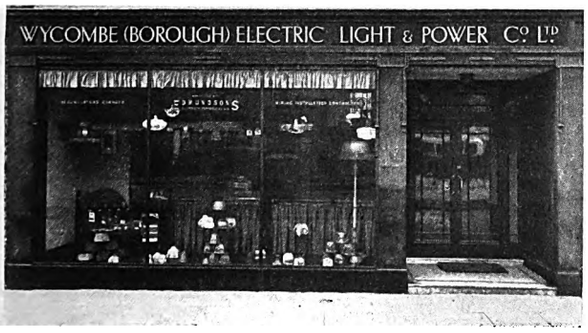
$$H = 2i/x^2,$$

where H is the magnetic intensity (equal to B/μ) at a perpendicular distance x from a long and straight conductor



THE importance of the shop-front in planning for increased trade in domestic electrical appliances was emphasised in an illustrated article in The Electrician *of July 5th. Here are three further illustrations of modern shop-front construction.*

In the first example (by E. Pollard and Co.) the front is in teak and the enclosure back is of Ancona walnut framed in teak. The plinth is faced with polished black Belgian granite. The two remaining illustrations are of fronts put in by S. Haskins and Bros., Ltd.



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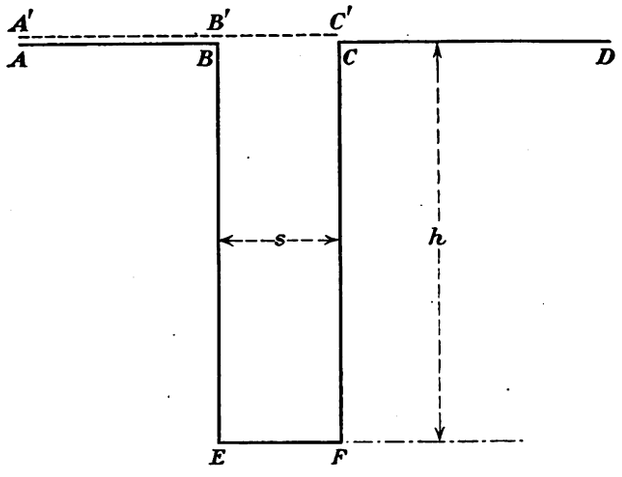
carrying a current i. But this idea must be wrong, for the dimensions of magnetic intensity are current/length, and a magnetic intensity therefore cannot be represented by an expression whose dimensions are current/(length)^2.

Actually, with the CGS electromagnetic units here referred to, the magnetic intensity varies from about i/x to about $2i/x$, according to the distance of the point in question from the middle of the conductor, it being assumed that the length of the conductor is many times as great as x. The mistake of putting x^2 in the denominator has caused the E.R.A. to give an incorrect rule for dealing with cases in which their method is employed with a drawing that is not full-size. If the scale of the drawing is 1/8, as is likely when we are dealing with a very large circuit breaker, the method represents the force as being about 1/8 of what it really is. And more than an hour's hard work would be required for arriving at this wrong result, whereas the right result can easily be arrived at by my method in two or three minutes.

For the proofs of the formulæ that are given below, I must refer the reader to my article in the "Journal of Scientific Instruments," dated November, 1927, or to the French translation that appeared in the "Revue Générale de l'Électricité," dated May 12, 1928. In those articles, the CGS electromagnetic units are adhered to throughout; but in what follows, the currents are in amperes and the forces in pounds. It will be seen that the length unit is immaterial, since the lengths occur only in the form of ratios.



If the vertical leads of the circuit breaker have a radius r, a length h, and a distance s between their axes, and if the current is I amperes, the electromagnetic force that these leads exert on the crossbar EF (see diagram) is a downward one of

$$4{\cdot}5\ (I/10\ 000)^2 \log_e \frac{2{\cdot}57\ s/r}{\sqrt{(s/h)^2+1}+1} \text{ pounds,}$$

each of them exerting half the force here indicated. This is an improvement upon the corresponding formula in my article; it embodies a more accurate evaluation of $2e^{\frac{1}{4}}$ (namely, 2·57 instead of 2·56), and a closer approximation to the value of dw/dh (where dw is the increase in the store of magnetic energy due to an increase of dh in the length of each vertical lead).

If the horizontal conductor AB or CD has a length m, the electromagnetic force that it exerts on the crossbar is an upward one of

$$2{\cdot}25\ (I/10\ 000)^2\left\{1+\sqrt{((m+s)/h)^2+1}-\sqrt{(m/h)^2+1}-\sqrt{(s/h)^2+1}\right\} \text{ pounds.}$$

If the horizontal conductor CD is replaced by one that takes the current in the opposite direction, as indicated by the dotted line $A'B'C'$, the part $A'B'$ will practically nullify the effect of AB, and the part $B'C'$ will exert on the crossbar a downward electromagnetic force of

$$4{\cdot}5\ (I/10\ 000)^2\left\{\sqrt{(s/h)^2+1}-1\right\} \text{ pounds.}$$

These formulæ give the instantaneous force when I is the instantaneous value of the current, and consequently give the average force when I is the root-mean-square value of the current. As a little consideration will show, they enable one to deal with any two conductors that are either parallel or perpendicular to each other.

Like previous writers on this subject, I have been assuming that there is no magnetic material in the path of the flux. The object of my article was to show that the fundamental case of conductors in a non-magnetic medium had not been satisfactorily dealt with. It may here be mentioned, however, that the usual iron tank of an oil circuit breaker will shield the crossbar from the flux that is due to the horizontal conductors outside the tank, and will thus make it unnecessary to allow for the presence of these conductors.—I am, etc.,

W. F. Dunton.

1, Haddon Avenue,
Failsworth,
Manchester.

Electrical Development in London.

[To the Editor.]

Sir,—When one of the supply companies operating in one of the suburban districts of London, not more than eight miles from Charing Cross, offered its consumers a two-part tariff with a unit charge of 1d., some of those who had previously been unable to make full use of electricity for domestic purposes were encouraged to believe that the new tariff would herald their electrical emancipation. That those hopes have not as yet been realised in at least one case will be seen from the following statement of facts.

Being desirous of installing an electric cooker, electric fires, and other domestic equipment, I informed the supply company of my requirements and asked what facilities they could offer in the form of hire or hire-purchase of cookers.

Instead of replying to my letter, the company sent a representative at a time which a moment's thought would have shown that I would be engaged at my work. My wife had the task of interviewing the representative, and as a result, it was reported to me on my return that no hire or hire-purchase facilities were afforded for cookers, and that in any case they could not consent to the installation of apparatus with a maximum load higher than 3 kW, which meant that if I wanted to have the food for my family of five (not allowing for visitors) cooked electrically, it must be done—presumably in relays—in a cooker of the "baby" class.

This may be a small matter to the supply company, but even in my small flat, they have waiting for them a load of at least 10 kW, which they are not prepared to take. As there must be many similar cases in the neighbourhood, there is a substantial load going begging which would certainly justify some sort of effort to acquire. It was gathered from the conversation with the company's representative that new mains would have to be put in—someday. In the meantime, the local gas company retains, for a further indefinite period, at least, one very reluctant user of a gas cooker.

Incidentally, it is surprising that a company which is not prepared to supply much beyond mere lighting requirements should offer its consumers a tariff which, while giving the latter a financial advantage on lighting, seems to give no corresponding advantage to the company.—I am, etc.,

A Mere Consumer.

London, S.E.26.
July 17th.

POINTS OF VIEW.

There is no animosity against British products.—*Mr. William T. Cosgrave.*

* * *

The telegraph is not itself a dying industry, but a growing one.—*Mr. James J. Tyrrell.*

* * *

The day is far past when you can leave your wares, however good they are, to sell themselves.—*Sir Ernest Petter.*

* * *

However optimistic I may have been in the past, I feel even more optimistic to-day as to the future of the electrical industry.—*Mr M. J. Railing.*

* * *

There is undoubtedly a growing consciousness on the part of school authorities that some training in matters electrical should be given to girls during their school life.—*Miss C. Haslett.*

* * *

The lower costs due to rationalisation means lower prices to meet competition for orders at home and abroad. They have a two-fold effect: they lower prices to the user or consumer and so possibly bring about a larger demand.—*Sir George Sutton.*

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NEWS IN BRIEF.

Wimbledon and Domestic Appliances—Electric Heating at Gravesend—The Marking of Permanent Magnets—The Engineers' Club again on Fire.

STEPS are being taken to arrange an electrical exhibition at Briercliffe, Lancs.

Shipley Electricity Committee recommends the Council to purchase showroom premises in Westgate, Shipley, for £1 800.

Wakefield Electricity Committee has authorised the installation of power plugs at Council houses where tenants guarantee a small minimum payment.

Middlesex County Council has decided to duplicate the electrical apparatus at the Clare Hall Sanatorium sewage works, at a cost of about £150.

Bingley U.D.C. requires an assistant to the Electrical Engineer.

Barking U.D.C. requires a mains superintendent and an assistant rotary sub-station attendant.

Whitby U.D.C. has received sanction to a loan of £1 500 for the construction of electricity showrooms.

The City of London Corporation is about to electrify the goods lift at the Guildhall School of Music, at a cost of £135.

The Rev. Edward S. Woods, Vicar of Croydon, is raising funds for the improvement of the electric lighting of the old parish church.

Wimbledon Electricity Committee is to seek sanction to the borrowing of a further £15 000 for the purchase of domestic electrical apparatus for hire.

Gravesend Town Hall Committee recommends a system of electric heating for the municipal offices, at a cost estimated at £436. The Electrical Engineer is to obtain tenders.

The Post Office submarine telephone cable between Lancashire and Co. Down was put into operation on Monday. Calls were made to London immediately.

Mr. Montague Williams, who has acquired the pier at Exmouth, intends to transform it into an amusement place. Among other attractions will be electric auto-scooter cars.

Dumfries T.C. has decided to fix the wages and conditions of engine room attendants and the assistant engineer at the electricity works in accordance with the terms of the National Joint Board for Electricity Undertakings.

The new Reliance telephone exchange, Walworth Road—the 12th automatic telephone exchange in the London area—was opened on July 11th. It is expected that 10 more automatic exchanges will be opened in the London area before the end of the year.

The Engineers' Club, London, which was damaged by fire a few weeks ago, was the scene of another fire on July 11th. Last week's fire originated on the first floor, did considerable damage in the upper storeys, and destroyed much of the scaffolding, which had been in use in connection with repairs after the previous fire. See page 91.

The Standing Committee appointed by the Board of Trade will hold an inquiry at 10.30 a.m. on July 30th, as to whether the following classes and descriptions of goods should bear an indication of origin: engineers' rules of metal; steel measuring tapes; tuning forks; permanent magnets. The inquiry will be held at the Board of Trade Offices, Great George Street, London, S.W.1. Communications should be sent to the Secretary, Mr. E. W. Reardon, at that address.

The Institute of Transport announces that its tenth annual dinner will take place at the Hotel Cecil, London, on March 12th, 1930.

If the Preston all-electric house experiment proves satisfactory, the same type of house will be adopted in a Corporation housing scheme.

Brierfield U.D.C. has applied to the Electricity Commissioners for sanction to a loan of £5 000 for the construction of the sub-station at the town hall which is rendered necessary by the change over from d.c. to a.c.

A burgh electrical engineer and manager is required at Dumfries.

The Commissioners for the Port of Calcutta require an electrical engineer. Applications to Mr. J. Angus, 10, Princes Street, Westminster, S.W.1.

Walsall Corporation has passed plans for the provision of accommodation for electricity showrooms and offices at the old Borough Offices, Upper Bridge Street, at a cost of £4 407.

An electrician-mechanic is wanted by the Public Works Department of the Government of Nigeria. Applications to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1. (Reference M. 1 514.)

Rotherham Education Committee has appointed a special committee to consider the system of heating to be adopted in the new technical college and to visit schools and institutions where electric heating has been installed.

Plans for the construction of a canal and a number of hydro-electric stations from Bukharest to the Danube have been approved by experts of the Rumanian Ministry of Communications. The scheme will cost about £3 650 000.

Interesting items at the exhibition of engineering models and apparatus on the occasion of the recent conversazione of the Institution of Civil Engineers included a model of a 132 000 V sub-station now being constructed by the Central Electricity Board; and a wireless beacon transmitting panel and a master clock for automatically controlling the times of signals, shown by the Elder Brethren of Trinity House.

Newcastle-upon-Tyne Corporation has passed a resolution to the effect that the present state of the law with regard to the testing and certification of electric meters is defective, and that the Corporation urges upon the Government the need for legislation requiring the certification and stamping of meters. The Electricity Commissioners are in communication with the Corporation with a view to ascertaining in what respects it regards the present state of the law as being defective.

The Judicial Committee of the Privy Council has dismissed, with costs, the appeal of Mr. Benjamin F. Groat, against judgments of the Trial Court and the Appellate Division of the Supreme Court of Ontario to the effect that the appellant's patent No. 189 369, dated April 1st, 1919, for a method of controlling surface water and other fluids with a view to the prevention of rivers, etc., becoming clogged with ice or other substances had not been infringed by the Hydro-Electric Power Commission of Ontario.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN, *dated July 19th, 1879, recorded that:*

The Eastern Telegraph Co. built a small vessel—the "Retriever"—for repairing the 82 shore ends of cables on its system.

Various novelties, including a patent fluid-filled Johnson and Phillips insulator, were shown at the conversazione of the Society of Telegraph Engineers.

A correspondent in America reported that during a visit to Menlo Park, Mr. Edison "exhibited the standard with the spiral of platinum at the top, which, for want of a better name, he calls a lamp." The high price of platinum for the "incandescent coil" was said to be an obstacle to practical success.

* * *

TWENTY-FIVE years ago it was reported in THE ELECTRICIAN *of July 22nd, 1904, that:*

The text was issued of the Bill "To provide for the Regulation of Wireless Telegraphy."

Bournemouth Lighting Committee declined to consider ratepayers' demands for the adoption of public electric lighting on Sundays.

Thieves who stole a quantity of cable from W. T. Glover's works put it on a fire so that the copper might be more readily available. Unfortunately for them the cable was of a fireproof type, and was abandoned in a sooty, but otherwise undamaged, condition.

* * *

TEN years ago, according to THE ELECTRICIAN *for July 18th, 1919:*

The new Household Fuel and Lighting Order permitted an annual consumption up to 1 600 kWh without certificate from the local Fuel Overseer.

Many "peace" illumination schemes had to be abandoned on account of the E.T.U. demand for a special rate of 2s. 6d. an hour plus a bonus of 12½% for such work.

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PERSONAL.

GELLYGAER U.D.C. has accepted the resignation of Mr. H. McNaul, electrical engineer and manager.

Mr. R. S. Wright has been elected to serve on the Council of the British Institute of Radiology for the 1929-30 session.

The offices of Mr. E. G. Okell, city electrical engineer, Plymouth, have been transferred to Armada Street, Plymouth.

Mr. J. W. Ellison has been appointed senior charge engineer at Newry power station, with Mr. E. Hillen as second in charge.

Bolton T.C. has increased the salary of Mr. H. Makin, buyer and salesman in the electrical fittings department, from £350 to £375.

Mr. G. A. Featherstone, Mr. Wm. Lee and Mr. J. Russell Knowles have recently been elected to the Board of Silvertown Lubricants, Ltd.

Mr. G. G. Eaglesome, late executive engineer of Babcock and Wilcox, Ltd., has been appointed joint managing director of Kiesselbach Steam Accumulators.

Mr. R. Lee, electrical engineer at St. Helens, who is leaving to take up a similar position at Stockport, has been presented by the staff and employees with a mahogany timepiece.

Estate of the gross value of £8 375, with net personalty £8 336, was left by the late Mr. Roland R. Marshall, who was for 20 years chief electrical engineer to Ayr Corporation.

Mr. Leslie Spencer Gould, eldest son of Mr. Charles Gould, electrical engineer at the First Garden City, Letchworth, has passed his B.Sc. Examination with honours in electrical subjects.

Mr. W. S. Johnston, manager of the Dumfries electricity works, has been appointed borough electrical engineer and manager at St. Helens at a salary of £800 per annum, rising in four years to £1 000.

The marriage of Mr. Joseph F. Drage, electrical engineer at the Kemsley Paper Mills, Sittingbourne, and Miss Edith Mary Allison Webb was solemnised at St. Michael's Church, Sittingbourne, on June 24th.

Mr. Alan D. Maclean has resigned his position as chief assistant engineer of the Yorkshire Electric Power Co. in order to take up the position of general sales manager to International Combustion, Ltd.

Messrs. H. Walkington and H. A. Webb have been appointed works manager and assistant works manager, respectively, of S. G. Brown, Ltd., while Mr. H. C. Goodman has accepted the position of home sales manager.

Darlington T.C. has stabilised the salary of the borough electrical engineer, Mr. J. R. P. Lunn, at £1 500 per annum for the three years ending March 31st, 1931, and at £1 600 for the four years ending March 31st, 1935.

Sir Felix J. C. Pole has been elected a director of the British Thomson-Houston Co., Ltd. He recently resigned the post of general manager of the Great Western Railway to become chairman of Associated Electrical Industries.

Lieut. Lancelot E. C. M. Perowne, R.E., who was recently appointed adjutant of the Tyne Electrical Engineers, has been given the rank of captain in the Territorial Army while so employed and seconded in the Royal Engineers.

Mr. A. A. Campbell Swinton, F.R.S., a director of W. T. Henley's Telegraph Works Co., Ltd., and other companies, who has been ill for some time, has now been able to leave his room, and it is hoped that he may soon resume his usual activities.

With reference to the paragraph on page 55 of our last issue, concerning the impending appointment of Mr. Railing to the position of joint managing director of the General Electric Co., Mr. Railing's initials are, of course, M. J., and not A. J. as printed.

The marriage of Mr. Kenneth Leslie Theobald, who is engaged in the research department of the radio station at Rugby, and Miss Mabel Mary Betts, was solemnised on June 22nd, at Colchester. Mr. Theobald was formerly on the staff of Marconi's Wireless Telegraph Co., at Chelmsford.

The marriage of Mr. Alan Victor Sowman, assistant manager of the Manchester branch of Crompton Parkinson, Ltd., and their representative in the Liverpool district, and Miss Winifred Thwaites, who was on the Chelmsford staff of the firm, was solemnised at St. Mary's Church, Broomfield, Chelmsford, on June 28th.

The Board of Directors of the Marconi International Marine Communication Co. has appointed Marchese G. Marconi president of the company. The Rt. Hon. F. G. Kellaway has been appointed chairman in the place of Marchese Marconi. Mr. Kellaway will retain the office of managing director.

Sir George Croydon Marks, of the firm of Marks and Clerk, consulting engineers and patent agents, who was a Liberal M.P. from 1906 to 1924, has been raised to the Peerage. Sir George, who recently announced his intention to support the present Labour Government, has decided to adopt the title of Baron Marks of Woolwich.

Three new Beit Fellowships for Scientific Research, of the value of £250 a year for two years, have just been awarded, and amongst the three Fellows who were elected a year ago, and whose awards have been confirmed for a second year, is Mr. E. C. S. Megaw, whose Fellowship was awarded for electrical engineering research.

Six colleagues wearing rubber insulating gloves and supporting transmission lines bearing zinc plates on which were the words printed in bold red letters, "Danger, 33 000 volts," formed a guard of honour at the wedding on July 11th of Mr. Albert Strong, assistant mains engineer for Leicestershire and Warwickshire Electric Power Co.

Mr. A. S. Clarke, assistant sales manager of the North Metropolitan Electric Power Supply Co., who is leaving the company's Enfield undertaking to take up a position as distribution engineer with the Burma Electric Supply Co., was, last week, presented with a case of pipes by the members of the Enfield staff. He sails for Burma on October 4th.

Sir Richard Threlfall has been presented with the medal of the Society of Chemical Industry. Sir Richard was formerly Professor of Physics at Sydney University. Since his association in 1889 with a firm of phosphorus manufacturers of Birmingham he has directed his attention to the application of engineering, especially electrical engineering, to chemical manufacture.

Worcester Electricity Committee recommended that the salary of the electrical engineer, Mr. C. M. Shaw, be increased, by £150 a year to £1 150, on the understanding that he undertook the duties of development officer. The Council, however, has deferred the matter until the presentation of the city budget at the end of the financial year. Mr. Shaw has been appointed development officer at a salary of £50 a year.

The Establishment Committee of Hackney (London) B.C. recommends that Mr. J. W. London be appointed showroom manager in the electricity department at a salary which, under the National Joint Board schedule, amounts, at present, to £297 17s. per annum, and that Mr. E. Brown be appointed sales manager. Mr. London and Mr. Brown have already occupied the positions referred to during a probationary period.

Mr. James Witter, superintendent of installations, Liverpool electricity department, has retired on superannuation. As the result, Mr. T. L. Bowler, assistant superintendent of installations, is appointed superintendent of installations; Mr. Sidney Wellington Hillsdon, wireman, is appointed assistant superintendent of installations; Mr. A. E. Aird is appointed electrical installation engineer; and Mr. R. C. Burton assistant to the electrical engineer.

Mr. Geo. W. Essex, previously assistant secretary, has been appointed assistant general secretary of the E.P.E.A., in succession to Mr. J. W. Thomas. Mr. J. F. Wallace, previously regional secretary, is now an assistant secretary, and his field of operation has been extended to include, in addition to Scotland, the North of England, North Wales and Ireland. Mr. Geo. E. Love has been appointed an additional assistant secretary to operate in the Midlands, South of England (including London) and South Wales.

The Kelvin Medal for 1929 has been awarded to M. André Blondel (France). He has been engineer of the Ponts et Chaussées since 1889, and also for many years the chief engineer of the light house services, and he is distinguished by his work on signalling apparatus, optical and electrical, and particularly for his investigations in connection with electrical measuring apparatus and photometry. In 1913 he became a member of l'Académie des Sciences, and in 1923 was appointed Inspecteur-Général des Ponts et Chaussées. Other recipients of the Kelvin Medal have been Dr. W. C. Unwin, F.R.S., Prof. Elihu Thomson, and Sir Charles Parsons.

OBITUARY.

MR. GEORGE JAMES DUNKLEY, at Manchester on July 10th, aged 56 years. Mr. Dunkley was a much esteemed representative of the Insulating Varnish Department of Pinchin, Johnson and Co., Ltd., in whose employ he was from 1917 to the time of his decease. He was for some time works manager of Micanite and Insulators, Ltd., and also served as foreman of the Mica Department of the British Westinghouse Co., Ltd., from 1905 to 1917.

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OVERSEAS TRADE.

Electrical Exports for Six Months Exceed Imports by £5 894 582.

UNITED Kingdom exports of electrical machinery, apparatus and material during June last amounted to £1 383 752, as against £1 574 951 for the same month last year. The decline by comparison was £191 199. Electrical exports for the six months January to June, 1929, amounted to £9 357 587, or £19 922 less than for the corresponding period of last year. Imports of similar goods during June, 1929, amounted to £622 148, compared with £474 604 during June, 1928, and for the six months of this year and last year the totals were £3 463 005 and £2 965 404, increase £497 601.

These figures indicate that June exports were £761 604 in excess of imports during the same month, and during the six months January to June electrical exports were in excess of imports by £5 894 582.

Export items which showed improvement during June when compared with the same month last year were telegraph and telephone wires and cables other than submarine, increase £35 600; electric carbons, increase £1 791; electric glow lamps, £3 110; and various electrical goods and apparatus, £16 157. Exports of railway and tramway motors, on the other hand, decreased by £27 987, motors and generators by £37 281; and other machinery by £57 097.

The item which showed the biggest increase on the import side was telegraph and telephone instruments and apparatus, the increase being £76 164. The following are detailed figures:—

	Month of June.		Six months,	
	1928	1929	1928	1929
	£	£	£	£
IMPORTS.				
Electrical Machinery	134 794	136 905	876 491	894 247
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	10 426	18 179	75 747	116 915
Insulation other than rubber (not being Telegraph or Telephone Wires or Cables	59 122	53 675	278 055	295 666
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	4 826	2 230	46 784	27 593
Submarine Telegraph and Telephone Cables	—	—	—	—
Telegraph and Telephone Instruments and Apparatus (except wireless valves)	45 660	121 824	291 390	632 523
Carbons, Electric	7 387	14 262	70 030	90 660
Electric Lamps and Parts thereof—			245 981	151 210
Electric Glow Lamps	25 860	12 484	4 155	4 305
Arc Lamps and Electric Searchlights	1 648	660	11 721	4 243
Parts thereof (except Carbon Rods)	1 513	424		
Batteries and Accumulators (including parts)	39 130	55 791	253 430	293 537
Electrical instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), House Service Meters, and Scientific	27 461	68 723	138 626	174 889
Switchboards, other than Telegraph and Telephone	323	239	777	1 578
Electrical Goods and Apparatus, all other sorts	116 454	136 752	672 217	775 639
Total of Electrical Goods and Apparatus	474 604	622 148	2 965 404	3 463 005
EXPORTS.	£	£	£	£
Electrical Machinery—				
Railway and Tramway Motors	44 948	16 961	300 059	166 218
Other Motors and Generators	213 654	176 373	1 255 525	1 136 990
All other Sorts	354 661	303 564	1 901 207	1 926 861
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	122 968	103 641	706 922	767 645
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	159 838	110 256	773 238	792 431
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	59 005	94 605	503 153	565 706
Submarine Telegraph and Telephone Cables	15 912	4 045	109 521	61 483
Telegraph and Telephone Instruments and Apparatus (except wireless valves)	215 094	200 911	1 546 931	1, 410 443
Carbons, electric	340	2 131	8 802	4 943
Electric Lamps and Parts—				
Electric Glow Lamps	44 557	47 667	255 644	298 511
Arc Lamps and Electric Searchlights	2 885	313	7 558	4 654
Parts thereof (except Carbon Rods)	1 989	136	5 227	3 576
Batteries and Accumulators (including parts)	94 025	64 428	531 138	485 257
Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), House Service Meters and Scientific	31 477	30 611	201 573	191 678
Switchboards, other than Telegraph and Telephone	4 461	2 816	39 882	31 575
Electrical Goods and Apparatus, all other Sorts	209 137	225 294	1 231 129	1 509 616
Total of Electrical Goods and Apparatus	1, 574 951	1 383 752	9 377 509	9 357 587

OVERHEAD LINES.

Association's Interesting and Comprehensive Tour of the Mid-Cheshire Area.

THE Overhead Lines Association paid a visit to the Mid-Cheshire area on July 5th, when, starting from Winsford, members inspected the bulk supply switching and sub-station for Winsford and Gravel Farm adjoining the Winsford railway station, which is at the point of junction between the Runcorn-Crewe line and the Mid-Cheshire system. There is a similar switching junction point at Hartford, one being a standby to the other. The sub-station contains 33 kV Ferguson, Pailin drop down gear and metering gear, also 3·3 kV Metro-Vick cubicle gear and open switchboard for supply to Winsford and the country line. There is outside one U.A. outdoor switch, also air break switches and fuses and "English Electric" transformers.

Lines in Erection.

The party left Gravel Farm by charabanc and proceeded down Station Road through Winsford. At the extreme end of the suburb of Over a steel pole single-phase rural line, 640 ft. span, with 3 300 V copper-steel conductors, was seen in the course of erection. The route passed through the beautiful Whitegate area, one of the several rural districts developed on the single-phase 3 300 V system, and the lines were pointed out in several places along this route, the special arrangement of conductors and patent guard bridging the earthed return, and the earth wire being noted. The party continued its tour via Sandiway Golf Course, Sandiway, the Blue Cap Hotel to Kennel Wood, where spruce timber dealt with by Cobra process was inspected, followed by a call at the 10 H.P. booster station. Proceeding along Chester Road to Delamere, and the village of Norley, compound lines and patent guarding of 3 300/220 V, avoiding duplication of poles and allowing of heavy consuming devices were examined. Points of special interest were the inconspicuous entry for overhead service to Norley Church and cheap crossings over Post Office lines, using Pernax P.B.J. at 3 300 V. The Delamere Housing Estate, Ruloe and Upper Cuddington, represent electrical development in beautiful surroundings, all farms and cottages having been wired for the tenants by the owner, Major Wilbraham.

The tourists then made their way by Hefferston Grange Sanatorium, stopped to view the native poles from Kennel Wood, "Cobra" treated for the 3 300 V line now being erected to supply these premises and Acton Village, to Weaverham village, developed by the Weaverham Company in 1913, and left much as it was then. Of special interest was a comparison of the thin poles and present practice indicating the advance in style since that date. The party then proceeded through the village to Owley Wood, Brunner Mond and Co.'s Housing Estate, glanced at the sub-single phase underground development in three circuits, and then down Weaver Valley to Wallerscote, noting on the way the Northwich step down sub-station, 33 kV to 3·3 and 6·6 kV heavy three circuit line. Brunner Mond and Co.'s new works extension, and research laboratory were also seen. Passing through Davenham on the way back to Winsford of special interest was the chimney distribution, avoiding frequent service lines.

Proposing the toast of "The Overhead Lines Association" during the tea interval at Northwich, Mr. ROBERT BLACKMORE, until recently chief of the Stalybridge, Hyde, Mossley and Dukinfield Joint Electricity Board, said the Central Board's scheme depended for its success upon the growth and development of cheap distribution, and it looked to the O.L.A. for support.

Mr. W. FENNELL, general manager of the Mid-Cheshire Electricity Supply Company, and president of the O.L.A. referring to subsidies, said the Government might pay half the cost to lay cables underground, but he did not think they would. When it came to touching their pockets they would be careful, and it could be avoided by the extensive use of overhead lines.

Mr. THEODORE STEVENS, hon. secretary of the O.L.A., said the 1926 Act did not fully serve in the development of the rural areas, and 50% of London and 90% of some cities, which ought to come before the inter-connecting of great power stations. He advised the O.L.A. to push for the "grid" to be used to supply current to rural and other areas not at present served, and for the development of the load for the good of the people.

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LEGAL INTELLIGENCE.

Continued Hearing of Case with Respect to Barton Power Station.

IN the House of Lords this week, Viscounts Dunedin and Sumner and Lord Blanesburgh continued the hearing of the appeal of the Lord Mayor and Corporation of Manchester, which arose out of a claim by Mr. Arthur Farnworth for damages and for an injunction to restrain the Corporation from committing a nuisance by their power station at Barton-upon-Irwell, in the County of Lancaster.

Last week their lordships intimated that they did not desire to hear further evidence on the question of the construction of the Acts, and Mr. Cyril Atkinson, K.C., counsel for the Corporation, addressed himself to the question whether or not the nuisance was inevitable or was avoidable.

He quoted the evidence of engineering witnesses to show that the generating station represented the best modern practice in design, and was considerably in advance of any other station in the country for efficient generation of electricity; that from the point of view of sulphur content the Corporation was using the best class of coal reasonably available, and that the substitution of a single chimney stack for the existing group of lower chimneys was impracticable.

Mr. W. E. Tyldesley Jones, K.C., following on the same side, said the effect of the indictment was so serious in respect of this generating station, on which the supply of Manchester and a large industrial area depended, that he thought it necessary to make additional observations. There was no dispute that the Corporation had committed a nuisance and no dispute that this was a most efficient station with nothing unusual about it. The builders of the station when they constructed it had not in mind damages by fumes, and similar damage was not known elsewhere from generating stations. The evidence of the Corporation's experts was that they could think of nothing to improve matters. On the other side there were affirmative suggestions by Dr. Travers, negatived by the Corporation witnesses, that certain matters might avoid or lessen the damage. Dr. Travers advocated higher speed in the ejection of gases, higher chimneys above the roof, and the absence of clusters of chimneys. The defendants, who relied on statutory powers, said not that the nuisance was inevitable, but that it could not have been avoided by any reasonable or practical precautions that up-to-date science or experience would suggest, and he contended that precautions were only reasonable or practicable if they were consistent with the carrying out of the purpose for which the statutory powers were given.

Mr. Singleton, K.C., appeared for the respondent, and on Tuesday their Lordships reserved judgment after shortly discussing with counsel the form the injunction should take in the event of their deciding against the Corporation.

Appeal on Alleged Infringement.

In the Court of Appeal before the Master of the Rolls, Lord Justice Lawrence and Lord Justice Russell, the hearing was concluded on July 12th of the appeal of the Lektophone Corporation of Jersey City, U.S.A., from a judgment of Mr. Justice Tomlin in the Chancery Division in their action against S. G. Brown, Ltd., of Victoria Road, Willesden Lane, N.W., to restrain an alleged infringement of the plaintiffs' patent, granted in 1914, for an invention by Marcus Clarence Hopkins.

The invention related to "improvements in sound-regenerating machines," and the plaintiffs complained that the Brown "Mascot" loud speaker was an infringement of the patent. Respondents, denying infringement, contended that the Mascot was merely an enlargement of the telephone receiver which was referred to in an earlier specification by Mr. Sidney George Brown, managing director of the respondent company. Mr. Justice Tomlin dismissed both the action and a counterclaim for revocation.

Sir Duncan Kerly, K.C., for the respondents, now intimated that as the plaintiffs' patent expired in the course of a few days respondents were not persisting in their cross-appeal regarding the counterclaim.

The first point argued by Mr. Trevor Watson, for the appellants, was as to the construction of the documents. The question, he said, was whether or not the Hopkins' specification was limited to gramophones. Mr. Justice Tomlin had found that it was so limited, but counsel's contention was that was an erroneous interpretation of the specification and that the invention was extended to loud speakers.

The Master of the Rolls: "It seems to me that we have got to take the language as used."

Sir Duncan submitted that the proper way to construe the document was to say that it did not describe the application of the Hopkins invention as extending to anything other than the stylus machines. It was true at the time of the invention that there was one other sound regenerating machine—the telephone—but nobody suggested how one could use a diaphragm such as described in the Hopkins specification with the telephone.

It was quite true that with the loud speaker such a diaphragm could be used, but between 1913 and the date of the Mascot loud speaker there intervened an invention by Mr. Brown which, counsel suggested, referred to the problem. Until the introduction of the amplifying device which enabled telephone current to be employed so as to get power to any extent, there was no further scope for Hopkins' invention, assuming that it was an invention.

The Court had to consider the document in the light of the surrounding circumstances of its day. Mr. Justice Tomlin had found that the post-Hopkins problem—the problem of the loud speaker for broadcasting—was a different problem altogether. What happened when the loud speakers came on the market was that everybody thought of the cone without any reference, suggested counsel, to Hopkins at all.

Hopkins' invention had not been heard of in this country. But when there were already loud speakers of various kinds, different in design from the Hopkins diaphragm, the patentee arrived and began to collect tolls from everybody, alleging that he had a patent which covered all cone loud speakers.

The Court gave judgment on the point of construction in favour of the respondents.

The Master of the Rolls, in his judgment, said it was admitted that the alleged infringement could not be claimed if the patent related to particular machines with particular characteristics, as indeed Mr. Justice Tomlin had found it did so relate.

The specification dealt with two inventions, one being for an instrument to reproduce sounds and the other being the mode of transmission. Taking the two claims side by side, and bearing in mind they were separate claims referring to separate inventions, one found in the first reference to machines that had the characteristics of the stylus and record machines, while the second claim had relation to the transmission and vibrations of the stylus.

Looking at the two documents, both of them indicated and referred to the vibrations that were initiated by the stylus.

The Court was satisfied that Mr. Justice Tomlin's interpretation of the Hopkins specification was correct. That being so, he was right in dismissing the action, and it followed that the appeal failed.

Lord Justice Lawrence and Lord Justice Russell concurred, and the action was dismissed with costs and the counterclaim without costs.

IN PARLIAMENT.

Points from Recent Replies to Questions in the House of Commons.

THE Postmaster-General (Mr. Lees Smith) is aware that complaints are made from time to time by telephone subscribers of harsh treatment with regard to unpaid accounts. Over a million accounts are dealt with each quarter, and he is afraid it would be impracticable to inquire as to the cause of non-payment in individual cases. If a subscriber's absence from home is known, special consideration is given to the case.

In reference to a suggestion that free wireless licences should be granted to all incurably infirm persons, Mr. S. P. Viant (Assistant Postmaster-General) states that the Broadcasting Committee, 1925, recommended that this concession be made to blind persons only, and he does not consider he would be justified in asking Parliament to extend it to other classes of the community.

The Government are fully alive to the importance and urgency of the problem of London traffic, and are ready to explore it with all the interests concerned.

The local authority concerned has agreed to the erection of an overhead line through Poynton. The scheme of the Trent Valley Electricity Co. was the subject of a Ministry of Transport inquiry last week.

A temporary manual telephone exchange is being equipped to serve the Romiley area, pending the provision of an automatic exchange. The latter will form part of a large scheme for automatic working in the Manchester area.

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THE SOCIAL SIDE.

ON June 29th, the employees of the L.P.S. Electrical Co., Ltd., journeyed by road to Hastings on the occasion of the annual summer outing, where a most enjoyable day was spent. Lunch was provided by the managing director, who presided at the gathering.

S. Rogers and Co., Ltd., electrical contractors, 15, Fitzroy Street, W.1, held their second annual outing on June 29th, when a party of 37 visited Margate. The journey was made by train, and luncheon and tea were provided by the Nayland Rock Hotel. After a most enjoyable day, the party arrived back in London at about 11 p.m.

The fifth annual sports and gala of Johnson and Phillips, Ltd., were held on July 6th on the works sports ground at Kidbrooke. Although the weather was doubtful, a large crowd of employees and their families and friends came and saw several of the firm's " records " lowered, and to enjoy the long and varied programme, which included track and field events. Sideshows were this year an additional attraction, and music was provided by the band of Callender's Cable Works. The prizes were presented to the winners of the events by Mrs. Macgregor.

Three G.E.C. championships were decided on the Wembley sports ground on June 29th. The cricket challenge cup, presented by Sir Hugo Hirst for competition by the London establishments of the G.E.C., was won by Union Works, Wembley, who defeated Watson's Works. The tennis finals for challenge cups, presented by Mr. C. Wilson and Mr. E. G. Byng, were also played off on the hard courts at Wembley. The " Wilson " cup for gentlemen of the London establishments was secured by the team representing the Osram Lamp Works, who beat the Magnet House head office team. The Magnet House head office ladies' team, however, secured their revenge in the " Byng " Cup competition for ladies of the various London establishments, as they were successful in wresting the trophy from the Fraser and Chalmers ladies' team who had held it for the past two years.

The annual athletic meeting of the Crompton Parkinson Sports Club was held on July 6th, at the company's Wood Street Ground, Chelmsford. There was a record attendance, and some extremely good times were recorded in several of the events. Chelmsford beat Guiseley in the new competition for a tennis championship cup presented by Mr. Frank Parkinson, the managing director. There was great enthusiasm when Colonel Crompton, who founded the company 51 years ago, appeared on the platform, and in a happy little speech proposed a vote of thanks to Mrs. Claude Hardie, who presented the prizes. The " Guvnor," as he is called, spent the morning at the Chelmsford works, inspecting modern examples of electrical plant and renewing acquaintances with old friends. During the afternoon he met Mr. E. A. Pochin, who many years ago designed the Crompton-Pochin arc lamp. During the meeting a programme of music was given by the Crompton Parkinson Silver Band, under the direction of the conductor, Mr. Walter Hall.

BUSINESS ITEMS.

MR. J. D. WILLIAMS, wireless dealer, of 65, Cardiff Street, Aberdare, has opened a branch business at 72, Pontmorlais, Merthyr Tydfil.

The date now fixed for the opening of the Bucharest Radio Exhibition, which will include household electrical appliances, is September 1st, and the closing date, September 20th.

An Auckland (N.Z.) agent wishes to represent British manufacturers of domestic and electrical appliances, on a commission consignment or purchase basis. Further information from the Department of Overseas Trade. (Reference No. 540.)

A firm of commission agents in Aleppo, Syria, with branches in Beirut and Haifa, desires to obtain the representation of British manufacturers of electrical apparatus and accessories, especially wire. Particulars from the Department of Overseas Trade. (Reference No. 552)

The " Southern Cross," in both its flights, carried a wireless receiving set constructed by the NEW SYSTEM TELEPHONES PROPRIETARY, LTD. This set, equipped with Osram valves (viz., one S.215, two DEL.410 and one DEP.410), had a wavelength range of from 18 to 2 700 metres, and " Gecophone " headphones were used. The aeroplane was also fitted with Osram lamps for illumination purposes. See page 91.

Park Royal Hospital has just been equipped with a specially designed " Marconiphone " wireless installation, incorporating 70 loudspeakers and 400 headphones, and in addition to radio programmes gramophone record recitals are possible by means of a pick-up. Services from the chapel and entertainments from the dining hall may be relayed by means of microphones, which are also used for urgent staff calls and general announcements. The equipment is one of the largest in London and, being on the unit system, can be extended when desired, if the necessity should arise.

The contracts awarded to the ALTON BATTERY CO., LTD., in January by the Australian Postmaster-General have been followed by a further Australian contract for batteries for Marouba, Box Hill, Oakleigh, Cottesloe Hurstville, Sale and Freemantle Telephone Exchanges. In addition, batteries of C.E.M.F. cells are to be supplied for Box Hill, Oakleigh, Semaphore and Cottesloe Telephone Exchanges. The batteries range in capacity from 181 to 1 015 Ah. A further repeat order from Canada for an Alton battery of 4 630 Ah capacity has also been received.

BIRMINGHAM ELECTRIC FURNACES, LTD., inform us that they have received an order from David Brown and Sons (Huddersfield), Ltd., for a furnace having a usable hearth 14 ft. long by 3 ft. 3 in. wide, with a maximum rating of approximately 200 kW. This furnace is double-ended and will be used for reheating and carburising. It is believed that this will be the largest electric furnace for this purpose in the country. In addition, Messrs. David Brown and Sons have already four electric furnaces in operation for heat treatment purposes, three of which were supplied by Birmingham Electric Furnaces, Ltd.

ELECTRICAL "socials" have again been prominent, and of the many and varied snapshots we have received, two are reproduced above. That on the left was taken at the Crompton Parkinson Sports and includes, right to left, Mrs. Parkinson and Mrs. Hardie. The right hand photograph shows one of the four special trains which were recently employed to take a portion of the Ferranti staff to Blackpool and London respectively, on the occasion of their annual day's outing. The view shows one of the L.M.S. trains arriving at Hollinwood station, and faintly in the background can be seen the chimney and a small portion of the Hollinwood factory. This outing, which takes place every year, is a very popular feature, as will be realised by the fact that each train was so long as to require two locomotives.

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DOMESTIC FITTINGS AND APPLIANCES.

New Lighting Fitting Designs — Electrical Apparatus for Table Use — Diathermy Equipment—New Radio Lines.

DECORATIVE LIGHTING, LTD., in association with the Artistic Shade Co. and Cunningham Slater, Ltd., 146, Kensington High Street, London, W.8, produce large scale shades for cinemas, theatres and ballrooms. Most of the fittings are specially designed for each particular setting, while some of the smaller examples of shades on view in the showrooms, in conjunction with the photographs of installations, give a good idea of the beauty of the larger and more expensive models. The shades examined were hand painted with numerous kinds of design, some very elaborate, others quite simple. Captain Wynn Slater, who is largely responsible for this work, pays special attention to the appearance of the shades in daylight—a good policy, for it must be admitted that fittings which look delightful when illuminated can, if care is not taken, appear ugly during the day. He also endeavours to produce shading devices which will be in harmony with the atmosphere of any individual room, large or small; i.e., gaiety for ballrooms, cosiness for boudoirs, and repose for libraries. As an example of the work of the firm one may cite the relighting of the Elite Picture House at Middlesbrough. The basic scheme on which the designer went to work was Wedgwood, and it has been stated by a daily paper that the beauty of the interior has been doubled, and that, despite the striking effects achieved, the illuminants are in harmony with the general interior. In the centre of the dome ceiling is a shade 14 ft. in diameter, and around it are six shades of different shape but similar design to the centre one. The other lighting is produced by shades which, though smaller, are said to be equally artistic, and made flush with the ceilings, so that the apparent height of the building may not be diminished. The footlights are subdued behind flowers, and at either side of the proscenium are illuminated vases. Wedgwood vases contain the wall lights. In the field of ballroom lighting the scheme installed at the Plaza, Glasgow, can well be mentioned. By a relatively simple system of wiring a fresh colour effect can, it is stated, be obtained for each dance every evening for a week, without repetition. Thus the most suitable colour for each type of dance can be switched on at will.

A new hot water jug by the Electric Heating Co.

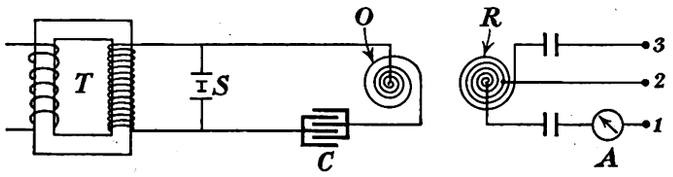
The ELECTRICAL EQUIPMENT AND CARBON CO., LTD., of Bank Buildings, 107-111, New Oxford Street, London, W.C.1, are marketing a light-weight, inexpensive vacuum cleaner, known as the "Carmenta." The machine is finished in polished aluminium and has a universal motor. It can of course be easily converted to a blower if desired.

The industrial lighting fitting, No. 54, of L. G. HAWKINS AND CO., LTD., 30, Drury Lane, London, W.C.2, has the special feature of a lower horizontal panel, which can be removed when the unrestricted light of the high-powered lamp is desired. This diffusing panel is circular and is secured in the base of the cylindrical fitting by slots, in such a way that it can be slipped out at will. The cylindrical bowl itself is of a somewhat novel design, and can be had either suspended by chains or as a ceiling type.

The ELECTRIC HEATING CO., of George Street, Croydon, has just put on the market an "Elect" water jug suitable for the tea and breakfast table. The capacity of the jug is 1¼ pints, and the loading is 400 W. The jug is constructed of stout metal upon which a heavy coating of nickel plate has been deposited. The handle is of heat resisting material covered with black and white cane.

During the present year interest has been aroused in diathermy treatment. The following particulars refer to the diathermy machines manufactured by the MEDICAL SUPPLY ASSOCIATION, LTD., of 167-185, Gray's Inn Road, London, W.C.1. The term "diathermy," meaning "through-heating," describes the physical effect of passing through the body a current of very high frequency. The current naturally generates heat all along its path, so that the tissues are heated throughout, thus producing "diathermy."

The apparatus used comprises step-up transformer, spark gaps, condenser and helixes. In the diagram reproduced on this page *T* is the transformer, *S* the spark gap, and *C* the condenser; the helix *O* is known as the oscillator, and the helix *R* the resonator. The resonator is so arranged that its position relative to the oscillator can be altered, the maximum diathermic effect being obtained when it is immediately over the oscillator. The person receiving treatment may be connected between terminals 1 and 2 or 1 and 3, which are coupled with the resonator through condensers. The ammeter *A* reads up to 3 000 milliamperes; the capacity of this apparatus is 6 500 milliamperes, but such heavy currents are only required in exceptional circumstances. The spark gap is of the Tungsten air type, which is stated to have an advantage over the gas type in that it requires no cleaning or adjustment. The instrument is finished in unscratchable cellulose lacquer, and is fitted with a white or grey marble panel. A safety cover protects the operator from accidental shocks; it is impossible to give treatment until the cover is in position, owing to the construction of the apparatus. A motor convertor is sold for use with the machine where no a.c. supply is available.



Illustrating the theoretical arrangement of the diathermy equipment of the Medical Supply Association.

A new ultra-violet ray lamp is the "Medi-Sun," also manufactured by the Medical Supply Association. This lamp is claimed to combine the giving of light containing a high percentage of violet rays with complete safety to the home user so long as the instructions are followed. The first claim can be verified in the showrooms, where a specially designed spectroscope is provided; this spectroscope also shows graphically how the "Medi-Sun" lamp and an ordinary luminous-ray therapeutic lamp may be used in combination to produce light, with whatever characteristics have been prescribed. Furthermore, a vita-glass filter can be used to cut off the ultra-violet rays below 2 900 Angström units. The lamp is of the quartz mercury vapour type, and takes normally 1½ A at 150 V. It can, however, be obtained in models adapted for supply circuits with pressures between 50 and 250 V. For d.c. the burner is of the two-pole type operated in series with a line resistance. The a.c. burner has three poles and is operated through a transformer, the connections being very similar to those of a mercury arc rectifier. The hood is free to rotate horizontally and vertically, and can be removed for packing; polished aluminium is employed, and the whole lamp has a strikingly attractive appearance.

The new "Hypermu" l.f. transformer.

The radio transformer, known as the "Hypermu," and manufactured by RADIO INSTRUMENTS, LTD., of 12a, Hyde Street, New Oxford Street, London, W.C.10, has two-

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special features—the use of which is stated to be a new magnetic alloy of superpermeability, and a specially arranged magnetic circuit designed to give extreme but uniform amplification. It is claimed that the amplification may be made practically the same at 25 cycles as at 1 000 cycles, and this is supported by National Physical Laboratory curves showing the application of the transformer to two different circuits. Owing to the high permeability of the iron circuit, it has been found necessary to enclose the transformer completely with an iron shield. One of the holding-down sockets has the metal exposed so that the shield can be easily earthed. The transformer is enclosed in a bakelite moulding.

A particular advantage claimed for the "Hypermu" is that its design reduces to a minimum the possibility of breakdown due to the passage of anode current through the primary winding. The method of connection recommended also lessens the risk of breakdown and is said to make the chance of high amplitude distortion almost negligible. The overall amplification of this transformer is large enough for it to be connected directly following a detector valve and feeding into a super-power or pentode output valve.

The new Marconiphone Model 55 is a five-valve cabinet receiver marketed at a price which brings it into competition with the cheaper range of five-valve portables. The MARCONIPHONE CO., LTD., of 210-212, Tottenham Court Road, London, W.1, is full of confidence in its popularity, since it is considered to have many of the good features of the higher-priced models. The five Marconi valves comprise two stages of h.f., detector and two stages of l.f., and all valves are stated to be tested in each set before the instrument is sent out. The battery equipment consists of a 108 V h.t. battery, 9 V grid battery and 2 V 28 Ah unspillable accumulator. A single switch is provided for changing from long to medium wavebands and for switching off. The running and volume controls are of the usual edge-control Marconiphone pattern.

NEW I.E.E. SUB-CENTRE.

Hampshire Members Attend Inaugural Meeting at Portsmouth.

HAMPSHIRE members of the Institution of Electrical Engineers gathered at Portsmouth on June 27th to form a sub-centre of the Institution, and the inaugural meeting was held in the Lord Mayor's Banqueting Room at the Guildhall, where a civic welcome was given. The Lord Mayor (Coun. J. E. Smith), who is recovering from a recent illness, was represented by the Deputy Lord Mayor (Coun. Frank J. Privett), who had been asked by the Lord Mayor to extend a welcome on his behalf and on behalf of the citizens. The Deputy Lord Mayor also welcomed the President of the Institution and said he was very happy that the inaugural meeting was held in Portsmouth.

Col. K. Edgcumbe (President of the Institution) proposed a vote of thanks to the Deputy Lord Mayor for his welcome, and while regretting the absence of the Lord Mayor and more especially the cause of that absence, he thanked the Lord Mayor for allowing them to meet in that magnificent building. He believed it was the first occasion on which one of their centres or sub-centres had been "christened" in a Guildhall, with a Deputy Lord Mayor standing as sponsor.

Mr. B. Handley seconded the vote, and associated himself with the President's remarks.

Col. Edgcumbe then observed that the local centres formed an important part of the Institution, and he thought the members who lived in Hampshire and the Isle of Wight were to be congratulated on having taken the step to form a sub-centre. The Institution set great store by their centres as they enabled the Institution to model its policy in such a way as to meet the requirements of the different districts.

Mr. B. Handley was unanimously elected as the first Chairman of the sub-centre, and other offices were filled as follows:—Vice-Chairman, Mr. W. G. Turner; Hon. Secretary, Mr. S. Harcombe; Hon. Treasurer and Hon. Assistant Secretary, Mr. P. G. Spary; Ordinary Members of Committee: Mr. R. Ayton, Mr. E. L. Ingram, Mr. N. W. Prangnell, Mr. H. J. Grapes, Mr. J. F. McMullen, Prof. G. D. A. Parr, Prof. H. Stansfield, Mr. H. Martin, Mr. G. Shearing, Major C. F. D. Suggate, Sir V. L. Raven and Lieut.-Col. A. E. le Rossignol.

Col. Edgcumbe and Mr. P. F. Rowell were thanked for their attendance, and Mr. S. Harcombe was thanked for undertaking the preliminary secretarial work of the centre. Mr. Harcombe announced that the membership for the county was 251 and that over 200 of those members were in the Portsmouth and Southampton districts.

ELECTRICAL WOMEN.

Electrical Association for Women Holds Fourth Conference at Newcastle-on-Tyne.

THE fourth annual conference of the Electrical Association for Women was held at the North-East Coast Exhibition, Newcastle-on-Tyne. The members were received at an informal reception on Wednesday evening, July 10th, by the local officers of the Association.

The opening ceremony at the Festival Hall, North-East Coast Exhibition, was presided over by Mrs. Wilfrid Ashley, President; the Lady Mayoress of Newcastle (Mrs. Arthur W. Lambers) expressed the city's welcome to the delegates, and Miss Baxter Ellis brought the good wishes of the exhibition authorities.

Five delegates were present from overseas, and gave interesting speeches on "The Modern Development of Electricity as it Affects Women," in their respective countries.

Miss Sophia Malicki (U.S.A.) spoke mainly from the point of view of the women working in the industry, and Miss K. Bohm (Germany) spoke from the point of view of the trained engineer. Mrs. Van Waveren and Mrs. Muller-Lulofs (both of Holland) spoke on developments in Holland from the housewife's point of view, Mrs. Van Waveren confining her remarks to the rural districts, and Mrs. Muller-Lulofs to the towns, with particular reference to Amsterdam. Miss H. Norris (U.S.A.) brought greetings from the Women's Division of the Electric Association, Chicago. The Rt. Hon. Margaret Bondfield, M.P., has long taken an interest in the Association, and she had hoped to be present. Parliamentary duties, however, kept her in London, and a letter from Miss Bondfield was read by Dr. S. Z. de Ferranti, F.R.S.

The Luncheon.

The meeting was followed by a luncheon at the Grand Assembly Rooms, Barras Bridge, and among those attending were the Lord Mayor and Lady Mayoress, the Sheriff of Newcastle and Mrs. Allan. Mrs. Wilfrid Ashley presided, and proposed "The King." The toast, "Success to Newcastle and the North-East Coast Exhibition," was proposed by Lady Brooks, who has been three times Lady Mayoress of Birmingham. Lady Brooks referred to the exhibition as "an extraordinarily plucky effort to re-establish trade conditions." The Lord Mayor responded.

Mr. R. P. Sloan proposed "The E. A. W.," and specially mentioned "The Electrical Age for Women" as an "age" which one could always talk about, and a magazine which he always found most interesting. Mrs. Wilfrid Ashley responded.

In responding to the toast of "The Guests," proposed by Miss Balls, chairman of the North-East Coast branch of the E. A. W., Mr. L. L. Robinson, borough electrical engineer, Hackney, said he thought the Association might consider collecting the women's point of view on the question of electricity tariffs.

The opening day of the conference ended with a reception and dance in the Grand Assembly Rooms, given by the city, and attended not only by E. A. W. delegates, but by visitors from Arras and members of the British Legion.

On Friday morning, July 12th, the annual general meeting of the Association was held at the Exhibition, presided over by Mrs. Hammer, chairman of the Council, and the annual report was presented by the director, Miss C. Haslett. Mrs. Wilfrid Ashley was unanimously re-elected President, and the other officers elected were: Mrs. S. Z. de Ferranti and Mrs. Hammer as joint chairmen; Coun. Mrs. Gregory as vice-chairman; and Mrs. Ll. B. Atkinson as hon. treasurer.

Immediately after lunch the delegates divided into four parties, and visits were paid to the Lemington Glass Works, the Cremona Park Toffee Works, A. Reyrolle and Co., Ltd., and Seghill Colliery.

On Friday evening delegates were entertained to dinner by the North-East Coast branch of the E. A. W., and were received by Miss Balls, chairman, and the vice-presidents, Miss Sloan, Mrs. Norbert Merz and Miss Teresa Merz. Miss Balls presided, and once again the Association was honoured with the presence of the Lord Mayor, and Lady Mayoress, and the Sheriff and Mrs. Allan.

On Saturday afternoon the party were taken in private cars to Borcovicus, one of the finest Roman encampments in this country, and on Sunday visited the Farne Islands, an experience for which gratitude was expressed to Mr. Sloan and the Newcastle-on-Tyne Electric Supply Co.

The arrangements of the conference locally were carried out by Miss Anna Holm, local secretary, and her committee.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

KEIGHLEY INDUSTRIAL CO-OPERATIVE SOCIETY, LTD.—Electrical work in tailoring and gentlemen's outfitting department. Specification from the Secretary, 5, Brunswick Street, Keighley.

WEST RIDING EDUCATION AUTHORITY.—Electric lighting installation in head teacher's house at Ardsley (E. and W.) Blackgates Council School. Specifications from Mr. Percy Beaumont, West Riding Education Office, 8, St. John's North, Wakefield.

SALFORD CORPORATION, July 19th.—Sub-station and pit type, single-phase transformers. Specification from the City Electrical Engineer, Frederick Road, Salford.

Hospital Lighting Installation.

METROPOLITAN ASYLUMS BOARD, July 20th.—Alterations and additions to electric lighting installation at Grove Park Hospital, Lee, S.E.12. Specification, etc., from the Board's Office, Victoria Embankment, London, E.C.4; deposit £1.

CENTRAL ELECTRICITY BOARD, July 22nd.—Supply and erection of central indicators and telephones in connection with the Central Scotland Electricity Scheme. Specification (C.S.-S.S. 15) and form of tender from Mr. R. H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

HINDLEY URBAN DISTRICT COUNCIL, July 23rd.—Erection of two electric motors and two centrifugal pumps at Strangeways pumping station. Specification from the Surveyor, Council Offices, Hindley; deposit £1 1s.

GAINSBOROUGH URBAN DISTRICT COUNCIL, July 24th.—Electric motors and pumps. Further particulars from Mr. S. W. Parker, waterworks engineer, Council Offices, Gainsborough; deposit £2 2s.

DOWN COUNTY REGINAL EDUCATION COMMITTEE, July 25th.—Electric light installation in Newcastle Technical School. Specifications, etc., from Mr. Castor J. Love, 5, Wellington Street, Belfast; deposit £1 1s.

EPPING GUARDIANS, July 25th.—Electric power installation, for laundry and well at the Institution. Specification from the Clerk, Union Offices, High Street, Epping; deposit £1 1s.

ABERTILLERY URBAN DISTRICT COUNCIL, July 26th.—Static transformer and low pressure switchgear for new central sub-station at Carlyle Street, Abertillery. Specifications from Mr. Dawson Thomas, engineer and manager, Electricity Offices, Abertillery, Mon.

HOUSE WIRING AT TORRY, July 26th.—Electrician's work of two houses at Balnagask Road, Torry, Aberdeen, for Mrs. W. Brebner and Mr. Alex Robb, respectively. Schedules, etc., from Mr. G. M. Hay, 177, Union Street, Aberdeen.

MANCHESTER CORPORATION, July 26th.—Manufacture, supply, and erection of a heavy oil engine and a c.c. generator at Partington gasworks. Specification, etc., from Mr. J. H. Sillitoe, Gas Department, Town Hall, Manchester.

CENTRAL ELECTRICITY BOARD, July 27th.—Supply and erection of 132 000 V overhead transmission lines, in connection with the Mid-East England Electricity Scheme. Specification (No. M.E.E.-P.L. 1), etc., from Mr. R. H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, W.C.2; deposit £2 2s.

HARLOW (ESSEX) LIGHTING COMMITTEE, July 27th.—Lighting the district from September 20th, 1929, to April 30th, 1930, by electricity or by other means (57 lamps), and also one lamp at the "George," for 12 months. Further particulars from Mr. R. C. Cowlin, chairman of the Committee.

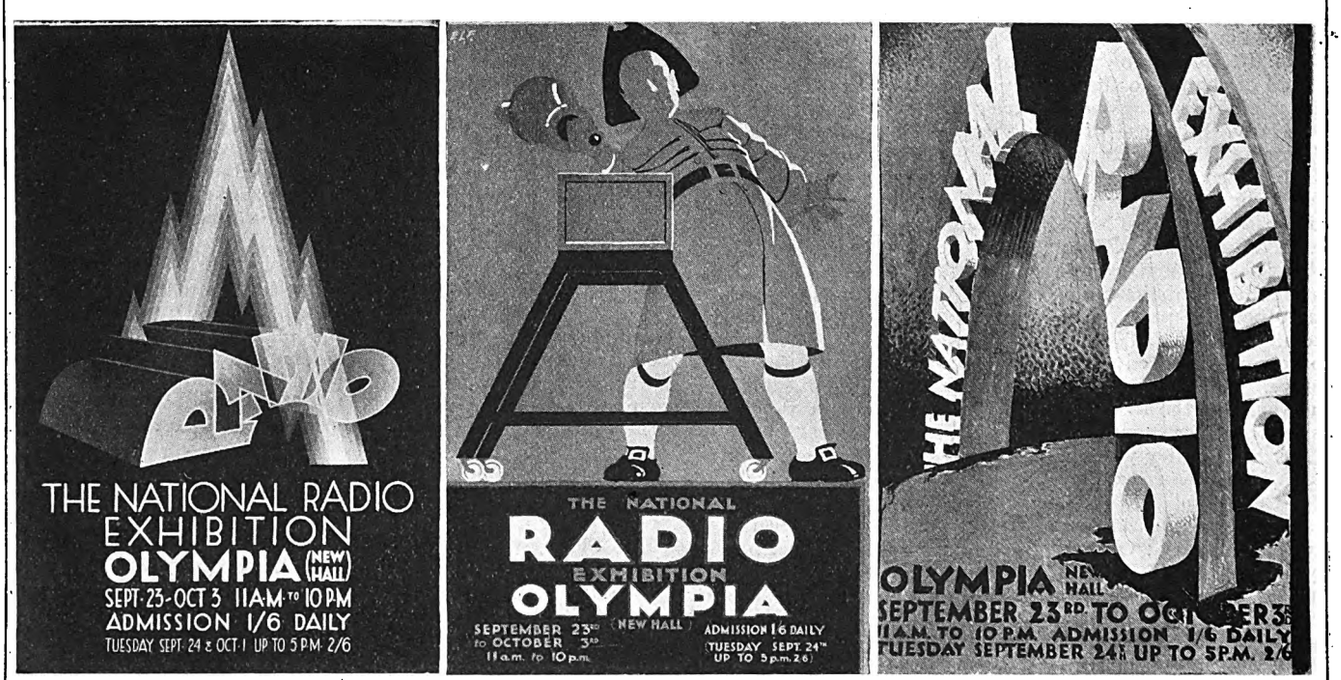
CARDIFF RURAL DISTRICT COUNCIL, July 29th.—Supply, etc., of sub-station equipment, underground cables, overhead lines, etc., in parish of Radyr. Forms of tender, etc., from Mr. R. Howard Fletcher, 3, Park Place, Cardiff.

Housing Scheme Contract.

DUNDEE CORPORATION, July 30th.—Electric light installation in connection with Fleming Trust housing scheme. Particulars from Mr. G. Baxter, 91, Commercial Street, Dundee.

MANCHESTER GUARDIANS, July 30th.—Circulating pumps and electric cable, at Crumpsall Institution. Specification from Superintendent of Works, Union Offices, All Saints', Manchester.

COMMISSIONERS OF H.M. WORKS, ETC., July 31st.—Electric lighting and power wiring at Natural History Museum, South Kensington, London, S.W. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s



THE posters which were awarded the first, second and third prizes respectively, offered by the Radio Manufacturers' Association in connection with the National Radio Exhibition to be opened at Olympia in September.

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ROCHFORD GUARDIANS, August 7th.—Underground cables, switchgear instruments, wiring, 25 H.P. motor, starting gear, etc. Specification, etc., from Mr. H. Tomlinson-Lee, 26, Victoria Street, Westminster, S.W.1; deposit £2 2s.

UTTOXETER URBAN DISTRICT COUNCIL, August 12th.—Overhead 11 000 V transmission line; e.h.t. and l.t. cables and roadwork and public lighting; and sub-station equipment. Persons desiring to tender must notify Mr. W. C. C. Hawtayne, 9, Queen Street Place, London, E.C.4.

NEWCASTLE ENDOWED SCHOOLS, August 24th.—Electric light installation in a new wing to be erected at each of two schools, viz.: Newcastle-under-Lyme High School, and Newcastle-under-Lyme Orme Girls' School. Specifications, etc., from Messrs. Cramp and Frith, 1, Dickinson Street, Manchester; deposit £3 3s. in respect of one contract, or £6 6s. in respect of both contracts. Tenders are invited only from firms on the National Register of Electrical Installation Contractors.

COMMITTEE OF VISITORS OF GLOUCESTERSHIRE MENTAL HOSPITALS, August 26th.—Electric wiring of Wotton and Coney Hill Mental Hospitals, on "Stannos" earthed concentric system. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

NEW ZEALAND POSTS AND TELEGRAPHS, July 23rd.—Supply of bronze and copper wire (tender No. P. and T. 151/1 599). (Reference A.X. 8 192.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 23rd.—Telegraph instruments (schedule C. 436). (Reference B.X. 5 323.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 23rd.—Adhesive insulating tape (schedule C. 457). (Reference B.X. 5 459.)

ST. JOSEPH'S CHURCH, CARRICKMACROSS, July 24th.—Electric wiring. Specification, etc., from Messrs. MacEntee and O'Kelly, 23, O'Connell Street, Dublin; deposit £1 1s.

VICTORIAN RAILWAY COMMISSION, July 24th.—Electric overhead travelling cranes, spare motors, and down shop trolley wires (contract No. 42 672). (Reference A.X. 8 092.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 25th.—Supply of two 2-ton electrically-driven hoist blocks (tender No. 1 471). (Reference A.X. 8 072.)

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., July 26th.—Supply of electric overhead travelling cranes, etc. Forms of tender and specification (£1, not returnable) from Mr. S. G. S. Young, secretary, 91, Petty France, Westminster, S.W.1.

MIDDLEBURG (S. AFRICA) MUNICIPALITY, July 29th.—Supply and erection of steam raising plant, steam driven alternator, condensing plant, 6 600 V transmission line and switchgear. (Reference B.X. 5 348.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 30th.—Motor driven centrifugal pump, to deliver 400 gallons per minute against total head of 50 feet, the motor to be wound for 230 V d.c. (Reference A.X. 8 150.)

CAPE TOWN MUNICIPALITY, July 31st.—Supply of paper-insulated, lead-sheathed cables (specification No. 467/1929). (Reference B.X. 5 486.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 1st.—One 10-ton electrically-driven overhead travelling crane, for Maritzburg workshops (tender No. 1 487). (Reference A.X. 8 105.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 1st.—Supply of telephone cable (tender No. 160). (Reference B.X. 5 345.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 6th.—Supply of 120-ton, four-motor, overhead travelling crane and runway (specification No. S.M. 358). (Reference A.X. 7 810.)

NEW ZEALAND POSTS AND TELEGRAPHS, August 7th.—Enamelled and silk-covered resistance wire (No. P. and T. 151/1 497). (Reference B.X. 5 322.)

PORT ELIZABETH MUNICIPALITY, August 8th.—One 250 kVA, 3-phase, self-cooled type, indoor transformer (specification No. 30). (Reference B.X. 5 487.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 8th.—Telegraph material, including g.i. tubular side-arms, insulators, paper sleeves, insulator spindles, etc. (tender No. 161). (Reference A.X. 8 112.)

CHILEAN MINISTRY OF MARINE, August 9th (extension of time).—Supply and erection of two aerial towers for new wireless station at Arica. (Reference A. 8 244.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, August 12th.—Supply and erection at Burrinjuck of auxiliary hydro-electric generating plant. (Reference B.X. 5 365.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 13th.—Water turbine driven generating sets and switchgear for Waitaki power development (section 2). (Reference B.X. 5 278.)

EGYPTIAN MINISTRY OF THE INTERIOR, August 13th.—Supply of electric power plant, with underground and overhead network, for the town of Maghagha, Minieh Province. (Reference B.X. 5 318.)

CHILEAN STATE RAILWAYS, August 16th.—Material for overhead lines, underground cable and cable boxes (Group 41); and material for lighting of locomotives and carriages (Group 43). (Reference C. 3 069*.)

CHILEAN STATE RAILWAYS, August 16th.—Telegraph and telephone materials, including copper wire and cable, switches, table telephones (Ericsson type), telephone cords, etc. (Reference C. 3 072*.)

CHILEAN STATE RAILWAYS, August 16th.—Supply of instruments of staff or tablet type, for installation at 36 stations between Alameda and Talca, locking apparatus for switches batteries and telephone combinations. (Specification C. 3 070*.)

URUGUAY POSTS, TELEGRAPHS AND TELEPHONES, August 17th.—Supply of telegraph wire. (Reference A.X. 8 229.)

AUCKLAND ELECTRIC POWER BOARD, August 19th.—Single-phase transformers. (Reference B.X. 5 324.)

PORT ELIZABETH MUNICIPALITY, August 22nd.—One 10 000 kW turbo generator and condenser, boiler, steam and feed water pipes, etc. (Reference B.X. 5 430.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 22nd.—Extension magneto bells, bell sets, condensers, magneto generators, central battery switchboard, tumbler switches, wall and table telephones, etc. (Reference B.X. 5 415.)

GREY ELECTRIC POWER BOARD, August 27th.—Supply and erection of generating plant, for the Arnold river hydro-electric scheme. (Reference B.X. 5 422.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 27th.—Supply of cord type switchboards (schedule C. 448). (Reference B.X. 5 428.)

NEW ZEALAND GOVERNMENT RAILWAYS, September 4th.—Supply of motor generator (specification 287). (Reference B.X. 5 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 7th.—Supply of v.i.r. wire. (No. P. and T. 151/1 573.) (Reference B.X. 5 416.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 10th.—Two-conductor cords (P. and T. 151/1 600). (Reference B.X. 5 462.)

LOURENCO MARQUES PORT AND RAILWAYS, September 11th.—Battery tractors and trailers. (Reference A.X. 8 172.)

BULAWAYO MUNICIPALITY, September 13th.—Supply of h.t. overhead transmission lines, stepdown transformers, pumps with motors, etc. (Reference A.X. 8 181.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 24th.—Supply of condensers (schedule C. 461). (Reference B.X. 5 488.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General, Victoria House, Strand, London, W.C.; deposit, £2 2s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

Tenders Accepted.

WAR OFFICE.—Metro-Vick Supplies, Ltd., 12 months' supply of electric fans.

BARNSTAPLE CORPORATION.—Mirrlees, Bickerton and Day, Ltd., 300 kW Diesel set, £5 532.

BURTON-ON-TRENT.—Forest City Electrical Co., erection of electric traffic signals in Station Street, £105.

LINCOLN CORPORATION.—Kirk, Wright and Co., electrical portion of 32 all-electric houses at St. Giles housing site.

BEDFORD CORPORATION.—Chloride Electrical Storage Co., Ltd., extension of battery, £339 8s. 7d. (Recommended.)

CANTERBURY GUARDIANS.—G. E. Dashwood, electric light installation in remaining portion of institution, £144 10s. 9d.

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CROYDON CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply of two 400 kVA transformer kiosks, £167 10s. each. (Recommended.)

CAMBERWELL (LONDON) BOROUGH COUNCIL.—W. M. Williamson, additional electric lighting at Wells Street baths, £118 15s. (Recommended.)

ROTHERHAM RURAL DISTRICT COUNCIL.—F. L. Smith, electric light installation in 12 houses at Wickersley, £55; and in 40 at Thrybergh, £173.

ILFORD CORPORATION.—Metropolitan Electric Cable Construction Co., Ltd., and Union Cable Co., Ltd., supply of cables. (Both recommended).

ROCHDALE CORPORATION.—H. Tattersall, Ltd., electric lighting and power installations to 138 houses on the Rathbone Street and Dicken Green estates.

London School Lighting.

LONDON COUNTY COUNCIL.—J. Briggs, Electrical Contractors, Ltd., electric lighting at Marvels Lane School, Lewisham, £365. (Recommended.)

GLASGOW CORPORATION.—Mensons, Ltd., fittings for destination boxes; Titan Trackwork Co., Ltd., special tramway track work. (Both recommended.)

SHOREDITCH (LONDON) BOROUGH COUNCIL.—City Electrical Co., electric lighting installations at 32 tenements on Whitmore housing estate, £485. (Recommended.)

ST. HELENS (ISLE OF WIGHT) URBAN DISTRICT COUNCIL.—Isle of Wight Electric and Power Co., Ltd., electric light installation at the Puckpool Park Café, £110 3s.

ILFRACOMBE URBAN DISTRICT COUNCIL.—Ilfracombe Electric Light and Power Co., Ltd., electric light installation at isolation hospital, £50, including lamps, shades, plugs, etc.

BARKING URBAN DISTRICT COUNCIL.—Hackbridge Electric Construction Co., Ltd., supply of 2-400 kVA transformers, £179 each, in connection with supply to River Road.

AUSTRALIAN COMMONWEALTH GOVERNMENT.—Standard Telephones and Cables, Ltd., supply and installation of British-made plant at two subsidiary stations under new national broadcasting scheme.

BRADFORD CORPORATION.—Electric light installations at Council houses: Armitage and Longbottom, 180, £625 10s.; Taylor and Ashworth, 36, £108; H. Taylor and Co., Ltd., 24 single rooms, £49 4s.

SALFORD CORPORATION.—E. M. Evans and Son, maintenance of internal telephones at town hall and education offices, for five years, £190; Yorkshire Electric Transformer Co., Ltd., four 216 kVA transformers, £440. (Both recommended.)

H.M. OFFICE OF WORKS.—Metro-Vick Supplies, Ltd., part contract for Cosmos electric lamps, for 12 months; Edison Swan Electric Co., Ltd., supply of lamps; Siemens Electric Lamps and Supplies, Ltd., 12 months' supply of Siemens gasfilled and vacuum lamps.

BIRKENHEAD CORPORATION.—Macintosh Cable Co., Ltd. (£1 276) and Hackbridge Cable Co., Ltd. (£1 982), supply of cables. W. T. Henley's Telegraph Works Co., Ltd., supply of overhead lines in connection with supply to Burton and Puddington, £4 483 15s.; Liverpool Patents Co., Ltd., supply of trident electric scaling machine at gas works, £80.

HULL CORPORATION.—W. F. Dennis and Co., supply of cable for telephones department, £1 295. (Recommended.)

SHEFFIELD CORPORATION.—A. Reyrolle and Co., Ltd., supply of two 11 000 V feeder panels, £468 5s.; T. A. Ashton, Ltd., installation of Frigidaire apparatus at Crimicar Lane hospital, £280, and at Commonside hospital, £194.

GLASGOW CORPORATION.—Electric Vehicles, Ltd., supply of utility electric truck for Govan refuse works, £233; Richard Garrett and Sons, Ltd., six electric vehicles, for refuse collection, £1 098 each; A. Reyrolle and Co., Ltd., two 20 000 V feeder panels at Cadogan sub-station, £1 327 16s.; Anderson and Monro, Ltd., main switchboard at M'Lellan galleries, £129 19s. (All recommended.)

CROYDON CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., two 400 kVA transformer kiosks, £167 10s. each; A. Reyrolle and Co., Ltd., two sets of oil-immersed fuses, £95 5s. each, and armour-clad switch, £193 2s.; British Electric Transformer Co., Ltd., one 100 kVA transformer, £112 10s., and 250 kVA transformer in connection with supply to works of Creed and Co., Cherry Orchard Road, £180 10s. (All recommended.)

STEPNEY (LONDON) BOROUGH COUNCIL.—British Thomson-Houston Co., Ltd., supply of four 1 500 kW motor convertors and switchgear, for sub-stations, £19 933 16s. (Recommended.) Also tendered: Ateliers de Constructions Electriques de Charleroi, £19 600; Metropolitan-Vickers Electrical Co., Ltd., £19 982 12s.; Bruce Peebles and Co., Ltd., £20 204 10s.; General Electric Co., Ltd., £20 236; English Electric Co., Ltd., £20 305 5s.

TORQUAY CORPORATION.—British Thomson-Houston Co., Ltd., supply of switchgear, £696; English Electric Co., Ltd., installation of voltage regulator at Paignton for dealing with next winter's load on the e.h.t. system, £1 400; Metropolitan-Vickers Electrical Co., Ltd., 2 000 kVA Scott transformer group, £905 17s.; Stirling Boiler Co., Ltd., supply of flat furnace arches of "Liptak" type for two boilers at generating station, £1 024 10s.

GLASGOW CORPORATION.—A. Reyrolle and Co., Ltd., supply of switchgear, £4 408 18s.; British Thomson-Houston Co., Ltd., starting gear for motors, £520; Callender's Cable and Construction Co., Ltd., supply of 20 000 V cable, £4 419 10s.; W. T. Glover and Co., Ltd., supply of 6 500 V cable, £2 320; Kennedy, Stark and Co., electric light installation at Dixon Hall, £421 6s. 1d.; R. J. M'Intyre, electrical installation at 492 houses on Haghill estate, £2 076 8s.; J. P. Hall and Co., frequency changer, £318 10s. (All recommended.)

CAPE TOWN CORPORATION.—Albert Vaux, Ltd., 250 fuses (350 A), £331 5s., and 50 pairs of spare contacts, £37 10s. Supply of transformers: Bruce Peebles and Co., Ltd., three 1 000 kVA, £592 each; Reunert and Lenz, Ltd., ten 300 kVA, £206 each, seven 150 kVA, £136 each and eight 100 kVA, £97 each; Metropolitan-Vickers Electrical Export Co., Ltd., five single-phase, £289 18s. 4d. each; Dowson and Dobson, Ltd., two 300 kVA, £205 each and two 150 kVA, £120 each; South African General Electric Co., Ltd., two 300 kVA, £219 each and two 150 kVA £145 each. (All recommended).

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—Enfield Cable Works, Ltd., 1 650 yd. 0·25 four-core cable, £2 013; 500 yd. 0·15 four-core cable, £405; 300 yd. 0·0145 four-core cable, £67; 5 000 yd. 0·01 l.t. twin cable, £575. (Recommended.) Also tendered: British Insulated Cables, Ltd., £2 040; £410; £69; £583. Pirelli-General Cable Works, Ltd., £2 044; £410; £69; £584. W. T. Glover and Co., Ltd., £2 050; £413; £69; £586. Siemens Bros. and Co., Ltd., £2 068; £416; £69; £590. Union Cable Co., Ltd., £2 073; £418; £70; £593. Callender's Cable and Construction Co., Ltd., £2 074; £417; £69; £593. Macintosh Cable Co., Ltd., £2 079; £419; £70; £594. W. T. Henley's Telegraph Works Co., Ltd., £2 092; £421; £70; £600.

MANCHESTER CORPORATION.—Sudlow and Co., electrical installation at Burnage School; Seddon and Sons, electrical installation at Higher Ormond Street school; Welding Equipiment Co., Salford; Equipment and Engineering Co., Ltd., and Quasi-Arc Co., Ltd., supply of mild steel electrodes; R. H. Clampnett and Co., supply of electric cable for Water Street depot; Tudor Accumulator Co., Ltd., repairs to Dickinson Street battery; British Thomson-Houston Co., Ltd., supply of three 1 000 kVA transformers; Hackbridge Electric Construction Co., Ltd., supply of one 11 500 kVA auto-transformer; A. Reyrolle and Co., Ltd., supply of 33 000 V feeder protective gear; R. Johnson and Nephew, Ltd., supply of cadmium copper trolley wire; British Insuated Cables, Ltd., supply of tramway rail bonds.

ADVISORY COMMITTEE ON COMMUNICATIONS.

In accordance with the recommendations of the Imperial Wireless and Cable Conference which sat in London last year, it has been decided to set up an Imperial Communications Advisory Committee, which is to be charged with responsibilities in regard to the institution of new services, the discontinuance of existing services, alterations in rates, and distribution of traffic between alternative routes. One of the main features of the plan proposed by the Imperial Wireless and Cable Conference is the fixing of a standard net revenue which should be available for the purposes of the communications company, and 50% of all net revenue in excess of that standard is to be devoted to the reduction of rates or such other purposes as the Advisory Committee may approve. The following appointments to the Advisory Committee have been made: United Kingdon—Sir Courtauld Thomson. Canada—Sir Campbell Stuart. Australia—Mr. Clive L. Baillieu. New Zealand—Sir James Parr. Union of South Africa—Lieut.-Col. E. A. Sturman. Irish Free State—Mr. T. J. Kiernan. India—Sir Atul Chatterjee. Colonies and Protectorates—Sir Edward Davson.

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ELECTRICITY SUPPLY.

County of London Co.'s Charges—Omagh Electricity Scheme—Bulk Supply to York Hospital—Consumers Benefit from Standard Prices—Leicester Lighting—Keswick Objects to Overhead Lines—Battersea Power Station.

AUCHTERARDER T.C. has decided to carry out a scheme of lighting the streets electrically.

Tunbridge Wells T.C. has received sanction to a loan of £13 302 for mains, plant, sub-stations, etc.

Stranraer T.C. has adopted a scheme for the supply of electricity in the town by the Holderness Trust.

Kingston-on-Thames T.C. has applied for a loan of £43 762 for extensions of the plant at the electricity works.

Douglas (Isle-of-Man) Corporation's Pulrose station is expected to be running before the end of the summer.

Keswick U.D.C. has informed the Central Electricity Board that it insists upon underground cables being used through the town.

Castleford U.D.C. has instructed the Surveyor to investigate the question of the Council generating the electricity required by its departments.

Bradford Electricity Committee has decided to carry out a change over from d.c. to a.c. in the Heaton and Frizinghall districts, at a cost of £22 028.

The laying of the main to Briercliffe has been completed, and a supply of electricity is now being afforded by Burnley electricity department to that district.

Notice of a motion to remit to the Treasurer's Committee of Musselburgh T.C. the question of purchasing the local electricity supply undertaking has been lodged.

Winchester Corporation has applied for a loan of £11 400 for a supply to Twyford and Compton. Electricity is to be supplied in bulk by Southampton Corporation.

Croydon Electricity Committee propose to erect and equip a new sub-station at Ena Road, at an estimated cost of £1 275; while mains extensions are to be carried out at a cost of £687 10s.

Carlisle Electricity Committee obtained sanction to borrow £3 500 for mains extensions, £5 000 for prospective unspecified expenditure on electricity meters and £15 000 for mains and services.

West Lancashire D.C. has decided to apply for an Order to carry out an electricity scheme for the parishes of Hesketh-with-Becconsall, Tarleton, Rufford, North Meols, Scarrisbrick, and Halsall.

Godalming T.C. is to enter into an agreement with the Urban Electric Supply Co. for public lighting for one year at 34s. per lamp for maintenance and renewals and 3d. per kWh for current.

Colchester Electricity Committee is to seek sanction for a loan of £40 000 for mains and services.—The Committee has asked the Electrical Engineer to take steps to afford a supply to the Eight Ash Green district.

Electricity Distribution of North Wales and District, Ltd., has submitted to St. Asaph P.C. a scheme for lighting the streets electrically at a cost of £3 5s. per lamp. The Council has referred the matter to a committee.

The County of London Electric Supply Co. has reduced its lighting flat rate from 6d. to 5½d. and the unit charge under the domestic and business "all in" tariff from 1d. to ¾d. in the administrative County of London.

Scarborough T.C. has applied for loans of £10 000 for supplying electricity by an overhead line to Filey, £2 500 for a supply to Scalby Mills Lane, and £3 700 for a supply by overhead lines to Osgodby and district.

Omagh U.D.C. has received from Mr. P. A. Spalding details of a scheme for lighting the district electrically. The cost is estimated at £9 000, the amount of the anticipated receipts for the first year is £1 934, and the net profit £189.

Dartford Electricity Committee reports that the trustees of the Swaisland Estate have consented to the laying of the ring main through the Stanham Farm Estate, and tenders have been invited for the supply of the necessary cable.

Newry U.D.C. has decided to proceed with a scheme for electric light and power installations in the town hall and the technical school. The Town Hall and Electricity Committees are to take expert electrical advice as to the best system of wiring the buildings.

Reigate T.C. has decided to extend the mains to houses to be erected on the Monson Estate by Mr. C. Franklin, at an estimated cost of £1 130, subject to a guarantee of 8% on the capital outlay for 25 years, or until the gross annual revenue reaches £226.

York Electricity Committee recommends an agreement with the Visiting Committee of the North Riding Mental Hospital for a bulk supply of electricity at £5 per kVA per annum (minimum, £100 per annum), plus 0·7d. per kWh, subject to the Corporation's usual coal clause.

London County Council Highways Committee states, in a report on the effect of the agreements entered into with the London electricity supply companies in 1925 with regard to standard prices, etc., that, up to last year, consumers had benefited by being charged less than the standard prices to the extent of £1 348 778.

The electric lighting of the streets of Leicester is to be extended and improved. In the town hall square there are to be 28 lamps of 750 c.p. each, in addition to two standards bearing four lamps each at the main entrance of the town hall. Thirty new lamps are to be attached to the tramway standards on the Aylestone Road. All these new lamps are to be automatically controlled.

A deputation, headed by Sir John Randles, urged Keswick T.C. last week to oppose the proposal to erect overhead cables in the district. The Chairman (General W. Spedding) said he was sure the scheme would bring cheaper electricity. The better way would have been to work with and not against the Electricity Board. The Council decided, with one dissentient, to ask for an inquiry.

A new scheme for supplying electricity for domestic use has been approved by Fleetwood Electricity Committee. The tariff is 20% of the net rateable value per annum, plus ½d. per kWh for current consumed for lighting and power. Each consumer must have appliances equal to 2 kW in addition to lighting equipment, and must undertake to continue to use electricity under the scheme for 12 months.

The Exe Valley Electricity Co., which, subject to the consent of the Electricity Commissioners, will shortly receive bulk supply from Exeter, is one of the undertakings of Whitehall Securities Corporation, Ltd. In anticipation of this development, the Electricity Committee, at last week's meeting of the Exeter City Council, was authorised to apply for a loan not exceeding £15 000 for the provision of cables.

London County Council Public Health Committee has recommended the Council not to support the resolution passed by a conference of local authorities to oppose the erection of the new Battersea power station. The Committee recommended the Council to ask the Minister of Health to receive a deputation from the Council on the subject of efficient safeguards, and the Council has adopted the suggestion.

Oldham Electricity Committee has decided to supply electricity through slot meters at 5d. per kWh. The Electrical Engineer is to prepare a scheme for wiring houses on a deferred payment scheme.—The Committee has obtained sanction for a loan of £70 000, the estimated cost of the tie and inter-connecting mains between the new generating station of Slacks Valley and Greenhill station and the existing e.h.t. distributing system.

Kendal T.C. has received sanction to a loan of £5 000 on account of the sum required for feeder and distributing mains, and a further loan of £10 000 for a similar purpose has been applied for. The Council has appointed Mr. J. E. Storr, at a fee of 60 guineas, to prepare a scheme for the transmission and distribution of electricity over the area covered by South Westmorland Rural Council, with the exception of the district included in the Order of the Windermere and District Electricity Supply Co.

St. Pancras (London) Electricity Committee reports that a method devised by the Chief Electrical Engineer for dealing with dust and grit at the King's Road generating station is to be applied to boilers Nos. 7 and 8. The system comprises water-spraying apparatus in the chimney of the boilers. Tests made by independent experts have confirmed the efficiency of the method in absorbing the sulphurous and sulphuric acids. To restrict the emission of dust into the chimneys, the Chief Electrical Engineer has devised a scheme whereby large chambers can be inserted between the outlets of the boilers and their chimneys, which will permit of the speed of the travelling gases being reduced from 27 ft. per second to 7 ft. per second; and, if necessary, treated with water sprays.

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COMPANY NEWS.

Cables and Wireless Quotations—Sale of Fife Tramway, Light and Power Co.'s Undertaking—Petters' Increased Profit—Prosperous Condition of W.T. Henley's Co.—Directors' Reports—New Electrical Companies Registered.

THERE is not much to record of the electrical share market this week. Cables and Wireless quotations appear to have settled down at round about 90, the "A" ordinary at a little under and the "B" ordinary at a little over that figure. Siemens shares are a further 1s. 3d. down and Callender's have lost half-a-crown. Ever Readies have dropped 6d. below 20s. Electric Construction 7% preference at 21s. 3d. are 7½d. to the good. British Electric Traction 6% preferred stock are two points and Metropolitan Railway ordinary and London United Tramways 1st debenture stock each one point down.

Last Annl. Divd.	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
%	**Electricity Supply.**				
(*d*)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	31/-	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	26/6	26/6	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/-
6	,, ,, ,, ,, 6% C.P.	23/-	23/-	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	56/-	56/-	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	23/-	23/-	24/-	21/3
(*e*)	Kensington & K'bridge Ord. (£1)	26/-	26/6	27/6	23/9
1/9⅝	Lon. Elec. Sup. Ord. (£1) ..	28/6	28/-	37/6	23/-
1/9⅝	Metro. Elec. Sup. Ord.	46/3	47/6	53/-	24/9
4½	,, ,, ,, 4½% C.P.	17/0	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2⅝	N'castle-upon-Tyne Elec. Sup. Ord.	26/10½	20/10½	30/3	19/3
6	N Metro. Elec. 6% C.P.	23/-	23/-	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord (£1) ..	27/6	27/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	—	—
1/9 1/2	W'minster Elec. Sup. Ord. (£1) ..	26/-	26/-	52/9	24/-
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/6	36/6	38/9	24/6
6	,, ,, ,, 6% C.P. ..	24/-	24/-	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	128½	128½	152	117
7·67	,, ,, 6% Pf. Stk.	126½	128½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4	,, ,, ,, 4% Deb.	78*	80	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	73½	75½	42½
4	,, ,, ,, ,, 4% Pf. Stk.	73	73	77	68
4	,, ,, ,, ,, 4% Deb. ..	78	78	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams. 1st Deb.	59	60	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	71	71	73½	62
5	,, ,, ,, 5% Deb. ..	67½	67½	70½	65½
3½	Met. Rly. Cons. Ord. Stk.	58½	59½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	63	63	67	60½
3½	,, ,, ,, 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	75	75½	77½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	81½	81½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	70	64½
7	Underground Electric Rlys. Ord.	22/6	22/6	28/2	11/-
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	,, ,, ,, 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P. ..	13/9	13/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	86/3	56/-
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/-	23/-	24/9	19/7
7	,, ,, ,, 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord Stk.	134	135	153½	120
15	Callender's Cable Ord.	75/-	77/6	91/3	66/-
6½	,, ,, 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	,, ,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/-
8	Crompton-Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	,, ,, 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	25/7½	25/7½	13/-	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	16/3	16/3	32/6	23/6
7	,, ,, 7% C.P. ..	21/3	20/7½	22/9	21/-
—	English Elec. Ord.	6/3	6/3	15/9	5/-
—	,, ,, 6% C.P. ..	7/6	7/6	18/9	7/-
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/6	20/-	92/3	18/1
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	43/9*	51/3	46/6	26/6
25	W. T. Henley's Ord.	130/-	130/-	120/-	69/3
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/-
7½	Lon. Elec. Wire. & Smith's Pref. ..	23/9	23/9	25/-	22/3
7½	Siemens Bros. & Co. Ord. ..	27/6	28/9	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23½*	23½	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	60½*	61½	63½	56½
—	Cables and Wireless "A" Ord. ..	87	87½	—	—
—	,, ,, ,, "B" Ord. ..	94	92	—	—
3½	Eastern 3½% Pref. Stk.	62½*	65½	70½	59
4	,, 4% Deb.	78½	78½	81½	74
4	Eastern Extension 4% Deb. Stk.	79½	—	80	74½
22	Gt. Northern Telegraph (£10) ..	30½	30½	43½	26
10	Indo-European (£25)	49½	50½	48½	30
15	Marconi's Int. Mar.	60/-	60/-	90/-	16/6
4	Western Tel. 4% Deb. Stk. ..	77½	—	82	76

(*a*) 19.5*d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. * Ex. dividend.

BIRMINGHAM DISTRICT POWER AND TRACTION CO., LTD.—Intm. div. of 3% actual is announced.

CHISWICK ELECTRICITY SUPPLY CORPORATION, LTD.—Intm. div. on ord. shs. of 7½% will be payable on July 23.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Divs. of 1¾% on pref. stk. and 1% on common stk. have bn. declared.

BELLISS AND MORCOM, LTD.—Blce. on rev. acct. for year ended March 31, £26 531. Fin. div., makg. 12½ % for year, proposed.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—Divs. for qrtr. ended June 30th of 15s.% on ord. stk. and £1 10s.% on pfd. stk., less tax, will be payable on Aug. 1st.

ROTHESAY TRAMWAYS CO., LTD.—Rev. for 1928, £18 914, workg. pft. £4 513, agst. £4 346. To depreciation, £4 022. Div. of 5% on pref. shs. for year. Fwd. £1 846.

TRACTION AND GENERAL INVESTMENT TRUST.—Int. div. for half-year ended June 30, 1929, 2½% actual on pref. stk., and 6% actual on ord. stk., less tax, payable July 31.

FIFE TRAMWAY LIGHT AND POWER CO., LTD.—At an extraordinary gen. mtg. held on Monday, the shhldrs. approved the sale of the electricity undertakgs. to the Scottish Power Co.

EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.—Int. on 4% mtge. deb. stk. for half year endg. July 31 will be paid on Aug. 1st. Deb. register will be closed from July 27th to 31st, inclusive.

WEMYSS AND DISTRICT TRAMWAYS CO., LTD.—Net pft. for 1928, £7 817, includg. £167 brt. in, after provisn. for reserves in subsidiary cos., £4 096. Int. £6 560, deb. stk. redemptn. £200; to res., £1 000. Fwd., £56.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—Reg. qrtrly. div. of $0·50 p. sh. was recently announced. This is first div. declared on new cap. stk. without par value. Rate of div. is equivalent to rate formerly declared on $100 shs. of cap. stk.

HEAD, WRIGHTSON AND CO., LTD.—For year ended April 30 credit blce. was £4 783 (agst. £17 554), plus £1 170 brt. in. Transferred from res. for gen. purposes, £13 000, makg. total £18 953. Int. on debs., £6 750, div. on pref. shs. £10 148, and directors' fees £1 000, leavg. blce. carried fwd., £1 056.

CITY OF SANTOS IMPROVEMENT CO., LTD.—Net rev. for 1928, £166 465, plus £18 252 brt. in. After provisn. for deb. int., sinkg. funds, div. on 6% pref. shs. and intm. div. of 3%, tax free, on ord. shs., blce. was £116 847. To tramways renewal acct., £10 000. All shhldrs. accepted offer of Brazilian Traction Light and Power Co. to purchase ord. shs.

JAMES KEITH AND BLACKMAN CO., LTD.—Accts. for year ended March 31, 1929, show blce. of mfg. and tradg. acct. £120 152, transfer fees, etc., £11, and int. on investmts. deposit acct. etc., £2 172, and, after provisn. for all exes., includg. patent renewal fees and auditors' fee, income-tax, deb. int., and depreciatn. (£3 201), net pft. transferred to blce. sheet was £43 087. To res., £12 000; div. on ord. shs., 15%, less tax; fwd., £13 740.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—After providg. for int. and premium on debs. (£121 849, agst. £133 387) and for depreciatn., income-tax, etc. (£610 754, agst. £516 598), net pft. for 1928 was £377 295, agst. £373 445, plus £141 451 brt. fwd. To res., £50 000 (same). Fin. div. of 1% on pref., makg. 10%, and fin. of 12% on ord., makg. 15%, all less tax, for the year have been declared. Fwd. £153 747. Directors have also declared div. of 3%, less tax, on pref. for six months ended June 30th, 1929.

CABLES AND WIRELESS, LTD.—The co. announces that the certificates of "assents" deposited with the Bank of England at the close of business on July 10 instant were: Eastern Telegraph Co., Ltd., 97·04 %; Eastern Extension Australasia and China Telegraph Co., Ltd., 96·93 %; Western Telegraph Co., Ltd., 96·89 %; Marconi's Wireless Telegraph Co., Ltd., 88·45 %. The offer was conditional upon its being accepted within the prescribed time by holders of 60 % (or such smaller percentage as might be approved by the Government) of the amount of stock, or number of shares, affected by the offer in the four respective companies.

NORTH WALES POWER CO., LTD.—Pft. for 1928, £77 102 (agst. £47 572). After paymt. of deb. int., blce. is £26 540, includg. amt. brt. in. To special int. res., £1 404; to special

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renewals fund, £5 000. Blce. (£20 136) to special int. res. Special renewals fund with above additn. was £25 000, of which £20 884 is still available. New power statn. at Maentwrog was brt. into operatn. during latter part of year, and sale of electrical energy durg. 1928 increased by about 11% over that of previous year. Since close of year two important transactns. have taken place. Co. has entered into a satisfactory contract with Central Electricity Board; and a scheme for financial reorganisatn. of co. has been carried through successfully.

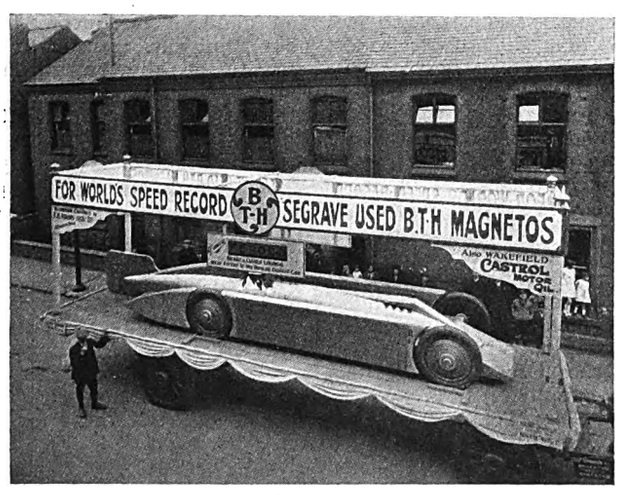
UNDERGROUND GROUP.—Directors have declared intm. divs. for six months ended June 30, 1929, as follows: *Metropolitan District Railway Co.* on 4% guaranteed stk., 2%, on 4½% 1st pref. stk. 2¼%, on 5% 2nd pref. stk. of 2½%, on ord. stk. 2½% (same). *London Electric Railway Co.*, on 4% pref. stk. 2%, on con. ord. stk. 2½% (same); *City and South London Railway Co.*, on 5% pref. stks. 1891, 1896, 1901 and 1903, 2½%; on con. ord. stk. of 2½% (same). *Central London Railway Co.*, on undivided ord. stk, 2½% (same), on pfd. ord. stk., 2% (same). *Associated Equipment Co., Ltd.*, on ord. shs. 4%, tax free (same). *Underground Electric Railways Company of London, Ltd.*, on 6% 1st cum. income deb. stk., 3%, on 6% income bonds, 3 % (same), on ord. shs. 3% (same). The divs. will be payable on Aug. 7, other than the int. on the 6% 1st cum. income deb. stk. and 6% income bonds of the Underground Co., which will be payable on Sept. 2.

Company Meetings.

ELECTRIC AND GENERAL INVESTMENT CO., LTD.—Mr. J. B. Braithwaite, presiding at the meeting on July 9th, said: There is no great change in our profit for the year. The earnings are £13 175, against £10 691 last year. That is accompanied by other changes in the balance-sheet which are equally on the right side. Our loans from the bank and others have been reduced by £41 000 during the year and our debenture stock outstanding has been reduced by £4 652 to £3 170. As a consequence of these reductions in our liabilities our investments have been reduced by £52 007 and our cash has been increased by £5 491. We are recommending a dividend upon both the ordinary and the deferred shares. I am glad to say that the improvement in the value of our investments amply justifies this recommendation. During the past year our assets have further improved in value, so that at the end of May our investments were worth more than the figure at which they appear in the balance-sheet. In addition to that, we have a free reserve fund of £50 000 and a carry forward of over £20 000. We have also cleared off the whole of the outstanding income certificates. After providing for general charges, £2 738, debenture interest, £215, preference dividend, £4 776, 10% of our ordinary shares, £2 000, and a payment of 1s. per share on our deferred shares, also £2 000, there remains out of the profit of the year (£13 175) a balance of £1 444. You may say we have been a long time reaching this position. This is the 40th annual meeting of this company, but I would remind you that we were the pioneers, or at any rate one of the pioneers, in financing the electrical industry, and naturally we suffered the fate of most pioneers, and have had a very long row to hoe. We hope we are now coming into the due reward of our 40 years work. The report and accounts were adopted.

PETTERS, LTD.—Sir Ernest W. Petter, presiding at the meeting on July 12th, said: We have been glad to be able to announce some progress in the result of the year's trading which, having regard to the conditions prevailing in the engineering industry, is very satisfactory. During the year we have introduced a new type of engine which we have designated the Atomic Diesel. This engine, which is a cold-starting heavy oil engine, has been well received by our agents at home and abroad, and the prospects of sales are distinctly good. As regards investments, we still hold our British Government stocks. There is a reduction in the amount under the heading of Petters (Ipswich) Ltd., due to £22 000 of debentures having been repaid, and a further £20 000 has since been received by us since March 31st for debenture redemption. We have a net profit of £32 891, an increase of about £7 300. Adding the amount brought forward, we have a disposable balance of £52 436. Interest on the funding certificates and provision for redemption for the year to July 15th require £2 500. We now recommend that the half-year's dividend on the preference shares, due at March 31st, 1929, less tax, be paid, and also a dividend on the ordinary shares at the rate of 6% per annum, less tax, being the same as last year. We also recommend that £10 000 be transferred to reserve fund, raising the same to £85 000, and that the balance of £28 536 be carried forward. I was greatly encouraged by the references to the potentialities of our Empire made by the mover of the Address in the House of Commons last week. I have never ceased to endeavour to impress upon my fellow-countrymen that it is to the Empire we must look for the solution of our great national problems, and in particular to the solution of the unemployment problem. We intend that there shall be no lack in that spirit of confidence and adventure which we have shown in the past, and His Majesty's Government can count on us to do our utmost to back up their efforts for the expansion of our industry and the welfare of our people. The report and accounts were adopted.

ARON ELECTRICITY METER, LTD.—Mr. Harry Kahn, presiding at the meeting on July 8th, said the directors had reluctantly come to the conclusion that it would not be prudent to distribute the balance of £1 795 remaining to the credit of profit and loss account after payment of the interest on the 6% cumulative income debenture stock, for the reasons given in the report. The balance-sheet, reflected again a sound position. Profit on trading showed an increase over last year of £2 768. The net profit for the year, £6 594, showed an improvement of £1 419. Adding the carry forward of £161 and deducting interest on converted preference shares and 6% income



AT the recent "Lady Godiva Procession and Pageant" with which was incorporated the Coventry Hospital Carnival, the British Thomson-Houston Co., Ltd., had a number of exhibits in the procession. One of the awards secured by this company was the first prize in the horse-drawn tradesmen's exhibits section, the exhibit being a full-size model of the "Golden Arrow" car, the original of which was fitted with B.T.H. magnetos. Another attractive exhibit by the B.T.H. Co. effectively illustrated their range of fractional horse power motors and some of their many applications in industry and the home. Both the magnetos and motors exhibited were, of course, manufactured in the company's Coventry works.

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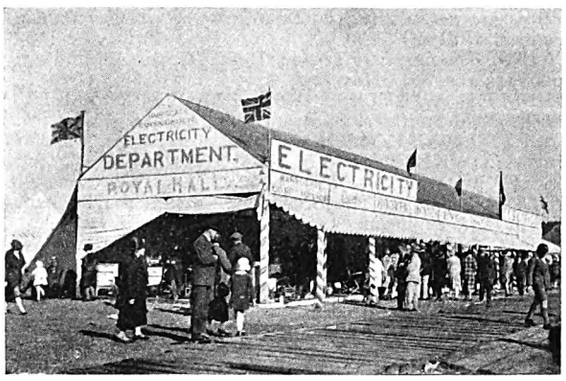
debenture stock, left a balance of £1 795 to carry forward. The shareholders would no doubt wish to know why they did not declare an ordinary dividend, however small, but the fact was they did not consider it prudent to do so in view of all the circumstances. Vienna, whose financial year started on October 1st last, showed a considerable decrease in turnover, chiefly owing to the shortage of money prevalent in Austria, which prevented the municipalities from giving their usual orders. He understood, however, that the position there lately in that respect was improving. In London the position was also rather difficult, as managers of supply undertakings were keeping their meter orders as low as possible in view of the uncertainty as to the eventual decision of the Electricity Commissioners in regard to the basis on which current should be charged. There was also pending the question of changing the supply of continuous current to alternating current. They were doing all in their power to meet the situation by bringing their factory in London up to modern standards. After moving the adoption of the accounts, the chairman called upon Sir Hugo Hirst to second the resolution, and added that he regretted to say that owing to his many activities Sir Hugo had felt compelled to tender his resignation as a director of the company. Sir Hugo Hirst expressed his regret that he found it necessary to resign from the board. The shareholders, he said, had nothing to worry about, for practically the whole of the capital was in safe assets. They had nearly £100 000 in cash, and valuable assets in the Vienna factory, the London factory, newly equipped, and their investment in the Taximeter Co., which was a very satisfactory concern, and, as far as he could see, their assets were perfectly intact. The report and accounts were adopted.

W. T. Henley's Telegraph Works Co., Ltd.—Sir George Sutton, presiding at the meeting on July 12th, said: The figures in the profit and loss account do not differ greatly from the previous year. The considerable sum of £47 829 is allowed for depreciation, in addition to which, not shown on the account, there has been an expenditure for maintenance of £34 500, which has been charged against revenue. If you adapt the board's recommendations, there will be a balance to carry forward to the unknown future of £545 000. I will deal briefly with some of the main causes for the company's prosperity. Its goodwill, I suppose, should be put first; it has been made by many years of good service; and then its organisation, which enables the staff to follow the course of the manufacture of all its products and to direct the business into channels which are to be preferred. The industry is a very live one, and the turnover for the year under review is a record. Home and overseas trade have both increased. The overseas trade is responsible for 40% of the total output of the business. Profit in the way of percentage on cost is lower, but the larger trade has increased the amount. Two years ago I informed you that we had just completed a working agreement with certain other cable makers. The difficulties have been great, and modifications in the original agreement may yet be necessary, but the benefits already realised have been considerable. There had to be an endeavour to consider the interests of one's allies as much as one's own interests, and it has not always been easy to attain that atmosphere. The progress has, perhaps, been slow, but it has been sure, and other firms have sought to join the alliance, and negotiations have been entered into and in some cases completed. Besides a continuous endeavour and some advance in improving the means for the distribution of electricity, or, in other words, the designing of electric cables and accessories to give increased efficiency, success has been achieved in the reduction of cost of production. The lower costs due to rationalisation mean lower prices to meet competition for orders at home and abroad. They have a twofold effect, they lower prices to the user or consumer and so possibly bring about a larger demand. The ability to compete in price for overseas business should bring more orders to the allied firms, and the increase of demand due to lower prices should also bring more business to the allies. It is this increased business, by meeting competition and by increasing demand, which should, and I think I may say must, bring larger sums to the credit of the profit and loss accounts of the allies. It may be convenient here to say a few words respecting the resolution which will presently be moved for the bonus to the hourly paid workers. The bonus will consist of two weeks' pay based on a normal week of 47 hours, excluding any extra payments made for night work or overtime. The report and accounts were adopted, and resolutions were passed approving the bonus scheme and increasing the remuneration of each of the directors by £500 per annum.

NEW COMPANIES.

Camden Electric, Ltd.—Cap., £500. Electricians, manufacturers of and dealers in electrical apparatus, plant and appliances, etc. Reg. Office: 92, Park Street, Camden Town, London, N.W.1.

Rolyat Electrical Co., Ltd.—Cap., £500. To adopt agreement with Mary D. Taylor, and carry on business of electricians, wireless, telegraph, telephone, electrical or experimental engineers, manufacturers of and dealers in electrical and wireless apparatus, etc. Reg. Office: 11, Furzedown Market, Tooting, London, S.W.17.



THE stand of Harrogate Electricity Department at the Royal Agricultural Society's Show in Harrogate. Firms which assisted in making up the comprehensive exhibit were Credenda Conduits, Ltd., Hoover, Ltd., the Jackson Electric Stove Co., Ltd., the British Vacuum Cleaner and Engineering Co., Ltd., the Revo Electric Co., Ltd., Electrolux, Ltd., Belling and Co., and Santon, Ltd. Wireless equipment was exhibited by Mr. R. C. Burrell, of Harrogate. During her visit Princess Mary asked the Mayor of Harrogate (Capt. C. W. Whitworth) specially to show her the electrical exhibit, and she was much interested in many of the items on view.

Nucomotors, Ltd.—Cap., £200. Automobile and mechanical engineers, electricians, electrical engineers, etc. Reg. Office: 141, Battersea Park Road, London, S.W.8.

Improved Wilson Microphone and Electrical Co., Ltd.—Cap., £100. Electrical or wireless dealers, etc. Secretary: J. McGuire, 4, Lloyd Square, London, W.C.1.

British Household Appliances, Ltd.—Cap., £1 000. Manufacturers of and dealers in household and domestic utilities and appliances, motor and radio engineers, electricians, etc. Reg. Office: 1, Budge Row, London, E.C.4. (Public Co.)

Frank White, Ltd.—Cap., £5 000. To acquire undertaking of Woore White, Ltd., carrying on business as engineers, etc., at Richmond Foundry, Liverpool, and to carry on same and business of mechanical and electrical engineers, etc. Reg. Office: 41, North John Street, Liverpool.

Marco Refrigerators (1929), Ltd.—Cap., £200 000. To acquire business carried on by Marco Refrigerators, Ltd., with the trade mark "Marco," to adopt an agreement with the said company, R. A. Fulford and A. E. Leach, and to carry on business of manufacturers of and dealers in refrigerators, electrical and general engineers, etc. Reg. Office: Manor Works, Streatham Vale, London, S.W.16. (Public Co.)

Geo. Crossley and Son, Ltd.—Cap., £2 000. To acquire business of dealers in electrical accessories carried on by G. Crossley and G. B. Crossley as the Crossley Electric Co., at 4, South Street, Manchester, and to carry on same and business of electric light, power and radio engineers, manufacturers and installers of wireless apparatus, heating accessories, departmental telephones, electrically illuminated signs, electric bells, etc. Reg. Office: 4, South Street, Manchester.

Tele-Radió, Ltd.—Cap., £700. Manufacturers, purchasers, hirers, importers and exporters of and contractors for sale, supply, letting on hire, installation and maintenance of plant, machines, instruments and apparatus, in particular those used in connection with television, radiovision, noctovision, wireless telegraphy, telephony and similar sciences, or for reproduction, production or recording of sound in synchronisation with films, photographs and pictures, etc. Reg. Office: 4, Copthall Chambers, London, E.C.2.

Boroughbridge and District Electric Supply Co., Ltd.—Cap., £10 000. To acquire benefits of Boroughbridge and District Electricity Special Order, 1928, made by the Electricity Commissioners in favour of R. F. Winder, authorising supply of electricity within parts of townships of Boroughbridge, Aldborough, Minskip, Roecliffe, Ellenthorpe, Kirby Hill, Landthorpe and Milby, with certain personal property and assets belonging to the said R. F. Winder and used in connection with generating, accumulating, distributing and supplying electricity within the said area and with certain real and personal property belonging to R. F. Winder and C. E. Winder. Solicitor: D. Green, Boroughbridge. (Public Co.)

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ATKINS, Thomas, 24, Linton Road, Upper Edmonton, electrician. £13 18s. 8d. May 30th.

BARNSLEY WIRELESS AND ELECTRIC SUPPLY CO., Wakefield Road Smithies, Barnsley. £14 0s. 11d. May 3rd.

BASSETT-LOWKE, Mr. H. A., Kingswell Street, Northampton (trading as LOWKE DOMESTIC ENGINEERING CO.), electrician. £13 0s. 2d. June 10th.

CORDON, Mr. L. H., The Broadway, Loughborough Road, West Bridgford, radio engineer. £15 16s. 11d. May 1st.

EGERTON (R.) AND CO., Pear Tree Road, Derby, wireless dealers. £10 17s. 8d. May 2nd.

GARNETT, A. AND F., High Street, Hayes, electrical engineers. £19 11s. 6d. May 8th.

GASCOIGNE, Mr. H., 40, Cricklade Street, Cirencester, wireless dealer. £21 19s. 6d. June 14th.

JOINER, Mr. A. C. (trading as S.O.S.), Oakley Place, Old Kent Road, S.E., electrical engineer. £20 12s. 3d. June 12th.

LEWTHWAITE, Stanley Victor, 6, Towend, Almondbury, wireless engineer. £13 16s. June 5th.

MORLEY, Frank Johnson, 304, Clapham Road, Clapham, electrical engineer. £10 19s. 6d. June 4th.

RIPON ELECTRICAL CO., 39, Kirkgate, Ripon, engineers. £35 16s. 4d. June 13th.

TURTON, Mr. L. W., 47-9, Balderton Gate, Newark-on-Trent, electrical apparatus dealer. £10 4s. 8d. June 7th.

WARNER, Walter John, 13, Windsor Road, Willesden Green, electrician. £47 6s. 5d. May 10th.

Bills of Sale.

BARNETT, Bernard, 41, Beehive Lane, Ilford, electrical engineer. Dated July 8th, filed July 15th. £300.

HEARN, Frederick Charles, The Rest, Brighton Road, Rottingdean, electrical contractor. Dated July 1st, filed July 5th. £40.

SMITH, William, 24, Hampstead Road, Elm Park, Liverpool, electrician. Dated June 28th, filed July 2nd. £100.

Deeds of Arrangement.

ATHERTON, Jack, 15, Mawdsley Street, and 49, Rydal Road, Bolton, electrical engineer. Dated July 11th, filed July 12th. Trustee, C. A. Wragge, 15, Mawdsley Street, Bolton, accountant. Liabilities unsecured, £858; assets, less secured claims, £205.

ATHERTON, Walter Edmund, trading as ATHERTON AND HALL, Claremont Works, General Street, Blackpool, radio engineer. Dated July 4th, filed July 9th. Trustee, I. G. Aspinall, 7, Birley Street, Blackpool, C.A. Secured creditors, £3; liabilities unsecured, £842; assets, less secured claims, £417.

MIDGLEY, John Bird, and GREEN, Albert, trading at Orme Buildings, Parsonage, Manchester, as ANDERSON AND GREEN, wholesale electricians. Dated July 5th, filed July 9th. Trustee, A. Yearsley, 27, Brazennose Street, Manchester, I.A. Liabilities unsecured, £4 113; assets, less secured claims, £2 033.

Receiverships.

DUGGAN AND LEE, LTD. E. J. Turbyfield, of 65A, Fenchurch Street, E.C.3, was appointed receiver and manager on July 5th, 1929, under powers contained in debentures dated July 19th, 1928.

OLDHILL MANUFACTURING CO., LTD. A. N. Flemming, accountant, of 24, Shiplake Buildings, Calvert Avenue, E.2, was appointed receiver on July 5th, under powers contained in debentures dated June 1st, 1929.

NORTHERN REFRIGERATION AND ELECTRICAL CO., LTD. (originally W. T. RAWCLIFFE, LTD., renamed OWEN AND CHARLTON, LTD., and again renamed as above). J. R. Charlesworth, C.A., of 85, St. Petersgate, Stockport, was appointed receiver and manager on June 26th, 1929, under powers contained in debenture dated June 5th, 1923.

Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

ANIMATED DISPLAYS, LTD., London, W.C., dealers in electric signs.—Registered June 29th, £100 debenture, to H. H. Pearce, Longford Avenue, Southall; general charge.

EXPRESS MAGNETO (REPAIRS) AND ELECTRICAL CO., LTD., Yeovil.—Registered June 25th, £450 (not ex.) mortgage, to Bank; charged on land and premises in Holloway Street, Exeter. *£400. March 26th, 1929.

M.E.D.A.S., LTD., London, W., electrical engineers.—Registered June 21st, series of £2 200 debentures, present issue £1 855; general charge.

PEERLESS ELECTRICAL MANUFACTURING CO., LTD., London, W.—Registered June 28th, agreement supplemental to debenture dated May 22nd, 1928, to Bank; charged on hire purchase agreements, etc. *£5 000. September 25th, 1928.

RUSSELL (J. W.), LTD., Watford, electricians. Registered June 22nd, £4 000 debentures; general charge.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

HENDON ELECTRIC LAMP CO., LTD. At the statutory meeting of the creditors in this voluntary winding-up, the liquidator, Mr. F. Rowland, submitted a statement of affairs which disclosed liabilities to unsecured creditors of £929, against net assets £403, or insufficient to pay the claim of the debenture holder, which approximated £700. The receiver for the debenture holder is realising the assets. The liquidator stated that the company secured a fairly large contract for the supply of electric lamps to the Durban Corporation. The contract ran into some hundreds of pounds and every effort was made to carry out the contract, but some of the lamps were rejected on the ground that they were faulty. That put the company to considerable loss. Towards the close of last year the Omega Lamp Co. were creditors for something like £1 000 and they ultimately agreed to accept £750 in discharge of their claim. They pressed for payment of that amount, but the company was unable to settle, owing to the loss on the Durban contract and other matters. The company were then asked to give a debenture to secure the Omega Co. He (Mr. Rowland) was consulted with regard to the debenture and pointed out that if it was issued in the form proposed the Omega Lamp Co. would be able to call the money in at any moment. Eventually, however, it was agreed that the debenture should be issued to the Omega Co., who undertook not to exercise the right to foreclose so long as the Hendon Electric Lamp Co., Ltd. paid £40 a month. Some of the instalments were paid, but finally the company got in arrear and a receiver was appointed. The receiver was not appointed until some time had been given to the company in which to look around with an idea of finding further capital. That additional capital, however, was not forthcoming and the receiver took possession. It was true that the debenture was for a past consideration, but it was issued more than three months prior to the liquidation and was, therefore, good. The debenture issued by the company became good in March and the receiver was not appointed until some little time later.

No definite resolution was passed, but it was agreed that the voluntary liquidation of the company should be continued with Mr. Rowland as liquidator. The following are creditors:—Ashdown, H. E., and Co. (Birmingham), Ltd., £26; Beko Lamp Co., £25; Electric Heating Co., £11; Eltrem and Co., £32; Hirschberg, E., and Co., £55; Knowles, J. and Co., Ltd., £12; London Commercial Stores, Ltd., £75; Neglin Co., £80; Nelson Electric Co., Ltd., £50; Overseas Engineering Co., Ltd., £11; Snape, H., and Sons, £17; Stella Lamp Co., Ltd., £16; Universal Lamp Co., £67; Whitchurch Electric Lamp Co., £53.

STONE MANUFACTURING CO., 108 and 109, Great Saffron Hill, E.C., wireless and electrical dealers. A meeting of the creditors in this matter was held on July 12th at the offices of Lever Bros. and Co., C.A., Chiswell House, Finsbury Pavement, E.C., when the representative of the Brownie Wireless Co., the largest creditors, presided. A statement of affairs was disclosed showing liabilities of £1 936, of which £1 065 was due to the trade, the bank were creditors for £156, loan creditors totalled £380, and advertising, royalties and sundries amounted to £335. The bank were also secured creditors for £274. The assets totalled £265, from which had to be deducted preference claims of £69, leaving net assets of £196, or a deficiency of £1 740.

The accountant said there were negotiations pending at the present time whereby another company would take over the business and if that were so, the creditors should receive a satisfactory dividend. The debtor was unable to make any offer on his own behalf. A creditor in the room said that the negotiations for the taking over of the business could only be carried out provided that the moulding tools should be returned by the creditors who at present held them. Several creditors said that under no circumstances could those mouldings be returned, even if the creditors were to receive 20s. in the £. It was pointed out that the offer would therefore have to fall through for the taking over of the business. After considerable discussion it was decided that the estate should be dealt with under a deed of assignment in favour of Mr. Lever as trustee with a committee of inspection consisting of three of the creditors. The following are creditors:—Brownie Wireless, £230; Lewis Banks and Son, £214; Ebonestos Insulators, £119; John, Son and Watts, £105; McLeod and McLeod, £80; County of London Electric Supply Co., £23; Hawkins, F. F., £21; Lever Bros. and Co., £19; Maydew, £10.

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London Gazette, etc.

Company Winding-up Voluntarily.

HIGHTENSITE AND ECONITE MANUFACTURING CO., LTD.—By reason of its liabilities, July 2nd. A. A. Lough, Chartered Accountant, 8, Frederick's Place, Old Jewry, London, E.C.2, appointed as liquidator.

Bankruptcy Petition.

THORNTON, William Haigh, 25, Bridge Street, Burnley, electrical and wireless engineer. A bankruptcy petition against this debtor has been presented by the Secretary of J. Dyson and Co., Ltd., manufacturers of radio and electrical equipment, and is to be heard at Burnley County Court on August 13th, at 10.45 a.m.

Bankruptcy Information.

BAINES, Gerald Talbot, 66, High Street, Gorleston, Suffolk, electrical engineer. Receiving order, July 13. Debtor's petition.

BRAYSHAW, D. (Mr.), 78, Granby Street, Liverpool, electrician. Receiving order, July 10th. Creditor's petition.

COWEN, Kenneth, trading as E. COWEN, 41 and 43, The Village, Lower Bebington, Chester, electrical engineer. Receiving order, July 9th. Debtor's petition.

Notices of Dividends.

EDWARDS, William Houston, The Docks, Milford Haven, electrical engineer. First and final dividend, 6d. per £, payable, July 19th, 4, Queen Street, Carmarthen.

JACOB, William Thomas, 14, Meyrick Street, Pembroke Dock, Pembroke, wireless engineer. First and final dividend, 2s. 6d. per £, payable, July 19th, 4, Queen Street, Carmarthen.

Notices of Intended Dividends.

KIRK, Ernest William, trading as the ACE RADIO MANUFACTURING CO., 26, Curzon Street, Derby, formerly wireless apparatus maker. Last day for receiving proofs, July 31st. Trustee, L. A. West, 22, Regent Street, Park Row, Nottingham, Official Receiver.

SEWELL, Sidney James, and BROWN, William Lewis, trading as SEWELL AND BROWN, 6A, The Exchange, Muswell Hill, Middlesex, electrical and radio engineers. Last day for receiving proofs, July 30th. Trustee, F. Vyvyan, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver.

SOUTHWOOD, Thomas Southwood Smith, Pound Farm, Whyke Road, Chichester, electrical engineer. Last day for receiving proofs, July 30th. Trustee, R. W. Cave, 12A, Marlborough Place, Brighton, Official Receiver.

METAL AND CHEMICAL PRICES.

		Tuesday, July 16th		
	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£74 10 0	—	10s. 0d.
Electro Wirebars .. .. „	£84 10 0	—	—
H.C. Wires, basis .. .. per lb.	11½d.	—	—
Sheet .. .. .. „	11⅝d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2½d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet „ .. .. .. „	10¾d.	—	—
Wire „ .. .. .. „	11½d.	—	¼d.
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£24 5 0	—	—
Foreign or Colonial .. .. „	£22 15 0	—	2s. 6d.
Tin—			
Ingot .. .. per ton	£210 10 0	£5 17 6	—
Wire, basis .. .. .. per lb.	2s. 9d.	¼d.	—
Aluminium Ingots .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£25 5 0	—	5s. 0d.
Mercury .. .. per bottle	£22 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¾d.
Sodium Bichromate—Per lb. 3½d.

Rubber—Para fine, 11½d.; plantation, 1st latex, 11 1/16d.

*** The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

Last week's market opened with forward lead 1s. 3d. up, while later, according to James Forster and Co., the tone was firm at 5s. per ton advance. On Wednesday and Thursday prices fell back 6s. 3d. per ton, but on Friday, after opening slightly easier, the market firmed up again and closed unchanged.

The American price, which had remained stationary at 7 cents since April 15th, was lowered on July 5th, to 6.95 cents and again on July 10th to 6.75 cents.

Closing prices on July 12th were £22 15s. for July and August, £22 16s. 3d. for September and October, 1s. 3d. down to unchanged on the week.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

311 640 J. McLEAN. Galleries for electric lamps. (31/10/28.)
299 812 BRITISH THOMSON-HOUSTON CO., LTD. Electric power systems for ship propulsion and other purposes. (1/11/27.)
300 211 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Aerial systems. (8/11/27.)
301 744 BRITISH THOMSON-HOUSTON CO., LTD. Electric discharge devices. (2/12/27.)
303 119 A. JASICEK, and F. POLNAUER. Electric shuttle-operating devices for power looms. (28/12/27.)
311 218 UNITED WATER SOFTENERS, LTD., and E. B. HIGGINS. Electrolytic production of sterilizing agents, germicides and the like, and processes for applying such agents. (6/2/28.)
311 826 A. F. SYKES. Electromagnetic transmitters and receivers for reproducing sound. (23/11/27.)
283 543 DUBILIER CONDENSER CO. (1925), LTD. Electrical condensers. (13/1/27.)
311 666 SIEMENS BROS. AND CO., LTD., C. L. PETERS, and D. A. CHRISTIAN. Automatic telephone systems. (11/1/28.)
311 792 W. FENNELL. Means for the protection of electrical installations. (17/1/28.)
311 793 BRITISH THOMSON-HOUSTON CO., LTD., M. C. I. HUNTER, and W. P. HAMLYN. Electric switchgear. (17/1/28.)
311 794 BRITISH THOMSON-HOUSTON CO., LTD., M. C. I. HUNTER, and W. P. HAMLYN. Draw-out electric switchgear. (17/1/28.)
311 676 A. G. KERSHAW and WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD. Railway signalling-apparatus of the double-wire transmission type. (11/2/28.)
311 677 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.). Composite magnetic materials. (11/2/28.)
311 796 INTERNATIONAL GENERAL ELECTRIC CO., INC., and C. G. MAYO. Measuring and like apparatus for use with high-potential circuits. (14/2/28.)
311 681 BRITISH THOMSON-HOUSTON CO., LTD., and F. P. WHITAKER. Vapour-electric rectifiers. (14/2/28.)
311 682 S. MORSE. Electric heating-units. (14/2/28.)
311 684 CREED AND CO., LTD., and F. G. CREED. Printing-wheels suitable for use in telegraphic receiving and printing apparatus. (14/2/28.)
311 685 STANDARD TELEPHONES AND CABLES, LTD., and W. K. WESTON. Electric communication cable. (14/2/28.)
311 686 STANDARD TELEPHONES AND CABLES, LTD., and M. S. SNELL. Automatic switches for telephone systems. (14/2/28.)
311 722 BRITISH THOMSON-HOUSTON CO., LTD., and L. B. AULT. Electromagnetic instruments for converting oscillating currents into sound and vice versa. (15/2/28.)
311 801 BRITISH THOMSON-HOUSTON CO., LTD., and J. C. READ. Vapour-electric rectifiers. (16/2/28.)
311 806 F. H. ROYCE. Control of output of variable-speed electric dynamos. (17/2/28.)
311 807 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and C. H. BRIZELL. Interlocking electromagnetic relays. (17/2/28.)
311 810 W. E. BEATTY (BELL TELEPHONE LABORATORIES. INC.). Picture-transmission system. (17/2/28.)
286 666 L. N. BRILLOUIN. Device for producing electric discharges of predetermined duration, and constant intensity. (8/3/27.)
287 161 C. LORENZ AKT.-GES. Remote-control arrangements for electric alternating-current distribution systems. (18/3/27.)
311 849 H. R. MILNES. High-tension electrical supply for wireless apparatus. (27/2/28.)
311 853 E. D. FELDMAN. Electric motors. (29/2/28.)
294 225 SIEMENS AND HALSKE AKT.-GES. Luminous circuit charts. (22/7/27.)
311 851 E. Y. ROBINSON and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Vacuum electric tube devices. (28/2/28.)
311 870 R. I. DENHAM. Electromagnetic actuating-mechanism for the reproduction of sound with radio loud-speakers, telephone receivers, and the like. (21/3/28.)
311 871 ENGLISH ELECTRIC CO., LTD., and H. BACON. Mechanical trip devices applicable for use with electric switches and for other purposes. (22/3/28.)
311 881 P. FREEDMAN and W. J. RICKETS. Electrical relays and amplifiers. (29/3/28.)
287 914 A. GIAMBERTONI. Electrically-driven floor brushes. (29/3/27.)
311 811 W. FENNELL. Means for the protection of electrical installations. (17/1/28.)
311 893 GRAHAM AMPLION, LTD., and P. K. TURNER. Means employed for supplying current or potentials from mains to utilisation means. (3/4/28.)
311 895 MIDLAND ELECTRIC MANUFACTURING CO., LTD., and W. L. BARBER. Electrical switches and switch fuses. (4/4/28.)
311 906 R. I. SCORER. Incandescent electric lamp fittings. (16/4/28.)
311 914 SIEMENS BROS. AND CO., LTD. (C.W. SCHOFIELD). Electric cables. (24/4/28.)
311 915 R. NETTL. Electric switch lamp holders and the like. (24/4/28.)
311 921 COVENTRY AUTOMATIC TELEPHONES, LTD., and J. COLLYER. Means for measuring the rate of generation of electrical impulses. (26/4/28.)
311 929 R. AMBERTON and ELECTRICAL APPARATUS CO., LTD. Measuring or indicating instruments. (5/5/28.)
291 028 D. H. ROWLAND. Multi-part insulators. (24/5/27.)
290 584 G. CATTANEO. Timing-adjustment of magnetos for internal-combustion engines. (13/5/27.)
305 453 LEIPZIGER SCHNELLPRESSENFABRIK AKT.-GES. VORM. SCHMIERS, WERNER & STEIN. Method of producing points of adhesion for galvanic deposits on light metal bodies. (4/2/28.)
291 734 BRITISH THOMSON-HOUSTON CO., LTD. Apparatus for the inter-conversion of mechanical and electrical oscillations. (6/6/27.)
311 963 J. H. PEASE. Miners' electric safety lamps. (15/6/28.)
294 208 WESTINGHOUSE LAMP CO. Gaseous-conduction electrical rectifiers for alternating current. (20/7/27.)
311 981 ELECTRO-MECHANICAL BRAKE CO., LTD., and J. H. WILLIAMSON. Trucks or wheeled underframes for tramway, railway, and like vehicles. (12/7/28.)
296 664 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Remote-control systems. (3/9/27.)
311 992 M. KRAMER. Electrically-heated massage appliances. (25/7/28.)
296 432 NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Circuit arrangements for operating an electric discharge tube with direct current. (2/9/27.)
312 006 HEVI DUTY ELECTRIC CO. Electric resistance furnaces. (22/5/28.)
298 572 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Mercury-vapour rectifiers. (11/10/27.)
299 322 AKT.-GES. BROWN, BOVERI, ET CIE. Double-cap insulators. (21/10/27.)
301 753 SOC. FRANCAISE RADIO-ELECTRIQUE. Electric selective arrangements for operating alarm devices. (2/12/27.)
302 901 C. LORENZ AKT.-GES. Electric transmission of pictures. (23/12/27.)
305 131 C. LORENZ AKT.-GES. Arrangements for eliminating disturbing and secondary waves in wireless circuits. (31/1/28.)
283 544 L. V. SMITH and G. W. WAITE. Electric water-heater. (18/7/27.)
290 556 DUBLIER CONDENSER CO. (1925), LTD. Electrical condensers. (14/5/27.)
312 099 F. H. ROYCE and E. F. CLARK. Control of output of variable-speed electric dynamos. (18/1/28.)
312 100 BRITISH THOMSON-HOUSTON CO., LTD., and L. J. CLARK. Vacuum devices such as electric incandescent lamps, electron discharge tubes, and the like. (18/1/28.)
312 104 BRITISH THOMSON-HOUSTON CO., LTD., H. S. PETCH, and R. D. PARRY. Electric time-delay devices. (20/1/28.)
281 311 G. VIARD. Measurement of cross-talk in telephone lines. (25/11/26.)

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312 406 J. L. Baird and Television, Ltd. Television apparatus. (30/11/27.)
281 676 Akt.-Ges. Brown, Boveri et Cie. Method of operating a synchronously constructed generator with a commutator cascade machine, the excitation of which is supplied at least in part through a frequency changer. (3/12/26.)
285 074 R. Bosch Akt.-Ges. Dynamo-electric lighting systems. (11/2/27.)
312 382 Sykes and Dyson, Ltd., P. Sykes, and W. Cooper. Electric junction-boxes. (18/2/28.)
312 113 J. W. Davison, J. F. Perry, and Associated Electrical Industries, Ltd. Controlling mechanism for moving devices or apparatus, more particularly for winding, hauling, hoisting, and like gear. (18/2/28.)
285 513 Allgemeine Elektricitats-Ges. Method of and means for electrical resistance welding. (18/2/27.)
312 116 G. J. Blake and G. D. G. Leadbetter. Mercury-vapour arc lamps. (20/29/28.)
312 117 G. J. Blake and G. D. G. Leadbetter. Mercury-vapour arc lamps and rectifiers. (20/2/28.)
312 205 F. Berg. Insulator for electric live wires. (20/2/28.)
312 119 Standard Telephones and Cables, Ltd., and E. Kaempf. Electric communication cable. (20/2/28.)
312 120 Standard Telephones and Cables, Ltd., and J. H. E. Baker, and E. P. G. Wright. Automatic or semi-automatic telephone systems. (20/3/28.)
312 121 British Thomson-Houston Co., Ltd., and F. E. Smith. Signs or other advertising-devices. (20/2/28.)
312 127 F. Newton. Regulators for dynamo-electric machinery and other electric apparatus. (20/2/28.)
285 795 P. Fitzner. Base for automatic telephone instruments. (16/5/27.)
312 130 J. Copp, F. Tait, and A. C. Tait. Gramophone electrical "pick-up" devices. (21/2/28.)
285 912 E. F. Northrup. Method and apparatus for correcting power factor of electric circuits. (25/2/27.)

Applications for Patents.

April 29th.

13 287 Accumulateurs-Monoplaque, Soc. Anon. Production of accumulators. (5/2/29, France.)
13 320 Ateliers J. Carpentier. Electromechanical vibrators.
13 253 British Radio Corporation, Ltd., and R. S. Bunting. Radio receiving apparatus.
13 227 D. A. Christian, C. L. Peters and Siemens Bros. and Co., Ltd. Automatic telephone systems.
13 228 D. A. Christian and Siemens Bros. and Co., Ltd. Mounting arrangements for automatic telephone switches, etc.
13 229 H. E. Humphries and Siemens Bros. and Co., Ltd. Electric selectors.
13 284 L. Köros. Connection for anode circuits of thermionic valves. (6/6/28, Germany.)
13 285 L. Koros. Potential divider. (12/10/28, Hungary.)
13 213 G. Malin. Incandescent lamps. (3/5/28, France.)
13 254 R. P. Myers and R. E. Smart. Electric motors.
13 305 A. T. Prentice. Magneto make and break mechanism.
13 247 Sangamo Electric Co. Electric terminals. (5/10/28, U.S.)
13 283 Siemens-Reiniger-Veifa Ges. für Medizinische Technik. Cathode ray sterilisation. (30/4/28, Germany.)
13 286 Siemens and Halske A.-G. Traffic signalling installations. (16/2/29, Germany.)
13 221 L. Sunderland. Application of light, etc., for medicinal purposes.
13 317 Weston Electrical Instrument Corporation. Vacuum tube relay. (13/3/29, U.S.)

April 30th.

13 411 C. L. Arnold and M.K. Electric, Ltd. Electric switches.
13 421 Automatic Telephone Manufacturing Co., Ltd., and L. M. Simpson. Interlocking keys for controlling electric circuits.
13 471 Automatic Telephone Manufacturing Co., Ltd., and L. M. Simpson. Key controlled electric signal transmitters.
13 379 A. C. Bowles. Time switch.
13 329, 13 330. H. Bright. Device for controlling electrical apparatus.
13 341 H. Bright. Massage appliance.
13 417 British Thomson-Houston Co., Ltd., and A. J. Johnston. Electric totalising systems, etc.
13 415 British Thomson-Houston Co., Ltd. (Victor X-Ray Corporation). X-ray operating tables.
13 331 R. V. Broberg and L. E. Wood. Motor controllers.
13 443 V. G. van Colle. Wireless apparatus.
13 346 Constructors Associes de Paris. Electric cookers, etc. (24/5/28, France.)
13 425 J. Dieux. Transformation of electric currents.
13 416 U. Doring. Electric discharge devices. (30/4/28, Germany.)
13 383 S. Smith and Sons (Motor Accessories), Ltd., and E. A. Watson. Electric liquid level indicators.
13 416 H. J. Spanner. Electric discharge devices. (30/4/28, Germany.)
13 473 J. Swinburne. Electric circuit breakers.
13 445 C. B. White. Salvaging storage battery plates.

May 1st.

13 513 W. Aitken. Automatic telephone systems.
13 556 Automatic Telephone Manufacturing Co., Ltd. Telephone systems.
13 615 C. E. G. Bailey Gramophone Co., Ltd. Wireless receivers.
13 590 W. H. Bristol Talking Picture Corporation. Amplifying systems for electric currents. (1/5/28, U.S.)
13 527 G. N. Cadbury and Electro-Mechanical Brake Co., Ltd. Magnetic blow-out devices for current interrupters.
13 558 G. F. Dutton and Siemens Bros. and Co., Ltd. Measurement of variable electrical quantities.
13 529 Ferranti, Ltd., and R. C. Galletti. Propagation of wireless waves.
13 512 W. D. Fletcher. Wiring for electric lighting, etc.
13 503 J. and M. F. Fusco. Storage batteries.
13 561 E. Rademacher. Electric hand lamps.
13 578 Siemens-Schuckertwerke A.-G. Feeding commutator pole winding of commutator machines. (2/5/28, Germany.)
13 579 Siemens and Halske A.-G. Insulation of transformers. (4/5/28, Germany.)
13 559 Vereinigte Glühlampen und Electricitats A.-G. Manufacture of oxide cathodes. (8/6/28, Austria.)

May 2nd.

13 717 Associated Electrical Industries, Ltd. Photographic sound recording. (3/5/28, U.S.)
13 661 C. R. Belling. Electric heaters.
13 737 F. Buckler. Wireless receiving sets.
13 674 J. W. Canham. Induction motors.
13 659 Chamberlain and Hookham, Ltd., and S. James. Electricity meters.
13 707 U. Doring and H. J. Spanner. Electric discharge devices. (2/5/28, Germany.)
13 620 W. F. Dunn. Thermionic valves.
13 698 F. W. V. Fitzgerald. Storage cells.
13 651 A. A. Govan. Electric switches.
13 688 G. Henderson and Bruce Peebles and Co., Ltd. Arrangements for starting motor convertors.
13 725 I. W. E. Hustler, B. Lawrence and F. T. Pankhurst. Radio receiving systems, etc.
13 706 International General Electric Co, Inc. Insulating material. (2/5/28, Germany.)
13 699 D. E. Lambert, B. H. Leeson and A. Reyrolle and Co., Ltd. Electric selective remote control systems.
13 655 Maschinenfabrik Oerlikon. System for production of polyphase voltages and currents. (21/5/28, Switzerland.)
13 709 Siemens-Schuckertwerke A.-G. Built-in electric motors. (15/5/28, Germany.)
13 628, 13 629. J. B. Tucker. Eleotric switches.

May 3rd.

13 813 H. Astbury and Crompton, Parkinson, Ltd. Protection of electric supply circuits, etc.
13 841 Automatic Telephone Manufacturing Co., Ltd., and R. Taylor. Telephone systems.
13 855 British Thomson-Houston Co., Ltd., L. Griffiths and C. J. Morton. Coil ignition apparatus for motor cycles.
13 807 H. J. Charman and E. F. Entwisle. Telephone mouthpieces.
13 814 Crompton, Parkinson, Ltd., and G. Page. Fusible cut-outs.
13 774 Deutsche Gasglühlict-Auer Ges. Electric motors, etc. (3/5/28, Germany.)
13 839 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
13 794 Electrolux, Ltd. (Platen Munters Refrigerating System Aktiebolag). Regulating devices for refrigerating apparatus.
13 800 H. Foxall and J. Lucas, Ltd. Electric switches.
13 751 W. F. Grupe. Electrolytic deposition of gold.
13 757 J. H. O. Harries. Recording electric currents.
13 768 T. Hough and H. C. Mahoney. Frame aerials.
13 820 M. Kugel. Maintaining constant supply of phosphoric acid in electrolyte.
13 828 Akt. Ges. C. Lorenz. Cooling electrical apparatus. (5/5/28, Germany.)
13 873 Magnet-Werk Ges. Eisenach Spezialfabrik fur Elektromagnet Apparate. Magnetic separators for porcelain sludges, etc. (5/4/29, Germany.)
13 847 Marconi's Wireless Telegraph Co., Ltd. Thermionic amplifiers. (3/5/28, U.S.)
13 876 National Carbon Co., Inc. Adjustable lamp socket. (22/5/28, U.S.)
13 812 A. Nutsford. Manufacture of accumulators, etc.
13 815 J. R. Quain. Electric signs.
13 808 W. N. Roseway. Signalling circuit arrangements.
13 871 B. N. Sokoloff. Electromagnets.
13 861 B. A. Spaull. Electric lampholders, etc.
13 858 Standard Telephones and Cables, Ltd. Signalling circuit arrangements.

May 4th.

13 979 M. von Ardenne. High frequency amplifier. (5/5/28, Germany.)
13 920 Burnley Components, Ltd., and D. K. Ward. Thermal cut-outs for electrically heated receptacles.
13 974 Electroacustic Ges. Acoustic direction-determining device. (4/8/28, Germany.)
13 976 G. B. Ellis (Soc. des Usines Chimiques Rhône-Poulenc). Photoelectric cells.
13 941 International General Electric Co., Inc. Frequency changers. (4/5/28, Germany.)
13 973 A. G. Ionides and Wireless Music, Ltd. Electromagnetic devices for recording, etc., sounds.
13 975 C. Lorenz Akt. Ges. Wireless navigation apparatus. (10/1/29, Germany.)

May 6th.

13 998 N. Allday. Electric lighters for cigarettes, etc.
14 124 Associated Telephone and Telegraph Co. Electric signalling systems. (5/5/28, U.S.)
14 062 Automatic Telephone Manufacturing Co., Ltd., and H. D. Sharpe. Telephone systems.
14 086, 14 087. H. H. Berry and C. A. Painton. Water heaters.
14 088, 14 089. H. H. Berry and C. A. Painton. Electric heating elements.
14 072 British Thomson-Houston Co., Ltd. Motor control. (7/5/28, U.S.)
14 095 F. B. Brook and J. S. R. James. Electrical transmission of pictures and views.
14 059 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Circuit arrangements for frequency transformation.
14 060 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
13 995 J. and J. B. Foster. Safety device for vehicles fitted with dynamos, etc.
14 037 F. J. Gray, F. Pountney and Villiers Engineering Co., Ltd. Accumulator charging plant.
14 034 S. A. Hunter. Resistance grids.
14 057 D. C. Croom-Johnson. Fire alarms.
14 082 Kolster-Brandes, Ltd. Signal transmitting systems. (5/5/28, U.S.)
14 081 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Radio receiving systems.
14 002 A. A. S. Roscoe. Automatic control switch for internal combustion engine driven electric generators.
14 127 Siemens and Halske A.-G. Electrically controlled sorting machines for perforated cards, etc. (7/5/28, Germany.)
14 023 M. S. Snell and Standard Telephones and Cables, Ltd. Switching mechanisms for telephone systems.
14 115 Telefunken Ges. fur Drahtlose Telegraphie. Radio direction finding apparatus. (5/5/28, Germany.)

May 7th.

14 217 H. Bird and General Electric Co., Ltd. Resistances.
14 147 G. B. Bowell. Electric clocks.
14 208 British Thomson-Houston Co., Ltd. Electric heaters. (8/5/28, U.S.)
14 209 U. Doring and H. J. Spanner. Electric discharge devices. (8/5/28, Germany.)
14 215 B. W. and G. B. Handley. Electric switches.
14 251 Maschinenfabrik Oerlikon. Rotary transformer installations. (24/5/28, Switzerland.)
14 206, 14 207. Dr. P. Meyer A.G. Mercury switches. (7/5/28, Germany.)
14 222 N. V. Philips' Gloeilampenfabrieken. Incandescent lamps. (16/6/28, Holland.)
14 185 J. R. Quain. Electric lamps.
14 131 W. B. Sayers. Accumulators, etc.
14 267 Siemens-Schuckertwerke A.-G. Built-in electric motors. (12/6/28, Germany.)
14 263 W. W. Smith. Relay or servo mechanism.
14 216 D. S. S. Steuart. Transmitting and receiving apparatus for telephones, etc.
14 180 Western Union Telegraph Co. Cable telegraphy. (30/3/29, U.S.)

May 8th.

14 425 D. S. F. Adams, L. M. Myers and Universal and General Radio Co., Ltd. Television receivers.
14 393 Associated Electrical Industries, Ltd., P. G. H. Burbridge and N.R. Davis. Electrical furnaces.
14 394 Associated Electrical Industries, Ltd., and N. R. Davis. Electrical furnaces.
14 395 Associated Electrical Industries, Ltd., N. R. Davis, J. H. Ludlow and J. Marchbanks. Electrical furnaces.
14 413 British Thomson-Houston Co., Ltd., R. Clinker and C. G. Mayo. Measuring, etc., apparatus for high potential circuits.
14 371 E. E. Brulin. Receivers for picture transmission.
14 339 J. Cox and A. E. Telford. Portable wireless receivers.
14 412 U. Doring and H. J. Spanner. Electric discharge devices. (8/5/28, Germany.)
14 403 R. F. Dupaquier. Apparatus for comparing electrical capacities. (11/9/28, France.)

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29H

THE ELECTRICIAN

Vol. CIII.—No. 2669. Friday, July 26, 1929. [Registered at the General Post Office.] Sixpence

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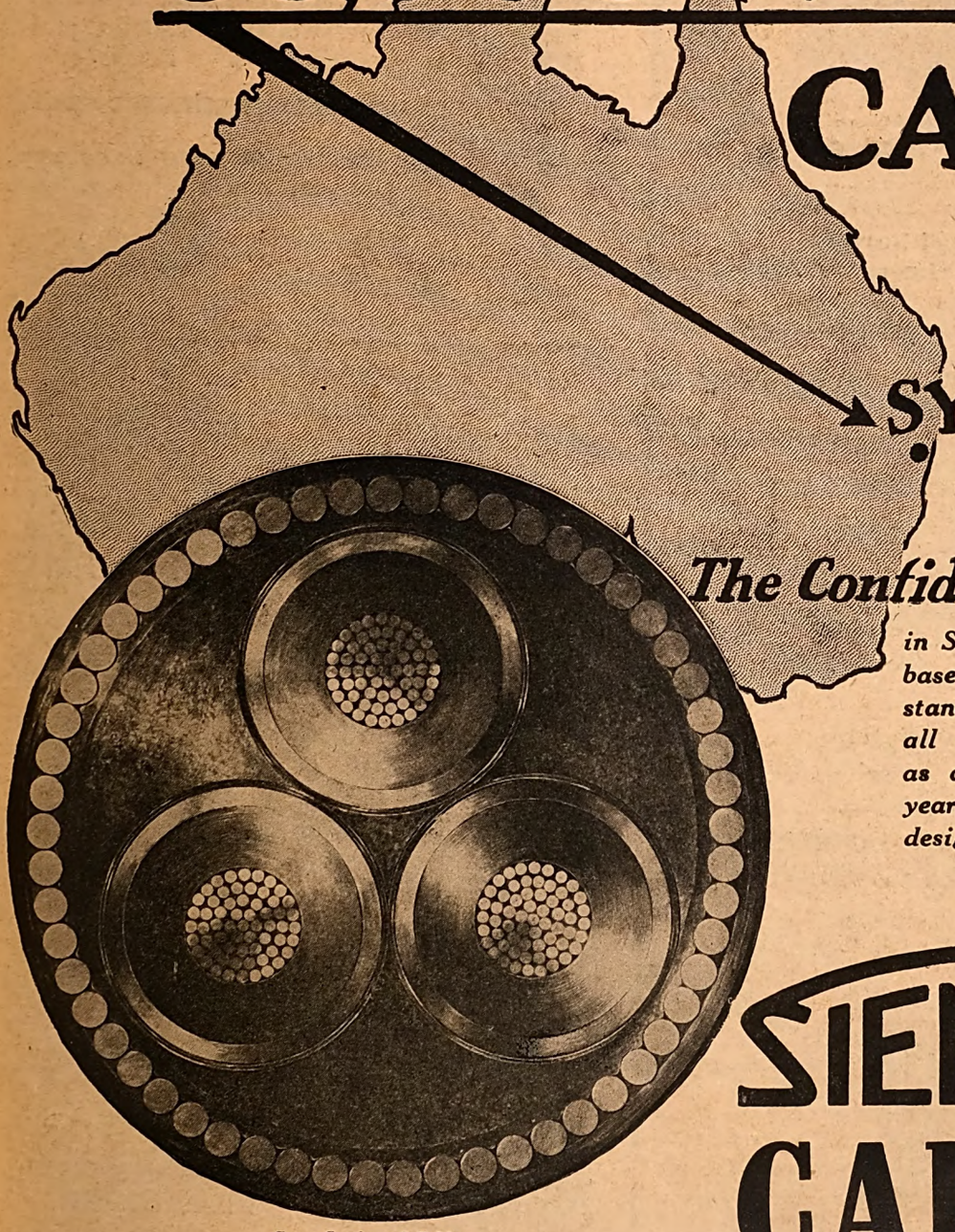

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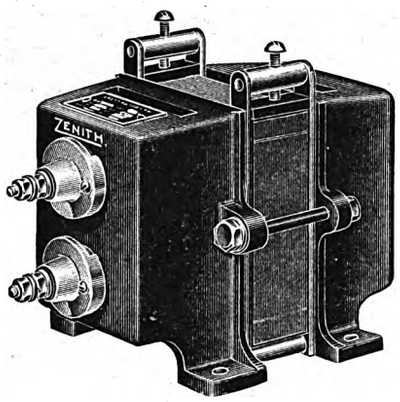

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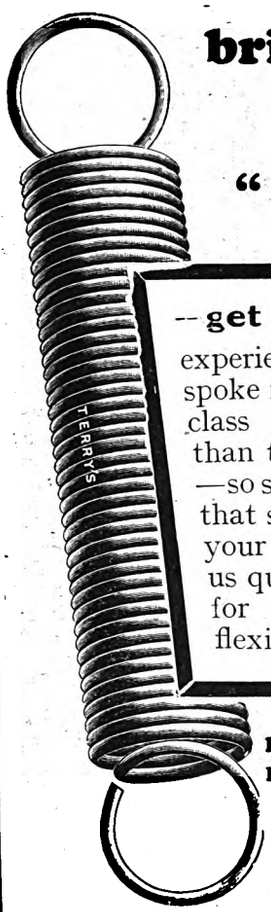

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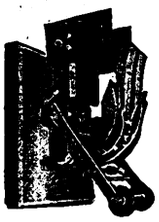

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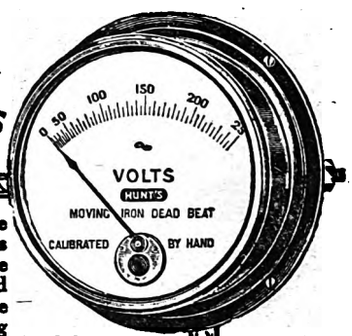

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Current Topics.

The Dorking Enquiry.

THE Ministry of Transport's inquiry at Dorking, last week, into the Special Order under which the Dorking U.D.C. leases the local electricity undertaking to Edmundson's Electricity Corporation, Ltd., for a further term of 40 years, was at first sight of purely local interest. Closer examination of the position suggests that the general questions involved may not be without importance in other areas, a view which is, to some extent, confirmed by the interest shown by the London and Home Counties' Joint Electricity Authority, which, for the first time since its establishment in 1925, appeared as an opponent to a Special Order. Pending the announcement of the Minister of Transport's decision we do not propose to comment on the Dorking case. We may, however, point out that the general method—of which the Dorking proposal is but one instance—of extending the tenure of companies who ask for high maximum unit prices and a fixed minimum dividend, which is automatically increased with every reduction in unit prices, is one which, while ostensibly safeguarding the consumer, may, on occasion, operate in a contrary direction. At present, it is true, the generating costs of some of these companies are high, and a big drop in their charges to consumers can hardly be anticipated under the conditions now obtaining. On the other hand, a reduction of unit prices to so low a figure as 6d.—which normally would not be considered cheap—would generally give to the company a big percentage increase in dividend, though the consumer would receive a correspondingly smaller percentage reduction in price. If, however, we look even a few months ahead, the position of the majority of the smaller supply companies will be considerably altered. Cheap supplies from the "grid" will become available to many of them, and the prices at which they will be able to secure a bulk supply will be so low as to make their legal maximum prices look quite absurd. Naturally the consumer will derive some benefit from the existence of the cheap "grid" supply, but some of the companies are bound to obtain a proportionately greater advantage from a service which they have done next to nothing to provide. There is, of course, no crime in making a profit; on the contrary, it is most desirable so long as it is reasonable. But we question whether loopholes should be provided—which may or may not be used—whereby those who may not be content with a reasonable profit can manipulate the "grid" supply in such a way as to derive from it far more advantage than the consumer, for whose benefit it was chiefly designed.

Marconi Royalties.

A MEETING of importance to electrical contractors was held in London, on Wednesday, when the council of the Radio Manufacturers' Association placed before the members details of an arrangement which had been arrived at between a Negotiating Committee of the Association, the Marconi Co. and the Gramophone Co. with respect to royalties. The negotiations were, of course, made necessary by the result of recent litigation between the Brownie Wireless Co. and the Marconi Co., and though the position of the Marconi Co. at the end of such litigation was exactly the same as before, the R.M.A. has prevailed upon the company to reconsider the royalty question. At Wednesday's meeting members were recommended to accept terms upon which to form a new licence with a royalty basis of 5s. per valve holder on all sets, whether incorporating a Marconi patent or not; to agree to a royalty of 5s. on battery eliminators, valve or metal rectifier, incorporated in a complete set; and to pay a royalty of 6% of the list selling price on eliminators not included in a complete set. The agreement covers the period 1928–1933, and permits licensees to use any existing or future patent owned or controlled within the time limit of the licence, by the Marconi Co., the Radio Corporation of America, the G.E.C. of America, the Gramophone Co., and the French and German Associates of these companies, in return for which the Marconi Co. may use, without payment of royalty, any patent owned or controlled by R.M.A. members. The Royalty on exported sets is to be 5s. per valveholder, except in the case of Australasia, when the royalty applicable is to be 2s. 6d. The Marconi Co. has agreed to do all in its power to restrict the importation of foreign-made sets and has furthermore agreed to prosecute in all cases of infringement of patents. The terms of the agreement, if accepted, also provide for the payment of arrears in royalties over an indefinite period. Whether or not the R.M.A. will accept the terms of the new licence remains to be seen, but since

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the National Radio Exhibition is to be opened in two months' time a quick decision is called for. In any case the new conditions would allow of a price reduction on all sets and eliminators, while the question of the free use of R.M.A. patents affecting radio receivers is best answered by considering whether or not those patents are of such importance as materially to benefit the Marconi Co. It is a rather unpleasant pill for the R.M.A. to swallow perhaps, but, on the other hand, a reduction of 7s. 6d. in the royalty charge is not any too pleasant to the Marconi Co., especially in view of the fact that the R.M.A. lost the day in the Brownie test case.

The Factory Lighting Campaign.

THE report of the E.L.M.A.-E.D.A. Factory and Workshop Lighting Campaign, which has just been published, indicates that the campaign was something of a success, and though at this early period it is difficult to estimate the amount of business which has been directly obtained from the efforts, the numerous letters which have been received clearly indicate the substantial commercial value of the campaign. From one area alone 100 inquiries resulted in nine definite orders and 55 prospects which are still "alive" Another report shows that the campaign was directly responsible for six installations approximating in all over 600 fittings, while in another area 1 800 industrial fittings have been supplied as a result of the special effort. As will be gathered from the abridged report published elsewhere in this issue, no fewer than 5 931 persons attended the 192 meetings, and as many as 96 towns took part. Workshops and sections of workshops were loaned by manufacturers for lecture demonstrations, while in other cases public halls, technical colleges and showrooms were utilised. The finances of the campaign have proved sufficient to meet all expenses, and the balance is to be devoted to the production and circulation of a booklet embodying photographs of modernised industrial lighting installations, and expressions of opinion as to their value. This booklet will be available for mailing on October 1st. so as to reach factory owners immediately before the end of summer time. The E.L.M.A. and the E.D.A., and in particular, Mr. J. L. H. COOPER, are to be congratulated on the successful conclusion of the campaign, though, in fact, no conclusion has yet been reached. Such an effort will, of course, remain "alive" for many years, since many of those factory owners who have not yet acted upon the advice they have received with respect to lighting, will, when enlarging their works or moving to new areas, put to practical value the information which the campaign has given them.

Electricity in Heat Waves.

THE recent hot weather has presented those who sell certain domestic electrical appliances with a wonderful opportunity, of which one hopes they have taken full advantage. We refer, of course, primarily to electric fans, then to electric refrigerators, though electric cookers should not be overlooked as "coolth" promoters. The scarcity of fans and refrigerators makes real summer weather almost unendurable in the large centres of population in this country, and, apart from domestic users, there must be many works, offices and public buildings which would readily instal such efficient cooling media if only they were approached in the right way. We have also referred to electric cookers, which, though not directly cooling, at least have the advantage of not making a warm kitchen hotter. There is a good deal to be done in the pushing of electric cooker sales in the summer months, and those who have recognised this fact find it decidedly advantageous to spread this business more evenly over the entire year than to be content with seasonal trading.

Summer Selling.

THE business of levelling up valleys is just as important in the manufacturing world as it is on the supply side, and the electrical manufacturer who seriously sets about levelling up his sales curve usually has little cause to regret he extra effort. Within the last few days we have come across more than one application of the levelling-up principle. In one case a firm making domestic electrical appliances has so altered the shape of its sales curves that the sales for May, June and July, which are normally valley months, have not only been brought up to existing peak levels, but have begun to form new peaks. It would be idle to pretend that selling in the holiday months is not attended by certain unavoidable difficulties, but the experience of the firms we have in mind clearly shows that such obstacles are surmounted by those who have sufficient determination to profit by existing conditions.

"The Padlocked Cooker."

DURING the last few days the newspaper-reading public has been regaled with a very clever advertisement in which pride is properly taken in the achievement of a certain gas cooker, which, when fitted with a special thermostatic device, was able to produce a properly cooked meal after being chained and padlocked for a suitable period. This "triumph of cooking under lock and key, without fuss, without watching, without basting, without turning," is proudly put forward as something which no other cooker in the world could have done. While we are prepared to allow the advertisement writer some of the licence which is the traditional right of the poet, we can hardly resist the temptation to remind him that this feat is being performed daily by thousands of electric cookers in this country. Many of these electric cookers can even turn on the heat at a predetermined hour, without human intervention.

Television and the B.B.C.

ONCE again friction has been caused between the B.B.C. and the Baird Television Development Co. over the vexed question of demonstration facilities. It will be remembered that last March the late Postmaster-General gave consent to the B.B.C. using one of their stations for the purpose of transmitting television, and expressed himself as anxious that facilities should be afforded, so far as was practicable without impairing the broadcasting service, for continued experiment with Baird apparatus. According to the Baird Television Co. the B.B.C. then offered three morning broadcasts weekly, each of a quarter of an hour's duration. This the Baird Co. insists is inadequate. Whatever may be the opinion of the B.B.C. of the progress so far made with television, we fail to see why the Corporation cannot provide better facilities for experiments in a science which must eventually become as public a service as that of broadcasting. The B.B.C. have been granted a monopoly, and out of consideration of that favoured position the least they can do is to assist other sciences allied to broadcasting by permitting experiments in transmission of longer duration than fifteen minutes, three times a week. Since the erection of a private station for the transmission of television is, under present conditions, out of the question, the B.B.C. is the only possible means whereby radio television can be developed in this country, and it appears to us that the public would be better served were the Corporation to take a rather broader view of the position, especially when it is remembered that the funds of the B.B.C. are subscribed by those very people who are anxious for television to become as general as the broadcasting of sound.

Postmark Publicity.

THE excellent facilities now afforded by the Post Office for the franking of letters for commercial undertakings do not seem to be sufficiently appreciated. For the information of those who are not familiar with the device, it may be explained that correspondence so treated is overprinted in one operation with a postage stamp, the usual circular date and place of posting stamp and a panel 2¼ in. wide by 1 in. deep containing a slogan chosen by the firm concerned. By this simple means every letter sent out contains an advertisement for the sender. An example of intelligent use of this service reached us one day this week, when a letter from the Leicester Electricity Department carried the slogan "Electricity makes everything so Easy."

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CONCRETE POLE DESIGNS AND COSTS.

Inefficiency of Existing Constructional Methods—Why Concrete Pole Lines should be Made on Site—Some Interesting Features of the Process—Detailed Costs Show Economy of Concrete.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

TAKEN broadly, there is much less excuse for casting a pole remote from the actual position it takes up in the line than there is in casting a heavy concrete water pipe at a point far removed from its final destination. For the pole, an entirely different kind of foundation is required, and the kind of pole referred to herein specially favours making the foundation the first operation (not the last), thus having the advantage of 100% undisturbed ground; moreover, the concrete pole can be quite easily and properly cast by hand, and, when cast in its final vertical position in the line, the concrete will possess the advantage of hardening under less moisture content and greater weight-pressure, conditions which tend to increase the quality, density, and strength of the pole just where they are most required.

The risk of fracture or injury due to the five operations (referred to below) before the pole is in its final place is great, and the method is both inefficient and uneconomical. The great weight of concrete destined for transport and to repeated handling is no doubt *the* main factor disqualifying the more general use of reinforced concrete for poles. The inherently superior qualities of concrete cannot be denied by anyone. The high first cost *per pole* in place is the principal objection, and this first cost cannot be reduced until we overcome or greatly reduce such costs as the moving and handling at works during the casting and curing and storing, haulage by road to the nearest railway station, rail transport, road transport and handling from railway to the pole line location, as well as the handling and erection on site. When *all* these costs are largely overcome, we shall then be in a position favourably to compete with the cost of a wood pole line, but not otherwise. Therefore, if we desire to have a cheap, stronger, and a better pole line, we must first change our methods. The money wasted " on the road " should be put into the pole and counted as effective pole materials and design strengths, all of which are of direct and lasting benefit to the electricity supply undertakings.

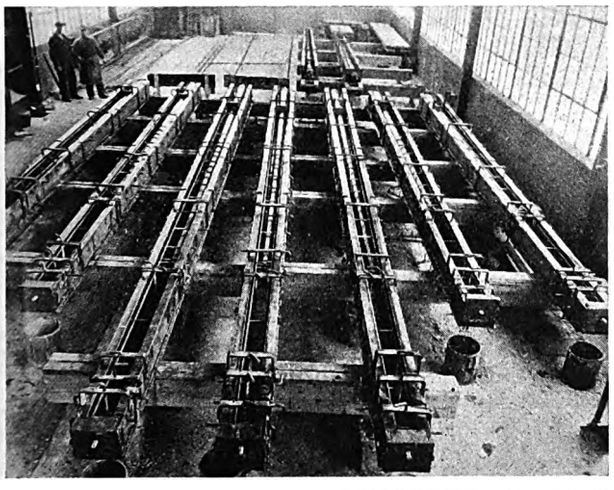
Use of the absolute minimum amount of material, with its consequent dangers and disadvantages, can be avoided by casting the poles or frames or structures right on the spot, i.e., each pole in its actual final position in the line. From the electricity supply undertaking's viewpoint this is most decidedly the better method, not only because the first total cost can be much less, but also because the complete making and construction can be inspected by them; there is no handling, no transport or haulage; on undisturbed ground, the foundation is made first; the pole is built up and left to cure and harden inside a moistened wooden form; the finished pole is neither disturbed nor moved; the greatest effective and most efficient mass of concrete is provided at the least cost. Actually, the whole of these operations tend to favour the electricity supply engineer, because he is securing the most of everything he desires in a pole and its foundation for the least money.

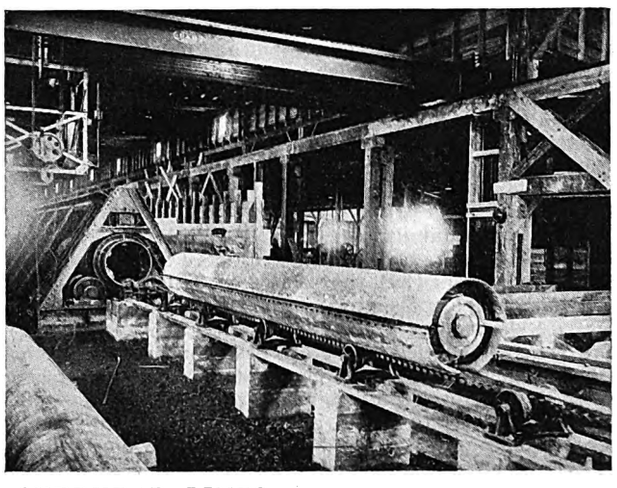
The steel assembly and welding or/and tying of hoops or spirals is completed, and the pre-cast blocks for centreing and positioning the steel are placed, before the completed steel reinforcement is set in the partly-built wooden form. In this position there is no more difficulty or uncertainty in the shifting of steel position than there is with the centrifugal and spun processes; also, the raising of from 50 to 200 lb. weight of concrete (per lift) is of no consequence whatever.

No Movement of Reinforcement.

When talking on this very point, the writer was recently questioned as to the iron reinforcement shifting its position, the possibility of longitudinal rods converging, and such like questions based on little construction experience. At least four of the outer longitudinal rods are assembled and tied or/and welded at intervals to the hoops, over which may (as desired) be threaded the interspaced small pre-cast concrete pieces, so that there cannot be any possibility of steel converging. This assembly and welding may, if cheaper and better, be done at a special works, or on the site as desired. Actually, there is less chance of steel movement than there is in making an ordinary column for a building, because pre-cast concrete blocks are used at determined section lengths (depending on the size and design) to position, and set and hold the steel rods. The wood form is built up in panels and left open at any point or those positions most desired for filling and/or inspection or puddling at (or above) the concrete line. Before a section length is filled with concrete the panels are positioned and braced; the braces are of a kind that clamp and at the same time dispense entirely with any form of scaffolding. The exterior of the wood form makes a kind of single or double stepladder for the workmen to climb up and down at the same time.

Some of the interesting features of this process are: (*a*) the foundation is made first; it need not necessarily be made at the time the pole is being cast; (*b*) the wood form need not be completed on all sides, there need only be sufficient to position and raise the reinforcement and provide for staying;





CONCRETE POLES FOR OVERHEAD LINES.

SOME idea of the complexity of the processes required for the manufacture of concrete poles by existing methods can be gained from these pictures, which show (left) forms for making poles at the plant of the Rochester Gas and Electric Co.; the reinforcing rods and cores are seen in place ready for the addition of the concrete; and (right) a concrete pole spinning machine used by the Westinghouse Electric and Manufacturing Co., Milwaukee. In the accompanying article Mr. W. T. Taylor advocates a system which eliminates these factory processes.

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(*c*) the wood form is stayed in its vertical position from the time of its assembly to the time the concrete is sufficiently hardened. The little extra time and tackle taken in raising the materials (steel or concrete or partly-built wood form, in their respective operations referred to) are well justified; more so than the process of raising members of steel towers in the air which involve very much more detailed work and more handling of materials, etc., as compared with an equally strong reinforced concrete frame (double pole); (*d*) differing from a pole cast horizontally with only a total overall depth of a few inches of concrete, the plastic mass is (by the vertical method) under pressure due to the vertical concrete weight that tends to provide a relatively higher quality concrete of a greater density and strength, in that section of the pole where the greater strength and density are most required; (*e*) the electricity supply undertaking obtains the greatest, most economical, and resistant mass of concrete for the least cost because the maximum amount of effective materials is put into the pole, i.e., for the same money that buys a pole made differently (especially poles of the hollow type) much more effective material of greater strength figure is put into this pole; (*f*) a decreased factor of safety can be allowed not only because of the greater amount of materials most effectively and efficiently used, but also because all possible likelihood of fracture or injury is done away with.

At the present time there are design proposals for reinforced concrete poles in short sections with one or more legs per pole, which are either coupled by means of sleeves, telescoped, butt-jointed and bolted, or lap-jointed, as the case may be. There are also the various hand and machine methods for casting, different ways of casting and curing and storing, as well as different methods of handling, transporting, hauling, and erecting. There is no reason why we should not adopt one or other of the best-known types of poles or structures now used in the form of wood or steel; whatever type and method and design we adopt, we cannot help our attention (on the one hand) being specially drawn to the excessive costs of handling, transport, haulage and erection, then (on the other hand) to the relative maximum strength and life of the pole for a given cost.

There is little need to concern ourselves with the cost of casting or making reinforced concrete poles, except that the works-made pole requires a costly machine in the first place, and it involves high maintenance costs for the series of operations from casting to storing. Most electricity supply undertakings may be seriously concerned with the type of design and manner of making, because these spell either long or short life, decreased or increased strength, or/and higher or lower maintenance cost with age, etc. Every operation of handling at works, transporting, haulage and erection, may well be the cause of fracture or failure, and many of these fractures may (and can) be covered over, and thus pass notice. Moreover, just as we avoid joints of almost any kind from electrical or/and mechanical reasons, so we should avoid (and always look upon as a point of hazard and added cost) any form of joint placed in the main column of a pole.

Pole joints can be made strong at a relatively greater cost, but there is usually involved an additional maintenance cost as well as a risk. The risk may be great and the maintenance cost may be high; the latter would be due to the fact that there is usually nothing else to maintain in a concrete pole, and to attend to this one item of maintenance cost is obviously relatively high, and is a disadvantage.

A Satisfactory Business Proposition.

The following tabulated figures of calculated designs and estimated costs are given in sufficient detail to serve as reliable proof to engineers that the reinforced concrete pole line is a satisfactory business proposition at this juncture of electrical development. The five examples are typical of the more general practice; they are based on present-day regulation loading conditions. The first three designs for 0·05 to 0·10 sq. in. copper conductors are well suited to line voltages ranging from 3 300 to 15 000, with the costs specially favouring those voltages at and below 11 000; for the bigger lines of two-pole design using suspension insulators and 0·15 or 0·20 sq. in. copper conductors, two designs are given which will be found suitable for line voltages ranging from 15 000 to 33 000, the costs specially favouring those lines operating at and below 25 000 V. In the designs given here, it will be noted that robustness, strength, ample height and clearances, etc., have not been skimped in order to show a cheap design—*the designs are for our future lines*, and not for any purpose of presenting a cheap thing. All the designs are for a *three*-wire line.

The tabulated figures give the first costs which, for concrete poles, are the only serious costs to consider, because the annual expenses are almost all due to the interest on the initial expenditure *plus* the depreciation annuity of the remainder of the line, which latter also favours concrete construction.

Therefore, what nearly every engineer is chiefly concerned with is the first cost *of the line*—not the relative costs of wood and concrete *poles*. For a given length of transmission the concrete pole *line* has fewer poles, less cross arms and hardware, less insulators and pins, less expenses for wayleaves, etc. Hence, it is inaccurate to refer to the relative initial cost of *poles*. The maintenance expenses of wood and concrete, or steel and concrete, are out of all proportional, as also is the relative life and the relative possible interruptions in service, etc., all favouring the concrete pole line as compared with the wood or the steel pole line. Referring to the relative costs of poles is bad, but not so bad as speaking of a factor of safety of 2·5 for bare, exposed, unprotected and unsupported steel, and 3·5 for totally covered and protected and supported steel, or, that concrete should have the same factor as steel.

CALCULATIONS FOR REINFORCED CONCRETE POLE LINES.

(Based on the present factor of safety of 3·5, which combined factor is more costly and less accurate than 2·5 for steel and 4·5 for concrete.)

	Sizes of copper line-conductors (sq. in.)				
	0·05	0·075	0·10	0·15	0·20
PHYSICAL DATA:					
Line voltage	3 300 to 15 000	3 300 to 15 000	3 300 to 15 000	15 000 to 33 000	15 000 to 33 000
Number of conductors ..	3	3	3	3	3
Weight, lb. per ft. of length	0·200	0·300	0·398	0·594	0·802
Radial ice-coating, in. ..	½	½	½	½	½
Type of insulators used ..	pin	pin	pin	suspension	suspension
Height of pole above ground, ft.	33	33	33	42	42
Horizontal conductor—separation, in.	48	48	48	60	60
Vertical conductor separation, in.	36	36	36	60	60
Distance from pole-top to top conductor, in.	6	6	6	21	21
Distance from pole top to lowest conductor, in. ..	36	36	36	84	84
Minimum clearance of conductors above ground, ft.	20	20	20	22	22
Relative number of poles per 10 miles of line	114	106	91	85	81
Number of anchor poles per 10 miles of line ..	10	10	10	10	10
Number of straight-line poles per 10 miles of line ..	104	96	81	75	71
STRAIGHT-LINE CONSTRUCTION:					
Horizontal wind load per conductor, lb. per ft. of length for 8·0 *lb. per sq. ft. of wind*	0·71	0·758	0·77	0·83	1·018
Allowable tension of conductor, lb.	1 536	2 240	3 032	3 202	5 829
Total horizontal wind, lb. per ft. of length	2·13	2·27	2·31	2·49	3·054
Span length, ft.	467	500	583	624	655
Total horizontal load for span, lb. (*x*)	994·5	1·140	1·347	1 557	2 000
Mean height of load application above ground, ft.(*y*)	21	21	21	40	40
Calculated load which, when applied at pole-top, gives the same bending moment at ground line as *x* applied distance *y* below top of pole, lb.	940	1 078	1 274	1 433	1 840
Regulation wind load on pole, lb. per sq. ft.	13	13	13	13	13
Calculated pole top dimensions, in.	9×6	10×6	10×6·5	11×6·5	11×7
‡Calculated *allowable* lateral pull for poles with these top dimensions, lb. ..	948	1 120	1 320	1 530	1 842
ANCHOR CONSTRUCTION:					
Ultimate strength of copper conductors, lb.	3 073	4 481	6 065	8 805	11 638
Allowing for two of the three conductors broken, and a tension of 40 per cent., lb. pull	2 200	3 565	4 400	7 050	9 290
Calculated actual load, lb. ..	2 080	3 370	4 160	7 050	9 290
Calculated top dimensions, in.	12×8	14×10	15×10	2—14×10	2—15×10
Calculated *allowable* lateral pull for anchor poles, with these top dimensions, lb. .	2 580	4 020	4 890	8 050	9 780

‡For these designs, this is the minimum value (respectively), shown by the *bending moments diagram*, which diagram is fully explained in the last Chapter of the writer's book "Electricity Supply Transformer Systems," now in the press.

COSTS OF CONSTRUCTION. (Reduced to an average cost per mile of length).

	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	Unit price.
Cement: delivered nearest railway station; based on 750 lb./sq. in. working stress	32·7	360	36·4	400	35·3	388	50·6	557	55·8	614	11s. per barrel
Sand and Gravel: delivered at pole site	490	638	547	712	538	710	760	990	840	1093	1s. 4d. per sack
Rubble Stone for the foundations, delivered at pole site	9	27	11	33	10·5	31	15	45	18	54	3s. per cu. yard

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	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	Unit price.
Steel Reinforcement, with a yield point (elastic limit) of 50,000 lb./sq. in. delivered at nearest railway station ..	7·5	450	7·97	478	7·9	474	11·4	684	11·9	714	60s. per 1 000 lb.
Wood Forms, based on forms being used 10 times only, then scrapped ..	212	124	212	124	208	121	252	147	254	149	7d. per sq. yd.
Labour, including cost of labour for transporting wood forms and equipment from pole to pole and of other materials from nearest railway station to respective sites	710	852	745	906	725	845	920	1105	1000	1200	1s. 2d. per hour
Transport of materials from railway station to pole site ..	10·9	273	11·8	295	11·4	285	162	405	17·4	436	25s. per ton
Overhead expenses [	15·3	295	16·3	315	16·0	308	23	443	24·4	470	19s. per cu. yd. of concrete
Cost per Mile of Line, excluding conductor and insulators, which the electricity supply undertaking may already have in stores and desire to erect themselves	3 023s. £151 3s.		3 363s. £168 3s.		3 162s.† £158 2s.		4 386s. £219 6s.		4 730s. £236 10s.		

†This price is slightly less than the next smaller standard size of copper conductor due to the fact that the spans are longer, which results in a smaller total number of poles per mile of line.

(*a*) Item for materials quantity, given in respective units and mentioned in the unit price column.

(*b*) Item for materials cost, given in shillings.

The *overhead expenses* are reduced to costs per cu. yd. of concrete in place, and include insurance, depreciation on equipment, supervising, miscellaneous supplies, travelling expenses and contingencies. These expenses, as also the unit prices given above, are considered quite reasonable. The quantities are accurate for the calculated loadings and designs proposed by the writer. Hence, the above figures of costs given here are reliable and are sufficiently detailed for engineers to check and compare with their existing wood and/or steel pole lines.

The above should serve as convincing proof that the concrete pole line is indeed much cheaper in the long run than the wood or steel pole line, when made as proposed herein. The veracity of these figures, which give actual costs free from contractors' profits, should also help to convince the engineer of the great advantages of this construction.

(*To be continued*).

BOOK REVIEW.

Vibration Problems in Engineering. By S. Timóhenko. (London: Constable and Co.). Pp. 351. 21s. net.

Like the repeated dropping of water which wears away the stone, the effect of vibration is cumulative and little understood, though its importance is growing with increased size and velocity of the modern machine. Such problems as the balancing of machines, the torsional vibration of shafts and of geared systems, the vibrations of turbine blades and discs, etc., can only be properly understood on the basis of the theory of vibration, without which it is not possible to design a machine in which heavy vibrations are at a minimum.

The author develops the fundamentals of the theory of vibration and illustrates their application to the solution of technical problems.

The first chapter discusses harmonic vibrations of systems with one degree of freedom. The general theory of free and forced vibration is explained, and its application to balancing machines and vibration-recording instruments is shown. The Rayleigh approximate method of investigating vibrations of more complicated systems is also discussed, and is applied to the calculation of the whirling speeds of rotating shafts of variable cross-section.

In Chapter II is given the theory of the non-harmonic vibration of systems with one degree of freedom. The approximate methods for investigating the free and forced vibrations of such systems are discussed, and a particular case in which the flexibility of the system varies with the time is considered in detail, the results of this theory then being applied to the investigation of vibrations in electric locomotives with side-rod drive.

Chapter III deals with systems with several degrees of freedom, giving the general theory and its application to engineering problems, and the final chapter gives the theory of vibration of elastic bodies. Problems considered include the longitudinal, torsional, and lateral vibrations of prismatical bars; the vibration of bars of variable cross-section; the vibrations of bridges, turbine blades and ship hulls; and the theory of vibration of circular rings, membranes, plates, and turbine discs. Brief descriptions of the most important vibration-recording instruments which are of use in the experimental investigation of vibration are given in an appendix.

L. A. H.

Wave Mechanics and the New Quantum Theory. By Arthur Haas. Translated by L. W. Codd. (London: Longmans, Green and Co.) Pp. xviii+124. 7s. 6d. net.

Many electrical men who heard or have read Sir Oliver Lodge's Kelvin Lecture on the revolution in physics will have felt the desire to have a further statement of the modifications of the laws of mechanics to which he referred. Prof. Allen's treatise on "The Quantum," recently reviewed in these columns, gave an excellent analysis of the present situation with references to the work of those who in this country have contributed to the advance. The present book, by one of the clearest of modern continental writers on theoretical physics, shows how the mechanical theories of physical phenomena which had grown in a regular or classical manner around the idea of continuity of action during the last century, have been expanded by acceptance of the conception of sudden changes of energy in quanta with a new field of thought. It is based on a course of lectures given in Vienna during the winter 1927–8, and each of its sixteen chapters contains, it would appear, the substance of one lecture, the whole forming a connected argument. He explains briefly how each new movement began. Wave mechanics with de Broglie's conception that the ultimate particles move with an undulatory motion, followed by Schrödinger's attempt to generalise mechanics on this basis in the same way that Huygens modified Fermat's principle. The contribution of Heisenberg to the quantum theory is to keep it on the level of measurable quantities so that its consequences may be checked by observation. Born and Jordan have shown how this can be done using the matrix theory known to mathematicians for more than half a century, but not hitherto applied to physics. Heisenberg's and Schrödinger's theories are connected by certain mathematical transformations, and are not independent. The physical meaning of the stage then reached is examined, and Pauli's principle of the restriction of quantum numbers of two electrons in a single atom is stated, leading to an explanation of the Periodic Law. The statistical matrix treatment was extended by Fermi, and in this country by Dirac, to consideration of quanta in general, and the bearing of their results is given on the kinetic theory of gases, and as a consequence, the behaviour of free electrons in metals. There is a reference to recent advances in spectroscopy, and the book closes with a note on the possible bearing of the new generalisation on philosophy.

It is a model framework of a course of lectures, the style easy and convincing, and the translation is excellent. By omission of many of the physical illustrations and consequences it gains in logical treatment what it loses in scope. The author, in his introduction, states that it would be easy to write a book of 1 000 pages on the work of the last few years. A knowledge of the subjects discussed, as far as they are here taken, would bring the reading of the original papers which are now appearing on every branch of fundamental mechanics within the range of the serious students of physics.

W. M. T.

BOOKS RECEIVED.

"Kabeltechnik." By M. Klein. (Berlin: Julius Springer.) Pp. 486. 57 marks.

"Speech and Hearing." By Harvey Fletcher. (London: Macmillan and Co.) Pp. xv+331. 21s. net.

"Elektrische Gleichrichter und Ventile. By A. Güntherschulze. (Berlin: Julius Springer.) Pp. 330. 29 marks.

"Groundwork of Calculus." By William Hunter. (London: University Tutorial Press.) Pp. 220. 5s. 6d. net.

"Direct Current Electricity." By L. Raymond Smith. (London: McGraw-Hill Publishing Co.) Pp. xi+262. 10s. net.

"Stores Accounts and Stores Control." By J. H. Burton. (London: Sir Isaac Pitman and Sons.) Pp. ix+144. 5s. net.

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OVERHEAD LINE PROBLEMS.

Questions Discussed at Paris Conference—Calculating Torsion Strains—The Use of Concrete Poles—Inspection of Wood Posts.

By THEODORE RICH, A.M.I.E.E.

DURING the recent International Conference held in Paris on Large Electric Systems a number of questions relating to overhead line practice came up for discussion. Some of the more interesting are here grouped together under the generic heading "Overhead Line Problems."

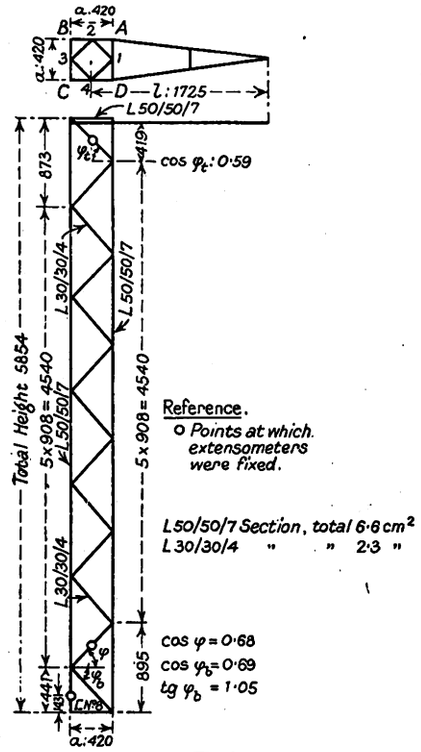

Fig. 1.

A report was presented by G. Sulzberger, of the Swiss Federal Railways, and B. Jobin, engineer, of Basle, on the calculation of torsion strains on towers. The development of transmission lines of large capacity makes it necessary to adopt higher and higher voltages with conductors of increasing diameter. For economic reasons very long spans are being adopted, and the question is whether the methods of calculation of tower strains have made equivalent progress.

Under normal circumstances the strains due to the conductor are balanced, but this is not the case where unequal spans are concerned or where irregular loading or conductor breakage takes place; while this last factor is of rare occurrence it should be taken into consideration.

The use of very high tensions and long spans involves an increased spacing of the conductors, and therefore an increased length, and torsion strains on supporting brackets. Such strains are therefore far from being negligible.

During line erection, towers can be subject to material torsion strains, the neglect of which has at times led to damage, if not to destruction. In view of these factors the problem has been studied mathematically, and tests have been made in Switzerland, especially as a result of the report of M. Labbé made to the 1927 High Tension Congress on an accident to a tower due to torsion strains during the erection of the conductor, and to the results of ideas put forward by M. Perrochet at the same time.

The effect of torsion applied to the extremities of a horizontally braced bracket on the members of a tower of rectangular section with and without diamond internal stiffening is studied. Towers are usually designed to resist a cross wind on the conductor, together with wind stress on the tower itself; this latter stress is maximum at the base and diminishes to zero at the top. The torsion stresses which are applied at the height of the brackets are often greater than those due to wind. Accidents due to torsion are usually due to deformation of cross-bracing a little below the brackets. The introduction of torsion into the calculation of towers is one that of necessity makes towards the increase in weight of construction; the importance of torsion must not be abused, as then the result would have a disastrous effect on the capital cost of lines.

Forthcoming Swiss Tower Regulations.

The Swiss regulations which are being drafted show progress on those previously adopted in the recognition of this factor, and they will state in a precise manner which towers must be calculated for torsion, and the extent of the forces to be allowed for.

The regulations will take into consideration lines of two categories: those with spans up to 50 metres (usually wood post lines), and those above 50 metres; only the second of which are of importance regarding this question. The lines above 50 metres are calculated: (*a*) with towers or supports which hold up the line calculated for the normal stresses which present themselves, and a certain number of anchor supports calculated to take into account broken conductors, so as to prevent the injury of long lengths of line; and (*b*) lines without anchor towers calculated not merely to hold up the line but also to deal with possible conductor breakage. The regulations take into account angle towers and towers for line end anchorage.

The anchor towers and the line towers in this latter section have to be calculated to resist with a certain security the torsion strains under the most unfavourable conditions which can result from the breakage of a conductor. The longest arm and the longest conductor have to be considered, although in the case of towers with a pyramidal elevation the greatest strain may come with the breakage of a topmost conductor where the tower section is at a minimum in overall dimensions.

A unilateral pull has to be considered at 0 deg. C. with an overload of snow uniformly distributed of 2 kg. per metre run for cable conductors, and 1·5 kg. for solid wires.

The following factors can be taken into account:—The reduction in load due to the altered inclination of the insulator chain on conductor breakage; the staying effect due to the presence of other conductors fixed more or less rigidly to the towers (one assumes that these other conductors remain intact and that they tend to balance under the effect of deformations); also no calculation is made for the shock which can take place at the moment of breakage, the results of which are difficult to calculate. In cases of torsion stress the load admissible for the metal of the tower is fixed at 0·45% of the breaking strain, a factor of safety of about 2·2. These prescriptions do not suppose the simultaneous operation of the torsion with other external forces such as wind or surcharges on the unbroken conductors.

Studying the Effect of Torsion.

In order to study the effect of torsion on a tower the Swiss Federal Railways, the Telegraph Department and the Government Department of Railways in Switzerland joined together and conducted tests at Ostermundigen, near Berne, in 1927.

The model tower was made by the Swiss Federal Railways Department, the movements and strains on certain members were measured by instruments of precision lent by the Swiss Ponts et Chaussées department, which administration also sent two of its engineers to assist. The design of the model tower is shown in Fig. 1, which gives the lines of centre of gravity of the sections; the tower, 5·826 metres (about 19 ft. 1 in.) high, was supported on a block of concrete not liable to material movement, a scaffolding being arranged all

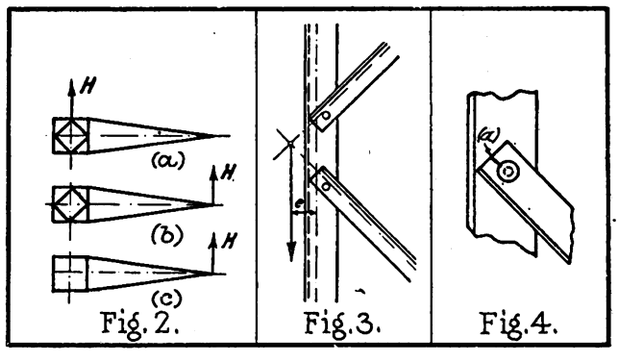

Fig. 2. Fig. 3. Fig. 4.

round the tower entirely independent of it. The tower was made up of angles 50 × 50 × 7 mm. (1·97 × 1·97 × 0·27 in.), and 30 × 30 × 4 mm. (1·18 × 1·18 × 0·15 m.). Three series of tests were made: (1) unilateral pull on the axis of the tower with loading 1 to 1 000 kg., Fig. 2A; (2) pull on the end of an arm of 0 to 625 kg. at a radius of 1·725 metres with diamond-braced tower, Fig. 2B; and a similar pull at a similar displacement on the tower without diamond horizontal cross-bracing, Fig. 2C.

For the purposes of measuring the load a dynamometer was placed in the traction wire rope, which was hauled by a

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winch. To measure the fatigue on the metal sections Okhuisen extensometers were used on each bar of the top cross bracing, the four cross braces at the base, and at two opposing points on the uprights, 145 mm. from the base. The inclination taken by each bar of the bracket framework and at the base, and the displacement and rotation of the tower were measured by precision instruments.

The results of tests 1 and 2 (with diamond internal bracing, correspond closely with those calculated. Test 3, however, gave results differing in a large measure from those calculated; material inequalities of stress were met with which the customary calculations do not take into account. It is desirable at the points of zig-zag bracing to make the two converging members meet at one rivet only. The use of two with a gap between, as in Fig. 3, involves undesirable bending strains. Where possible, gussets should be adopted for joining members.

During one of the tests the tower collapsed with a load of only 60% of that for which it was designed, through the failure of a diagonal brace, the rivet tearing the angle, Fig. 4, due probably to a fault in the angle plate end. This draws the attention of steel work constructors to dangers which may result from normal (structural) works procedure through the use of machine shears and punching machines, especially when the tool edges used have been subjected to a certain amount of wear Such methods are destructive to metals, as tending towards alteration of structure and breakage. One can well ask whether the use of such methods should not be forbidden in specifications.

With towers the use of gussets is generally avoided, but the tests show the advantages which would ensue if two rivets could be used for the joining of each element, as the safety would thereby be greatly increased; gussets are, however, useful under compression; where electric welding is used, care should be taken to see that the welding points are sufficiently spread.

In conclusion, the framework to which brackets are fixed should be stiffened up, a matter of small expense; the increased rigidity ensuring the almost uniform division of the strain on the four sides. The calculation then becomes easier. It seems to be also desirable to stiffen up the framework between the base and brackets—often a distance of 15 to 20 metres—by one or more horizontal frames. Some makers recommend that a space of 6 to 8 metres should not be exceeded between such horizontal bracing. Although not imperative, such strengthening is desirable for angle and end-anchor structures.

For large towers double cross bracing is desirable, and to minimise the loss of strength due to rivet holes it is possible to use angles with unequal depth of wing; in some cases the use of gussets involves two rivets, thus increasing the security. As the torsion loading on towers is exceptional, a factor of safety lower than the normal can therefore be adopted, namely, that of 2·2.

Greater care should be taken regarding the erection of conductors. Contractors too often insist on fastening their guide pulleys to brackets, and not to the tower structure. The pulleys are often of wood attached to insulator chains, and they often run badly, thus giving rise to prejudicial strains. Metal pulleys are recommended; aluminium pulleys would be advantageous, as they are easy to grease and to keep in order. Special care should be taken regarding erection at end-anchor and angle towers. The order in which conductors are to be fixed should be chosen in such a way that those on each side alternate. Temporary stays are often useful during erection work.

Concrete Posts.

M. R. Polack, of the Nord Lumière Company, that operates in the northern suburbs of Paris and in a rural area further north, gave a report on the use of concrete posts. The lines in the inner area at high tension are nearly all in the form of underground cable, but a material part of the h.t. distribution elsewhere is by overhead lines.

Owing to labour and other difficulties during the war, many of the old wood post lines were in a bad state. At first the work was taken in hand of replacing wood posts by wood, but the difficulties of changing them owing to the necessity for cutting off current were great. The depletion of many forests during the war raised the prices of wood posts. The appearance of combined concrete and steel pole bases saved the situation for the time being, two types, the "Forclum" and "Pallix," being adopted between 1923 and 1925; 4 000 posts were placed on concrete and steel bases of these types.

It may be noted that with the aid of prickers the post can be kept in position while the old base is cut off above the ground line, the hole excavated, the old stump end taken out, the concrete bases put in, and bolted up, and the ground put back and rammed without necessitating the cutting off of h.t. current.

At first it was thought that the problem was completely solved; after the war the more important new lines were placed on concrete posts, and for those of less importance wood posts injected with copper sulphate were placed on concrete supports. Later wood posts creosoted with 200 litres of creosote per cu. m. of wood were used, and between 1925 and 1928 270 km. of line was erected with concrete posts, and 170 km. with creosoted wood posts.

Two new lines at 60 000 V were put up with concrete posts, one 40·5 km. long to serve Beauvais, set to work in 1927, and one of 55 km. set to work in February this year, arranged to link up with existing lines. The latter line has posts with concrete brackets, no steel towers being used.

Since 1926 the use of pole bases has been recognised, not as a definite solution, but as a very useful means of line repair, but the deterioration when already started with the wood posts tended to continue, although the life was prolonged for some years; the definite replacement of old worn-out poles was only deferred, therefore, for an average of four years. It was found necessary by the operating department to arrange for skilled foremen to examine the wood posts on 15 000 V lines once a month, a matter of great expense. The complete replacement of posts was also a costly thing, and it was difficult to be certain of the condition of wood posts. Moreover, urgent replacements were a great trouble, the cost of replacing a post on an existing line being at least double that of the putting up of one for a new line.

Why Concrete was Chosen.

To diminish such troubles, regular examination and borings were adopted, but even then there was no certainty. In a great storm in November, 1928, fourteen posts were broken, eight of which had been passed as sound. In view of these troubles it was decided to replace all the wood posts by supports of a character which would not depreciate in strength. Armoured concrete was adopted in preference to steel, as it was considered desirable to avoid the necessity for painting supports. It was desirable, therefore, to replace progressively a certain number of wood posts scattered all over the supply area. A usual method of manufacture of concrete posts is to make them at temporary construction depots at convenient centres. Such a system does not lend itself when the sites of planting are scattered as when replacements are required, although it is useful when large numbers are required in a given area. It was decided, therefore, to use light concrete posts constructed in a factory, the low weight facilitating transport.

A careful study was made of each line to be reconstructed, so as to minimise any operation difficulties in the future. The lines were repegged out, alignments were improved, especially by crossings over private properties, which often enables spans to be increased and upkeep costs to be reduced. From 1926 to 1928 two thousand wood posts were replaced, and this work is continuing. After about 1930 there will remain on the 15 000 V system 30 km. of line with posts which were originally placed on bases and 170 km. of creosoted posts which will give a certain number of years of life without too much upkeep.

Regarding low tension (about 115 V to earth mainly), study has shown that lower upkeep costs will largely make up for the increased first cost of concrete over wood; with concrete posts there are certain difficulties regarding spans and branches (long spans are not convenient in many cases owing to the necessity for tappings to houses). All the same, a certain number of new l.t. lines have been constructed with concrete posts; in 1928 31 km. of such line were constructed. The spans inside villages were increased from 50 to 55 metres, and outside 50 to 80 metres. According to the French regulations no factor of safety is laid down for low tension work, but for design a factor of safety of about 2 on the breaking strain was adopted. (The normal French regulations are for about 15 lb. per sq. ft. on projected conductor area and about 24 lb. per sq. ft. on flat surfaces with no ice loading.) This arrangement has proved to be perfectly satisfactory. The cost of a line constructed with concrete posts as compared with wood posts treated with copper sulphate is as 1·20 to 1·25; these figures have been accepted as a basis by local rating authorities. The upkeep expenses saved, judging by experience of the sections in operation, can be taken as 1 800

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frs. per km. (about £22 10s. per mile) per year; it has been decided, therefore, gradually to replace wood for l.t. lines by concrete as occasion arises. For such duty light centrifugal poles are preferred, as they have the same resistance to bending in all directions, a matter of importance regarding overhead tappings; completely to reconstruct the l.t. overhead system with concrete posts will take five to six years, and will require 7 000 to 8 000 posts.

Centrifugal posts have been satisfactory, especially for low tension work. Concrete posts in general have given good results, even when the line has been subject to very violent winds. Only the falling of trees or branches has given rise to trouble under such circumstances.

During the last ten years experience with at least ten different types of concrete posts, differing in calculation, materials, manufacturing methods and supervision shows the necessity for placing orders not merely with firms of material standing, but with undertakings with great experience in this class of work.

The life of well-made concrete posts cannot be estimated with certainty, as sufficient length of time has not yet elapsed. Badly made posts give signs of cracks and rust marks at an early date, whereas other types have remained intact after years of use. Posts of the centrifugal type give very good prospects of resistance to atmospheric and other attacks, owing to the hard surface and homogeneous nature of the material used.

Posts Cast on Site.

Senor de Vinuesa (Spain) said that his company had erected over 600 km. of concrete post line for 70 000 V with 200 metres span. The posts are 14·5 metres high and 1¼ tons in weight. They are cast on site, alongside the hole. There are three conductors, each 60 sq. mm. section of aluminium steel. Last year, from May to October, 97 km. of line had been erected. Owing to wayleave difficulties, there had been certain delays in getting wayleaves, and to save time Ciment Fondu had been used. It was then found possible to erect the pole three days after casting. In very hot weather it was desirable, either not to cast, or to cover up the post after casting to prevent cracking. The upkeep costs since 1920 had been nil. The cost had been 27 000 frs. per km., or about £360 a mile.

Mr. Bornquist of Sweden, during the discussion, said there was a tendency to consider the economic life of a line to be longer than it really is. Supposing that the life of a concrete post could be taken as 40 or 50 years, the question was whether, after 20 or 25 years, the conditions had not changed, and whether after that time it would not be best entirely to rebuild a line.

Regarding wood posts, it was essential that inspection should be systematised. He adopted examination every three years. With 200 litres of creosote per metric cube of wood the life of a wood post should be about 25 years. Some difficulties had been experienced with concrete posts when the foundations were in rock, especially with centrifugal posts. M. Ferrier stated that the mistake often made regarding the foundations of ferro-concrete posts in rock was to make the hole too shallow.

M. Marcotte said that a comparatively flexible form of post was being used in some parts of France. It was made up of a light deep-flange steel joist of uniform section. After allowing for increased span its use came out only about 20% dearer than wood poles. This type of post was being used on some lines for 70 metre spans with three copper conductors 3·5 mm. dia. (about No. 9 S.W.G.). It looked neat, and the erection was rapid, as only about 1/10 of a cubic metre (about 3·5 cu. ft.) of concrete was usually necessary for the foundations. Twin posts bolted together could be used when extra transverse strength was required. The section had a flange of the same width as the depth of the joist. The upkeep costs of such poles were low.

ELECTRICITY IN AGRICULTURE.*

Results of Investigations in the Rural Supply Area of the Chester Corporation—Some General Considerations on Rural Electrification.

IN Bulletin No. 5 of the Institute for Research in Agricultural Engineering, University of Oxford, Mr. C. A. Cameron Brown furnishes an interesting report of an investigation undertaken in the rural supply area of the Chester Corporation between March, 1927, and April, 1928.

In his introductory remarks the author divides the problem of rural electrification into three main heads.

(A.) To cheapen the cost of constructing the transmission and distribution system and to increase the number of consumers, thus lowering the overhead charges to be met by the consumer connected to the system.

(B.) To encourage a liberal use of electricity for all suitable purposes by each consumer, in order to keep the average cost per unit consumed at a reasonable figure: at the same time to ensure that this use is of economic value to the consumer.

(C.) To secure as far as may be possible a steady and regular use of electricity by rural consumers.

It is pointed out that on the one hand the farmer will not use electricity unless he is convinced that it will afford him a cheaper form of power than he has otherwise at his disposal, and on the other that the supply company will not offer the farmer electricity except in the hope of benefiting financially, if not immediately, at any rate in the long run. The position is thus, viewed widely, a kind of deadlock. The farmer, at present uncertain of the benefits of electricity, is chary of making a request for it; the supply company, uncertain of the farmer's ultimate potential demand, is chary of making an offer.

The Americans are seeking a way out of this impasse by erecting experimental lines into certain rural districts and running them under careful supervision.† They are also conducting a very vigorous propaganda among the farmers, showing by letterpress and illustration all that electricity may be expected to do for them, from overhead irrigation and poultry raising to curling tongs and burglar alarms.

In spite, however, of the work which is being done in America and elsewhere abroad, it is difficult to get much definite information as to the demand likely to be made by rural districts; it is still more difficult to get detailed figures as to the individual power demands of the various operations that go to make up the activity of the farm. It is only by a study of the latter that either the farmer or the supply company can be furnished with the information of which they are respectively in need.

The report gives the results of such a study, conducted in the Chester area, on eight farms using electricity.

Permission was obtained for an observer to visit eight farms daily over a complete year. The Corporation Electricity Department assisted by separating as far as possible the various circuits in each farm and installing separate meters. One farm, for instance, was fitted with seven meters.

The main points which it was proposed to investigate were:

I.

(*a*) What amount of electricity is used by an average farm and how far this amount varies according to season.

(*b*) What proportion of the total amount is used respectively for domestic and for farm purposes, and

(*c*) How the latter is divided among the various farm operations.

II.

As regards purely farm operations

(*a*) What is the consumption required for each operation.

(*b*) What power and what size of motor does each operation require.

(*c*) How far the cost of an operation is affected by performing it at different speeds of working.

For the above purposes detailed tests were made from time to time. The quantity of material treated was accurately weighed and the power required was ascertained by special

* Extracts from Bulletin No. 5 of the Institute for Research in Agricultural Engineering, University of Oxford, published by the Oxford University Press, London, E.C.4, price 2s. 6d.

† C.R.E.A. "Bulletin," No. 7, May 12th, 1926.

‡ "Electricity on the Farm and in Rural Communities," C.R.E.A. "Bulletin," Vol. IV, No. 1.

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meters fitted to each motor ; a recording watt-meter, with the chart running at 6 in. per hour, was used in addition. The duration of the operation was also noted. The results obtained are given in Tables in the report.

III.

How does the farm load vary during the day ; in other words, what are the conditions which the supply has to meet ?

For this purpose an Evershed and Vignoles recording watt-meter was placed at each farm in turn for a week, during the period of winter high load. With the chart running at a low speed (1 in. per hour) a record was obtained of the load of each farm for a week. It was found impracticable to extend these observations to more than a week on each farm, but as the work on a farm is carried out more or less regularly, one week's chart may be regarded as fairly representative. In most cases there was found to be a regular repetition of daily conditions within the week. A second record at a higher speed (6 in. per hour) was obtained of the load of each farm for a day—the day on which observations were made for the purpose of II above.

In discussing the results of the investigation the predominance of the domestic load is very marked. In six farms the domestic consumption is greater than the farmyard consumption. In the remaining two farms the low proportion of the domestic consumption is easily accounted for.

It is evident that, provided the domestic equipment is proportionate to the standard of the farm, the most important load is that of the house.

Cost of Working and Power Required.

1. *Thrashing.*—Only two farms were available for these observations.

The average of 0·59 and 0·76 unit per cwt. might be taken as a basis for estimating possible consumptions. This works out at 0·68 unit per cwt. of grain thrashed. The average yield of oats, barley, and wheat is 18·6 cwt. of grain per acre. Thrashing this will require $(18{\cdot}6 \times 0{\cdot}68) = 12{\cdot}7$ units per acre under grain.

2. *Grinding.*—The conditions of working—rate and cost—vary tremendously with the degree of grinding : the coarser grinding can be done faster and more cheaply than the finer grinding. In this and in the following applications the consumption in any one farm will depend on the number of stock and the methods of feeding.

3. *Crushing.*—Only two farms were available for these observations.

4. *Chaff-cutting.*—The machine at Farm No. 1 was much larger than the others, and owing to its high rate of working the cost was considerably lower than for the other machines. The power required to drive it was naturally greater.

5. *Cake-breaking.*—This is a very small operation : the cost varies from 0·04 unit to 0·14 unit per cwt.

6. *Root-cutting.*—This is also a small operation : the cost varies from 0·30 unit to 0·89 unit per ton.

7. *Silage-cutting and Silo-filling.*—Grass provided a more difficult load than beans, peas, and oats, the rate of working being much lower and the cost considerably higher.

8. *Pumping.*—The cost and rate of pumping depends so much on the conditions, sizes, and lengths of piping, etc., that the figures given cannot be taken as strictly representative.

Effect of Rate of Working on Cost.

It was not found practicable to carry out any special runs to investigate this, and the observations had to be made as part of the detailed tests. These show in general that when the rate of working is increased, increased power is necessary, but, at the same time, the cost of working is decreased.

Grinding presents difficulties, because of variations of quality as well as speed of grinding. Where, however, the degree of grinding is kept the same, faster working lowers the cost. This has been seen to apply to all the operations ; within the limits of power available, the operation is done most cheaply when carried out at the maximum rate.

The Power Used.

In most cases the motors used for barn power were larger than was necessary—an important point where the tariff includes a quarterly charge of 2s. 6d. per H.P. connected.

Large motors, rated at much over maximum load, are necessary if the voltage regulation is bad. In such circumstances it would be a convenience if arrangements existed for the temporary hire of motors. The hired motor could be replaced by a permanent motor when the line became normal.

Taking everything into account there does not appear to be any need for a specially designed motor for agricultural barn power purposes ; standard motors satisfy requirements. For outdoor work specially weatherproof motors are necessary.

The idea that, for rural supply, reliability and continuity of service is not of primary importance is emphatically wrong. Such farms, in particular, as those with milk treating plants, milking machines, etc., depend for their success on unfailing power supply. Farm No. 7 has to retain an oil engine on account of this possibility of failure. During the year of observations, while there was no failure at the source of supply, an interruption was caused by trees being blown across the lines during a gale.

Part II of the report is devoted to a general consideration of the present possibilities of rural electrification, and deals in some detail with the appropriate conditions. In the conclusion it is stated that the observations are based on costs of construction which would appear to be obtainable at the present time, and the assumption has been made that the scheme is tackled as a whole and the work carried out comprehensively and consecutively.

Assisted Purchase of Equipment.

It is also taken for granted that the majority of the premises will be connected up to the lines, and it is pointed out that this latter condition can only be attained if there is some scheme of help to purchase equipment.

Not only does this apply to domestic equipment but to farm-power equipment as well. The farm may be well equipped with oil or other engines, and no matter what saving in running cost is in prospect, the farmer is unlikely to be able or willing to scrap his existing plant and buy electrical plant unless he is offered very easy terms of purchase.

In arranging the details of such a scheme it might be best to arrange for payments which increase year by year. The farmer would, in any case, have been called upon to pay increasing amounts every year for repairs and upkeep of the plant which he has now scrapped. During the earlier years he will be in a position to appreciate savings in running costs, and with the lighter initial payments he will not be hampered in effecting any improvements in operation which his experience of the first year's working may suggest.

The same considerations would apply to hire-purchase arrangements for domestic equipment.

A consumption at the rate of 129 units per head of population is not an unreasonable estimate. Such a rate would result in reasonable charges per unit to the consumer, and should be realisable soon after the system was put into operation.

It is added that the fuller estimate of 183 units per head of population should be realised later, when the advantages of electrical usage have been demonstrated.

But demonstration in the truest sense of the word is absolutely essential. Advertisement and verbal propaganda, useful though they may be, are not of themselves enough. However reasonable the prices offered may be, the appeal must be to facts and not to argument. The facts must be the facts of every day, not the facts of the staged display of the showground. If the bulk of rural dwellers, not merely the luxury user, are to be won, they must be convinced by the nearest possible approach to ocular demonstration under conditions resembling those of their own daily life, that electricity, in any given application, regard being had to its cleanliness, its convenience, and its dependability, is definitely and decisively cheaper than previously existing methods.

In any scheme of rural electrification, particularly in the early stages of development, it will be necessary to rely for revenue on the larger individual users of energy. For all that, it is urged the farmer must not be allowed to feel that he is a side-line ; the advancement of his interests must from first to last be the main aim and object. His contributions may be small at first, but they should, with proper encouragement and management, provide before long a useful return. This is without reference to the use of energy for field work. It would not be sound to reckon on this as an asset at first.

But given a rural district thoroughly electrified, the claims of electric ploughing and cultivating should not be slow to gain recognition. Contractors will be able to equip themselves with electric tackle knowing that a supply of electricity will be available wherever they may have to work. It is pointed out that if 10% of the hypothetical area—20 square miles, or 12 800 acres—were ploughed once over every year by electric power at a consumption of 30 units per acre, the revenue, at one penny per unit, from this operation alone would be £1 600. This may seem but a modest contribution ; but it will be a beginning, and that beginning once made, the use of electricity for other purposes of cultivation should extend.

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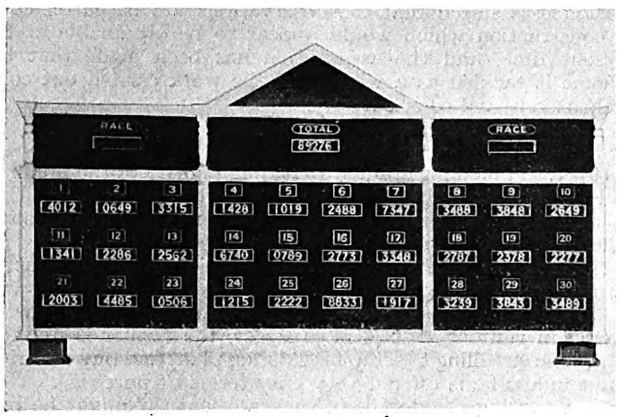
ELECTRICITY AND THE "TOTE."

Some Further Constructional and Operating Details of Equipment for British Racecourses—Indicating Mechanism—Probable Future Developments.

By D H. N. CALEY.

(*Concluded from page 73.*)

ALL-ELECTRIC operation has been chosen for the totalisators produced by The British Automatic Totalisator, Ltd., of Plant House, Longfield Avenue, Ealing, and 82, Victoria Street, London, S.W.1. When this firm was interviewed by the writer, orders had been received to supply eight courses, five of the orders being for complete, permanent installations,



Indicator board of a Lightning Totalisator (win section for 30 horses) built in England prior to the issue of the Control Board's specification.

and the remaining three for skeleton installations. In skeleton installations the framework and other necessarily fixed parts only are permanent, and all other parts are transferred from course to course. By making use of the skeleton system in suitable instances, the Racing Betting Control Board is able to save a considerable amount of capital expenditure.

The ticket machine has a keyboard with a key for each horse number and two selector keys for win and place. The keys are interlocked, so that only one can be pressed at a time; a further lock prevents a key from being returned until the ticket is issued. The printing section consists of a horse number drum, and a printing roller which provides for the general details. The printing type is supplied with ink from felt rollers covering ink cylinders. The machine is motor-driven with motors and reduction gear fitted in the base, which also accommodates the paper roller. The horse number drum is driven through a friction drive.

Escapement Mechanism.

The adding machines consist of six parts per digit, viz., commutator and collector, escapement coil, friction clutch, contact cylinder, stationary contacts, and transfer switch. The commutator is provided with a series of insulated contacts which are connected to the switch lines from tickets of one value. These contacts are traversed by a radial collector brush which rotates constantly during the operation of the totalisator. The collector brush is connected to one terminal of the escapement coil. The escapement coil operates a check-and-release device which engages with an escapement mechanism attached to the "contact cylinder." The contact cylinder has a series of studs suitably arranged to engage with the "stationary contacts" when the cylinder rotates. The stationary contacts are connected to lamps on the indicators.

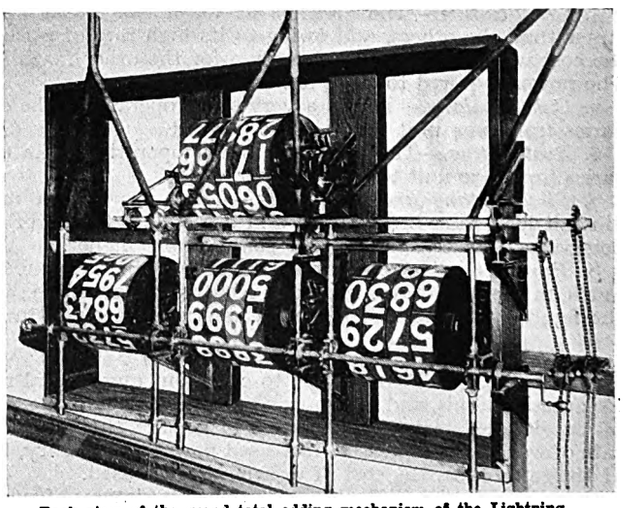
When current passes from the ticket machine end of a selector line to the segment on the corresponding commutator, the rotating brush engages with the live contact, and thus closes a circuit through the escapement coil. The energised coil then releases the escapement, which permits the contact cylinder to turn under the action of the friction clutch. The indicators in the British Automatic Totalisator, as was previously stated, are of the monogram type, and the lamps are thus selected by means of the contact cylinder in a manner similar to that used in a "spelling" monographic electric sign. The mechanism, including collector brush and escapement, takes the place of the solenoids, ratchets and pre-selectors of the Hamilton Totalisator. The object of the transfer switch is to close a circuit on the commutator of the next highest denomination, so that the figure 1 in the tens column of the indicator may be illuminated immediately the 9 in the units column becomes out of date, and so on.

In the groups dealing with horse totals, the selector lines from one ticket machine are connected in a symmetrical position on all commutators of the same denomination. All selector brushes are set at the same angle on the driving shaft, so that it is only possible to obtain one impulse at a time over all commutators of one value. The grand total escapement coil is connected in the main circuit, in series with the horse escapements.

Another special feature of this totalisator is the semi-translucent screen which covers the indicator lamps. As the base behind the lamp pockets is black, the screen normally shows a black front, but when a lamp is illuminated, the screen effect is destroyed, and white spaces upon a black background are displayed. This translucent screen should be a valuable advantage on days when the light keeps changing, as well as when the indicator is directly in the sun.

The Super Totalisator.

A good idea of probable future developments of the "Tote" is given by the Hamilton "Super Totalisator," already invented by Mr. R. M. Hamilton, of Graham Amplion, Ltd. This machine cannot as yet be submitted to the public, as it does not fall within the specifications of the Control Board. The chief difference between betting with an ordinary totalisator and with a "bookie" is that with the "Tote" system the odds which will be paid if the backed horse wins are not exactly known at the time of betting; the gambler does not know just how great is the risk he is taking. If, with the standard totalisator, it is desired to know what are the odds against any horse at the moment, it is necessary first to deduct from the pool the percentage charged by the machine, then to deduct the number of bets on the horse in question from the remainder obtained by the first operation, and finally to divide the new remainder by the number of bets on the horse. This process is so tiresome that in practice the racegoer does not attempt it, and, instead, racing slips showing the approximate current odds are sold at frequent intervals. The



Back view of the grand total adding mechanism of the Lightning Automatic Totalisator, showing drum type indicator.

Hamilton Super Totalisator overcomes this drawback by itself calculating and displaying the instantaneous odds in the same form as they are offered by a "bookie." Thus it is claimed to combine the accuracy and honesty of a totalisator with the mathematical method of a bookmaker. With this improved machine a conclusive bargain can be struck by a backer at any time before the race, with no risk of the odds changing—as they may change considerably with a "Tote" that simply integrates—before the starting price is reached. The odds can be fixed by having them stamped on the ticket, either at the time of making the bet or at any moment when they appear to the backer to be favourable to him. In this way the Super Totalisator should tend to eliminate the rush to the windows just before a race starts.

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The operations which have to be performed by the calculating mechanism may be indicated by the following example: If at a given moment during betting the odds shown against any selected horse are 10 to 1, and there have been, say, ten bets made on that horse, it follows that, after deducting the percentage, there are 100 bets on all the other horses in the race. If the ticket is endorsed at 10 to 1, then ten of the bets are ear-marked to pay the bet if the chosen horse wins. This ear-marking leaves 90 bets on the other horses and nine on the selected horse—i.e., the odds are unchanged at 10 to 1 for the other nine bets. The machine has to subtract the stake value of each ticket stamped from the total amount of money on the horse, and to subtract from the pool an amount equal to the odds multiplied by the stakes of those stamped tickets. If the horse loses, an ear-marked or stamped bet goes to pay the winner in the same way as if it had not been stamped.

Disconnecting Switches.

The possibility that at the beginning of betting there may be shown against certain horses freak odds, which would not if stamped on the tickets represent in any way the probability of the horses winning, is eliminated by the provision of a switch which disconnects all the stamping machines until the pool has reached a predetermined number of units. A further protection against freak results is obtained by constructing the stamping machines not to give longer odds than 20 to 1, which limit is thought to cater for all reasonable requirements. It should be realised here that this limitation on the stamping machines does not affect the odds payable on a winner; the indicator shows up to 1 000 to 1, but all bets over 20 to 1 must be paid at starting price. It may be noted that as the final position of the indicator is the starting price all delay in declaring a dividend is obviated. Considerable extra time for betting is thus allowed between races; to facilitate rapid return to business a switch is closed to energise a circuit connected to all the stamping-drum motors, so that they may run together until the drums have returned to the zero position, when the circuit is broken—the whole system being reset to zero in approximately 40 seconds.

In the Super "Tote" the following operations are done automatically by electrical means: Printing tickets and recording their sale. Converting totals into odds. Indicating to the public these odds. Printing the odds on the tickets. And, lastly, recording the value of the tickets and the amount to be set aside to pay them if they win. The issuing operator turns a dial to the horse number and presses a knob. The turning of the dial moves the printing wheel to the correct position, and the action of the printing sends an impulse to the collector of that horse and to the pool collecting mechanism. The operator also presses a key corresponding to the stake value to be printed on the ticket. The electro-mechanical calculating mechanism for converting the total amount of money in the pool and on the horse into odds is known as the "log conversion unit." This clever and complicated piece of apparatus, which appears to work on a somewhat similar principle to a slide rule, converts the numbers into logarithms and thus divides them out. The percentage deduction is made at the same time. The result obtained is thus identical with what would appear after performing the arithmetical operations described in the first of our paragraphs referring to the Super Totalisator.

The calculating unit controls electrically the odds indicators, of which there can be any convenient number in various parts of the enclosures. The indicating unit used resembles a gigantic thermometer, an arrow moving up and down in front of a large scale. One advantage of this construction is that the approximate odds against any horse can be seen at a considerable distance, simply by noticing the height of the arrow. A special cam mechanism, which Mr. Hamilton believes to be the first of its kind, has been invented to enable big figures to be used. It gives a range form 100 to 1 on to 1 000 to 1 against. This is achieved by having one set of nineteen ranges of odds, and so arranging arrow-form pointers on an endless chain that whenever one pointer reaches the end of its travel and disappears at the top, another pointer appears at the bottom, the scale at the same moment being moved sideways to disclose a column of noughts, thus multiplying all the odds through a 10 to 1 step. Where the indicator formerly gave figures between even money and 10 to 1, it will next show odds between 10 to 1 and 100 to 1, and so on.

The odds stamping machine is very similar to the ticket issuing machine, and is operated in the same way, but, instead of transmitting one impulse to the pool collectors, it transmits impulses representing the stake multiplied by the odds, thus deducting the appropriate sum to pay the ticket if the selected horse wins.

The portable hand-operated model of the Hamilton Super Totalisator consists structurally of a light hut which can be supported on jacks at such a height that a six-wheeled lorry can be backed underneath. The permissible width for road traffic being only 7 ft. 2 in., one side is made collapsible, and the mechanism belonging to that side is arranged so that it can be carried inside the main structure during transportation from course to course. As the best position on existing small racecourses is half way between Tattersall's and the Silver Ring, the indicator is made collapsible, so that while it may be large enough to be clearly visible from the stands before a race, it may not obstruct the view of the course during the race.

This building would be staffed by twenty-five operators. Ten are permanently engaged in issuing tickets, and fourteen are available for paying out the winners immediately after a race. As soon as the bulk of this work is finished, six of the fourteen would change from paying out to stamping the odds on the tickets just issued on the current race. Six of the remaining eight will be available for operating the calculating mechanism about to be described.

The first of the mechanical operations is to collect all moneys received and add the totals continuously. Each booth sells only tickets of a certain fixed value. Upon selling a ticket the operator inserts it into the traversing printing head, which is then moved to the appropriate horse position and the knob depressed, thus printing the date, a code word, the number of the race, and either win or place. When the printing head is depressed, it actuates a lever operating the corresponding collector element, and at the same time depresses a common bar, which moves another lever connected to the pool collecting element. This automatically effects the totalising, and indicates the totals to the calculating operator, who sets drums accordingly, which results in the arrow moving to show the odds. The movement of the arrow causes a type bar to slide under the printing heads in the stamping booths, so that when a ticket is handed by the purchaser to the stamping operator it receives upon it the odds at which the arrow is standing.

Courses Wired Permanently.

The combination type super "Tote" has been designed for moderate-sized racecourses. The course is electrically wired in a permanent manner, and the calculating units are arranged in a small fixed pavilion. The ticket issuing and bet stamping booths are similar to the types used in the portable model, but the bets collector line shaft, instead of being connected to the odds-calculating apparatus by sprockets and chains, drive electrical transmitters by which impulses are sent over the permanent wiring to the centrally located calculating units. The latter are of the hand-operated type, but the primary elements are driven electrically from collector mechanism instead of being operated directly by the printing evers, as in the portable.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

The Electric Vehicle Question.

[To the Editor.]

Sir,—I have been interested to read, from time to time, your comments on the electric vehicle question; and in particular, your hope that coming legislation will help to create a demand. Every one of us who is condemned to dwell on the sides of the inferno of a modern main road ought to lean back in his vibrating armchair and wish for the dream to come true. But, I should like, if I may, to be allowed to ask a question: *Is* anyone besides you, sir, seriously interested, and honestly desirous to produce that which is so much needed? Or have we given way to an impression that the difficulties are insuperable?

The other day I caught my first sight of England, from the South American boat approaching St. Catherine's Point and the Needles. There was nothing pointed about St. Catherine, and the Needles seemed to be in the same plight; but what impressed me most was that the whole flat expanse of England seemed to be slipping (as I believe it is) into the sea, with an expression of supreme indifference on its bland countenance.

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This picture rises to my mind whenever I think of the electric vehicle problem.

Once, in 1914, this apathetic giant awoke suddenly to action: who of our British manufacturers will rally round the flag, and foil the dark designs of the greedy petrol invaders?—I am, etc.,

"LECTROBUS."

Chapel-en-le-Frith.
July 19th.

Electrical Development in London.

[TO THE EDITOR.]

SIR,—Being in the same supply area as "A Mere Consumer," I fully endorse his remarks on the way in which the supply company concerned is preventing domestic consumers from making full use of electricity. I, too, am prevented from using an electric cooker or any other fairly heavily loaded appliances, and, apart from the inconvenience which I suffer as a consumer, I am constantly twitted by friends in more fortunately placed areas, who naturally find food for jest in the case of the electrical man who does not use electricity in his own home. However careful one may be to explain why a member of the electrical industry cannot use something which he spends all his days in persuading others to use, it is inevitable that many people will jump to the conclusion that even on a standing charge and a unit rate of 1d. per kWh, electricity is too expensive to be used by those who know.

The present case—isolated though it may be—certainly shows the superiority (from the consumer's point of view) of municipal over private enterprise in the supply of electricity. Friends living in the adjacent Croydon municipal supply area enjoy cheap electricity, and are actively encouraged to use as much of it as they can. To live so near to this Electrical Utopia and be denied the use of more than 3 kW is particularly galling to

London, S.E.26.
July 22nd.

ANOTHER CONSUMER.

[TO THE EDITOR.]

SIR,—While sympathising with "A Mere Consumer," may I suggest that the operation of the sliding scale of dividends consequent on the reduction of price from a high flat rate to the low all-in rate, will amply repay the supply company for any loss of revenue from the reduction of domestic consumers' bills for lighting. So long as this anomalous arrangement is allowed to continue, development of a complete electrical service will be prevented in areas of the kind mentioned by your correspondent.—I am, etc.,

Streatham Hill.
July 19th.

"PRO BONO."

The steam turbine, known to Nero in 60 A.D., remained unpractical until its combination with the high-speed electric generator.—*Mr. Preston S. Arkwright.*

* * *

There are those among the thoughtful in America who are wondering whether it would not be better to adopt the British system, abolish the private advertising broadcasting stations and establish a few monopoly stations financed out of licences. —*Mr. J. C. Squire.*

SOUTHERN RAILWAY ELECTRIFICATION SCHEMES.

Some Suggestions—How Erection of New Charing Cross Station could be Avoided.

By J. G. B. SAMS, A.M.Inst.Mech.E., M.Inst.Loco.E.

THE Southern Railway is certainly to be congratulated on the fact that it is not content to rest on its laurels, but is pushing out still further with its electrification schemes, and in this respect is a shining example to some of the other railway groups. The following are the sections that it is hoped will be electrified by next year:—

Sutton and Wimbledon.
Dartford and Gravesend.
Hounslow and Windsor.
Wimbledon and West Croydon.

The first is a new branch entirely, at present under construction, and the railway expect to amalgamate the service to run over this section with the existing service between Wimbledon and the City via Herne Hill, which will give Sutton the advantage of another City terminal. The Dartford and Gravesend section is an extension of the three electric routes from London via Bexley Heath, Woolwich and Sidcup, which now terminate at Dartford, and the Windsor extension continues the routes via Kew Bridge and Richmond, serving, among other stations, the important riverside town of Staines. The last section is a curious little self-contained branch, part of which was built over the track of the 100 year-old Surrey iron tramroad, which extended from the banks of the River Wandle at Wandsworth to a spot near Croydon Parish Church, where it connected with the similar tramroad to Merstham and Godstone.

The particular failing of this piece of railway is that it lacks a connection between the stations at East and West Croydon, at which latter it terminates. A short connecting line, which would not amount to a mile in length, between these two stations would be of great traffic value, as it would put the rapidly increasing population of Wimbledon, Morden and Mitcham (all having stations on the branch) into direct connection at East Croydon with the Southern main line to Brighton and Eastbourne. At present one has to walk between the two stations, which, although not far, must act as a deterrent to traffic. The proposals of the railway do not include a through service between this branch and London, which perhaps is governed by the difficulty of fitting more trains in. A through service would perhaps attract some of the traffic now passing by the Tube from Morden, which is commendable from the Southern point of view. While in this neighbourhood there is one connection that, while having a certain traffic value, as through connections must always be of advantage to some of the travelling public, would be of material operating advantage as it would abolish two terminals; and that is a short connection between the ends of the Tattenham Corner and Epsom Downs branches. In this case the writer is speaking without his book, as he has no information on the difference of levels (if any) of the two branches, which may perhaps be prohibitive; but it is certain that at peak periods such as race days it would be exceedingly convenient to serve the traffic with two circular routes in place of the two terminals, and for this reason alone the scheme might be worth consideration.

The electric service operated by the Southern between Wimbledon and Waterloo via East Putney merits a little attention. This is an hourly service (half-hourly at peaks) and to the writer's knowledge is very lightly patronised; a glance at the map will show why. But if this service could be deflected on to the District and Metropolitan Railways via Earl's Court and continued on to Liverpool Street or Aldgate it might prove of considerably enhanced value, as it would give useful through connections with the group of terminals along the Metropolitan, in place of the two changes as now. Increased traffic might justify a reduced headway between trains, which at one hour seems a little sparse for electric services.

The final suggestion is in connection with the proposed abolition of the Charing Cross terminal, and it is that the Charing Cross steam train services should be diverted to Victoria and the electric services spread over Victoria and St. Paul's terminals. This would save the erection of a new terminal on the south side of the Thames, which is certainly the wrong side of the river for about 99 per cent. of passengers, as well as bad in operating theory. This is not the awkward problem that might appear at first sight, but naturally it would require some alterations and additions to the present facilities, the chief being an enlargement of Victoria terminal to accommodate the displaced steam service.

Other work necessary would be the completion to four tracks of the road between Victoria and Nunhead Junction, part of which already has four roads, and a further part three. It is considered—and the writer has had considerable experience in terminal working—that the displaced electric services could be absorbed into the present working at Victoria and St. Paul's by closing up the existing working so that additional platform accommodation would not be required.

Critics are reminded that there is a spur line between the ex-S.E. and C. main line to Charing Cross and St. Paul's, and that the Southern are seeking powers to instal a flying junction from their main line near St. John's and to restore the derelict Greenwich branch between that junction and Nunhead, which will provide the access necessary for this scheme.

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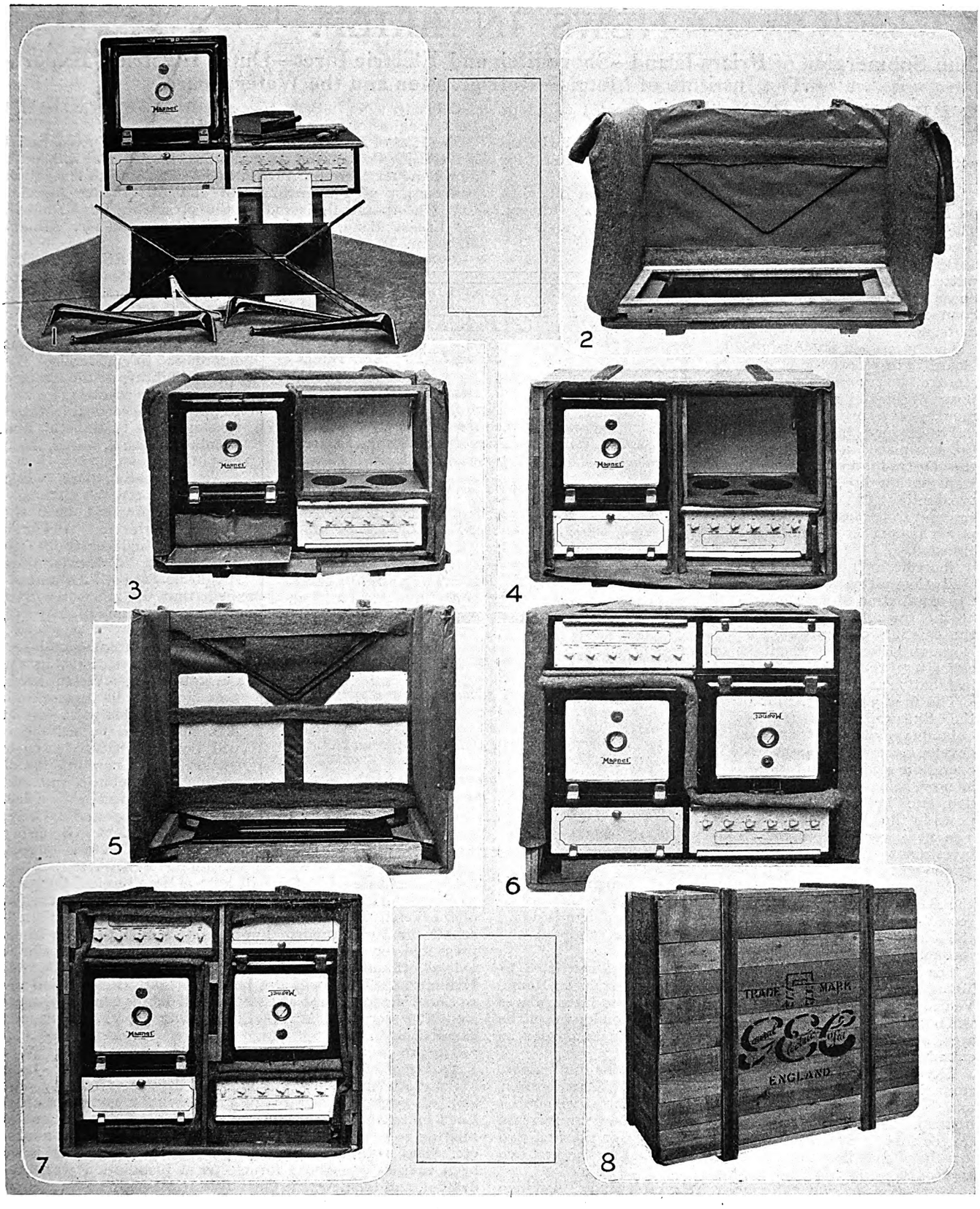

ENGLISH METHODS OF PACKING ELECTRIC COOKERS.

THE above pictures, reproduced by courtesy of the General Electric Co., show how "Magnet" cookers are packed, either singly or in pairs, for export. Figs. 1 to 4 show the former method, while Figs. 5 to 8 show the second method.

SINGLE METHOD.—(1) *Cooker dismanled ready for packing;* (2) *showing base battens fitted in extra strong wood case forming a recess into which cooker shelf is packed;* (3) *cooker in case with supporting frame of 1 in. timber fitted over hob to take weight of oven when case is turned over on end. The legs are wrapped in waterproof paper and securely packed in hot chamber underneath oven. Note rigid construction of case;* (4) *cooker packed, showing front supports. A thick felt pad is used wherever cooker comes in contact with case or battens, to prevent damage to enamel. Cases are lined with waterproof paper. Case is now ready for front lid to be fitted. The lid is lined with waterproof paper and thick felt.*

DOUBLE METHOD.—(5) *Showing base battens fitted in position, forming recess into which the two cooker shelves are packed. Enamelled splash guards and struts fitted in back and protected with felt. The case, which is of extra strong high grade wood, is rigidly braced and is lined with waterproof paper;* (6) *the two cookers in case ready for front battens to be fitted. The legs and heating elements are securely packed in the two hot chambers of the cookers. Thick felt padding is used generously where necessary. Note entire elimination of waste space;* (7) *front battens fitted. The case is now ready for lid to be fitted. The lid is also lined with felt and waterproof paper;* (8) *case strapped with steel tape ready for shipment.*

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NEWS IN BRIEF.

The Submerging of Friars Island—Shoreditch and Electric Fires—Dutch Electrical Exports—The Institute of Metals—Refrigeration and the Water Board.

SHARDLOW Board of Guardians has decided to adopt electric light at the institution.

The Metropolitan Asylums Board is about to instal wireless equipment at the staff homes at Queen Mary's Hospital for Children, at a cost of £250.

After a lapse of 800 years, Mass was celebrated on July 20th on Friars Island, Killaloe, in the ruins of St. Lua's Oratory. The island is to be submerged shortly, when the area will become a reservoir under the Shannon power scheme.

Bexhill Electricity Committee recommends the purchase of 500 lamps for use in connection with strip lighting at 1s. 9d. each net.

The Metropolitan Asylums Board is to renew the electric storage battery and booster on board the training ship "Exmouth," at a cost of £635.

The Calgary (Alberta) Power Co. has placed a contract for the construction of a 66 000 V. transmission line, costing approximately $3 000 000 and running from the Ghost River power system across country to Innisfail.

Shoreditch (London) Town Hall Committee recommends the installation of electric fires at the town hall, in place of the existing coal fires. The Borough Electrical Engineer estimates the cost of the installation at £390.

The first 3 800 H.P. unit of the Shuswap Falls (British Columbia) hydro-electric power development was brought into operation recently, and power is now being transmitted for domestic and industrial purposes in the Okanagan Valley. The new works represent an investment of approximately £1 000 000.

Cheltenham Electricity Committee is recommended by the Borough Electrical Engineer to purchase a number of second-hand 100 cycle motors for hire to consumers pending the change of system. The Committee has adopted the recommendation.

The Anglo-Italian telephone service, hitherto restricted to Milan, Genoa and Turin, is now extended in Italy to Rome, Venice and Bologna. Communication with the latter places will be restricted initially to subscribers in the London telephone area, but will be made available to the provinces as soon as circumstances permit.

The "Algemeen Handelsblad" states that the total export from Holland of wireless articles during 1928 has already been exceeded by about 9 million florins during the first five months of 1929. The export of electric globes also shows an increase on the first five months of 1928, the figures for the first five months of 1928 being 10·14 million florins and for the first five months of 1929 12·83 million florins.

A meeting of the Edinburgh Telegraph and Telephone Branch of the Union of Post Office Workers, on July 19th, recorded its protest against the Post Office proposals to employ female telephonists until 11 p.m., and affirmed its opinion that if the Post Office is really concerned with social conditions, it should meet its obligations by abolishing part-time employment and providing full-time work for men at fair rates of pay.

Orders have been placed for 150 ticket issuing machines of a new type for London Underground Railway stations. Coins, consisting of pennies and/or halfpennies, to make up the sums of 3d., 4d. or 5d., are dropped into a hopper—not edgewise through a slot—and the tickets are issued automatically. The first of the new machines has been placed in service at St. James's Park station.

Callender's No. 1 Band gave a performance at Cannon Hill Park, Edgbaston, Birmingham, last week.

The Earl of Birkenhead will be present at the International Advertising Convention at Berlin next month, and will speak at a banquet there on August 12th. The British delegation will consist of 236 members of the Advertising Association (Incorporated), including the president, Lord Riddell, Sir Ernest Benn, Sir William Crawford, and Mr. William Harrison.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated July 26th, 1879:*

An electrical treatment was devised for writers' cramp.

A telephone was placed in the Congregational Church at Mansfield, Ohio, and wires were led to the houses of several aged and invalid persons, who heard the service perfectly.

* * *

Twenty-five years ago THE ELECTRICIAN *dated July 29th, 1904, reported that:*

The National Telephone Co. had 9 700 potential subscribers awaiting connection.

A demonstration of the Raworth regenerative system of tramcar control was given at Gravesend, a "one-man" car being used.

* * *

Fifteen years ago, it was stated in THE ELECTRICIAN *for July 24th, 1914, that:*

Mr. Wordingham was advocating the establishment of a National Electrical Proving House.

Tenders were about to be invited for the construction of the tunnel for the Post Office underground electric railway.

The will of the late Sir Joseph Wilson Swan, inventor of the incandescent electric lamp was proved, with net personalty of £58 344.

The West Riding County Council has voted an estimate of £356 for electric lighting at the new County Offices, Wakefield.

The Metropolitan Asylums Board is to modernise the electric lighting at the Eastern Hospital, at a cost of £157, and to put in an electrical installation at the Lambeth and Woolwich casual wards, at a cost of £375.

At a meeting last week, Wolverhampton T.C. considered a proposal that the salary of the new Borough Electrical Engineer to be appointed at Wolverhampton should be £1 000. An amendment that the salary be £850, rising to a maximum of £1 050, was carried.

The fifth International Exhibition of Inventions, in the Central Hall, Westminster, London, will be opened on October 2nd this year. As in previous years the exhibition will be divided into a trade section and a new inventions section, and gold, silver and bronze medals will be awarded. The organising and general secretary is Capt. G. Drury Coleman, 39, Victoria Street, Westminster, S.W.1.

The Institute of Metals will hold a Metallurgical Congress at Düsseldorf from September 9th to 12th, on the invitation of the Verein Deutscher Ingenieure and the Deutsche Gesellschaft für Metallkunde. Fourteen technical papers will be presented for discussion, and visits will be paid to works in Düsseldorf and neighbourhood and to the Düsseldorf Foundry Exhibition. There will also be a whole-day excursion to the works of Messrs. Krupp at Essen. Full details can be obtained from the secretary, Mr. G. Shaw Scott, 36, Victoria Street, London, S.W.1.

The programme of the City and Guilds of London Institute Department of Technology has just been issued by Mr. John Murray, Albemarle Street, London, W. (price 3s. 6d.; by post 4s.). It contains general regulations, syllabuses for examinations in technological subjects and for teachers, particulars relating to scholarships, exhibitions, prizes, fees, text books, etc. The syllabuses for examinations in telegraphy have been revised and those for electrical installation work redrafted, and the new title for the electrical engineering section is "Electrical Engineering Practice." The book consists of about 500 pages.

The Assessment Committee of the Metropolitan Water Board reports that it has obtained powers which provide that where the owner or occupier of domestic premises desires to use water in connection with refrigerating apparatus, the Board shall be entitled to require that water so used shall be paid for by measure or at such rates as may be agreed. The Committee has submitted a sliding scale of charges for unmetered supplies, but states that, as regards the type generally adopted for domestic premises, the switch simultaneously operates the water supply and the electric or gas supply, and forms a safeguard against the wasteful use of water.

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LEGAL INTELLIGENCE.

Unsuccessful Appeal in Trade Name Injunction Case.

IN the Court of Appeal consisting of the Master of the Rolls and Lords Justices Lawrence and Slesser on July 22nd, the Edison Storage Batteries, Ltd., appealed from a judgment of Mr. Justice Clauson in the Chancery Division granting an interlocutory injunction restraining the company from carrying on business under their present name or any name calculated to lead to confusion between that company and the plaintiffs in the action, Edison Accumulators, Ltd.

The appellants, the defendants in the action, are an English company which had been promoted by an American company of the same name. In 1913 an agreement was entered into between the American Company and the Edison Accumulators, Ltd., plaintiffs' predecessors in title when the American company had a number of patents in this country for protecting the manufacture of their accumulators. Those patents had since expired and plaintiffs alleged that the effect of that agreement was to give their predecessors sole selling rights of Edison accumulators except the sales to Governments. That agreement continued in force until March, 1925, when it was substituted by another agreement for a period of five years with a provision for 90 days notice to terminate in the event of any breach. In January, 1929, the original Edison Accumulators company split themselves into two companies, Britannia Batteries, Ltd., and Edison Accumulators, Ltd., the latter company to have the benefit of the agreement of March 19th last, the plaintiff company received from the solicitors to the American company notice purporting to terminate the agreement on the ground that there had been breaches. On April 8th, 1929, the defendant company was registered as a private company to carry on the business of, amongst other things, selling accumulators in this country. The plaintiffs denied that there had been any breaches, and contended that in the circumstances the defendant could not carry on business under a name which so closely resembled theirs, and that there was bound to be confusion. The defendants denied that there would be confusion. They contended that their name was descriptive of goods which were sold, and the mere use of an honest description of goods could not be stopped.

Mr. Justice Clauson, as before stated, granted the interlocutory injunction as asked, stating that he was satisfied that it would be impossible for the defendants to trade under their present name without causing confusion.

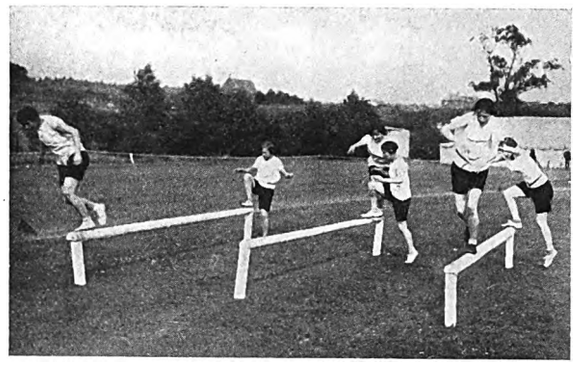
Sir Duncan Kerly, K.C., having stated the nature of the appeal, said Mr. Justice Clauson took the view that he had nothing to consider on the application except the fact that the plaintiff company had secured registration as a company of its name, and whether in his view there was likely to be any confusion between the business carried on by the plaintiffs under their name and the business of the defendants carried on under their name. The judge had refused to consider the following matters, which he (counsel) considered necessary. He had not considered whether the plaintiffs had any right to the exclusive use of their name. He had refused to consider how or why they had acquired that name. He had refused to consider whether the defendants name was descriptive of the goods which they sold, and which they were, as counsel contended, entitled to use. The judge said these matters did not concern him, and he refused also to consider whether the adoption of the plaintiffs' name was part of a scheme which counsel submitted was unquestionably a deliberate breach of contract. He contended that the court on such an application had to consider all these matters for the purpose of deciding whether the plaintiffs had a case and were likely to succeed at the trial of the action. The defendants took the view that the plaintiffs had not any right to trade under its signatory name. In any event it was not a case for granting an interlocutory injunction.

In giving judgment the Master of the Rolls said that no doubt the injunction which had been granted was of considerable importance to the appellants. But the fact was that Mr. Justice Clauson, who had the whole matter before him, had decided that it was not right to leave the question to be decided *in medio* at the present stage, and he (the Master of the Rolls) did not see his way to overrule the decision of the learned judge.

The Lords Justices concurred, and the appeal was accordingly dismissed with costs.

THE SOCIAL SIDE.

THE second and third of the annual series of golf competitions held at Preston by the staff of Siemens Lamp Works have recently been decided. These competitions are exceptionally popular and are most keenly contested. In the "S. H. Callow" golf competition (18 holes medal play) the successful competitors were :—1, A. G. Ogles; 2, S. Facer, jun., and 3, J. Lawrence. For the "W. O. Smith" prize, a "Graveyard" competition was chosen, being won by A. Facer, with W. Higginson and K. G. Lochhead second and third respectively. In the singles Bowling Tournament, A. Dilworth beat J. Foort in the final, the defeated semi-finalists being T. Wood and W. Marsh. All the competitions were held at Ashton Park, Preston, the sports ground of the Dick Kerr Club.



THE start of the ladies' obstacle race at the recent G.E.C. annual Witton Sports Gathering. The attendance was in the neighbourhood of 5 000, and various challenge cups were offered to competitors from all works and branches of the G.E.C. throughout the country. There were 427 competitors.

Messrs. James Bros., electrical engineers, Trowbridge, recently entertained their staff on an outing to Weston-super-Mare. The party numbered 60, and included the employees at the branches at Chippenham, Marlborough, and Devizes.

The employees of Messrs. Ernest F. May, Ltd., of Camden Town, London, had their annual outing recently. A party of 80 travelled to Clacton-on-Sea by rail, and dined at the Royal Hotel, Clacton, the chair being occupied by Mr. Chas. G. Fox. The function was voted a great success.

The annual sports of J. G. Statter and Co. were held on June 15th, a large company being present. Chief honours fell to H. Blake, who, with a series of firsts, easily carried off the Addenbrook Cup presented for the best individual aggregate of points. Among those present we noted Mr. J. G. Statter (just returned from South Africa), Mr. and Mrs. Addenbrook, Mrs. Albright and Mr. Wm. Albright. Mrs. Marston presented the prizes, and the sports were held in the grounds of Major Marston.

The annual outing of the Revo Electric Co., Ltd. (comprising Revo Electric Main Works, Revo Electric Heating and Cooking Department, Revo Foundry Co., Tividale Enamel Co., and the Groveland Brass Foundry Co., the employees numbering about 1 400), took place on July 6th, the destination being New Brighton. Two special trains were chartered from the L.M.S. Railway, and the party started from Dudley Port at 7 a.m., arriving at Liverpool about 9.30. The arrangements for the day were laid out by the Revo Social Sports Club, and after a pleasurable time seeing the sights of New Brighton quite a number took the ferry back to Prince's Landing Stage to visit the "Cedric," the "Duchess of York" and the "Samaria." The party then toured Liverpool, and even got as far as Southport, but eventually all turned up in time to catch the train at Lime Street Station for the return journey.

On June 15th the Mullard Companies held their annual outing, which this year was to Margate by special train, leaving Victoria at 8.30 a.m. An excellent luncheon was provided by the directors of the companies at the Queen's Highcliffe Hotel. The second annual sports meeting was held at the Sports Ground on the following Thursday, June 20th, when many valuable prizes were presented to the winners by Mrs. S. R. Mullard.

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PERSONAL.

SIR Hugo and Lady Hirst left London for Aix-les-Bains on July 20th.

Admiral H. W. Grant has joined the board of the Globe Telegraph and Trust Co., Ltd.

Mr. J. A. Benn and his Bride leaving St. Margaret's on Tuesday.

The marriage of Mr. John Andrews Benn and Miss Ursula Hankey was solemnised by the Bishop of Southwark, at St. Margarets, Westminster on Tuesday. Mr. Benn is the eldest son of Sir Ernest Benn, chairman of Benn Brothers, Ltd., the proprietors of THE ELECTRICIAN, and is himself a director.

Among overseas callers at THE ELECTRICIAN offices this week was Mr. Herbert W. Young, president of the Delta Star Electric Co., of Chicago.

The Duke of Atholl, Sir Philip Cunliffe-Lister, M.P., and Mr. Follett Holt have been elected additional directors of the Anglo-Argentine Tramways Co., Ltd.

Mr. Percy Rosling, general manager of W. T. Henley's Telegraph Works Co., has been nominated to fill a vacancy on the Beckenham Urban District Council.

Mr. E. T. Price, electrical engineer to Messrs. Wm. James and Sons, Cardigan, has been appointed electrical engineer to the Newcastle Emlyn and District Electric Supply Co.

Mr. H. C. Godsmark, chief technical assistant in the rolling stock branch of the Manchester tramways undertaking, has been appointed rolling stock superintendent of the Nottingham tramways.

Estate of the gross value of £476 992, with net personalty £367 296, was left by the late Mr. Bernard A. Firth, chairman of Thos. Firth and Son, Ltd., and a director of the English Electric Co., Ltd.

Glasgow Electricity Committee has recommended the appointment of Mr. Thomas I. Craig, now mains district superintendent, as sales manager, at a commencing salary of £600 per annum, rising to £850.

Mr. T. J. Francis, who has been a lecturer at Bolton Technical College and Manchester High School of Commerce six years, has been appointed lecturer in mechanical and electrical engineering at Plymouth and Devonport Technical College.

Derby Tramways Committee has recommended until November the continuation of the appointment of Mr. P. W. Bancraft as acting tramways manager, a position he has held since the retirement of Mr. F. Hardy at the end of last year.

Mr. A. Nichols Moore, borough electrical engineer for Newport, has been placed on the short list of applicants for a similar position at West Ham, shortly to become vacant by the appointment of Mr. F. W. Purse to the London Joint Authority.

Mr. Hubert Pryce Jones has been appointed assistant technical engineer at the Liverpool electricity undertaking. He first joined the department as a temporary assistant in connection with the preliminary work on the Clarence Dock power station.

Messrs. P. H. Peake and G. A. Roberts have been appointed sub-station attendants at Brighton Corporation's Southwick power station. Mr. Anderson, one of the present sub-station attendants, has obtained another appointment, and is succeeded by Mr. L. Brown.

IN PARLIAMENT.

Rejection of the Bills for the Co-ordination of London Passenger Traffic.

IN the House of Commons on July 17th, Sir Kingsley Wood in moving the third reading of the London County Council's (Co-ordination of Passenger Traffic) Bill, said in 20 years pressure on the local railways had doubled, tramway passengers had increased from 361 millions to nearly 1 000 millions and omnibus passengers from 280 millions to 1 671 millions per annum. The present conditions were chaotic and dangerous. The proposals in the Bill followed the recommendations of the London Traffic Advisory Committee.

Mr. Percy Harris, who moved the rejection of the Bill said it was unsound to concentrate the traffic into the hands of Lord Ashfield, the head of the tube and omnibus combine.

The Minister of Transport (Mr. H. Morrison) said the matter was receiving the immediate attention of the Government but these Bills would not to any material extent solve the problem.

Col. Ashley (ex-Minister of Transport) said it was a crying scandal that London should have to wait many years for improved traffic.

The Bill was rejected by 295 votes to 172, and the London Electric Railways (Co-ordination of Passenger Traffic) Bill was rejected without a division.

Relief of Unemployment.

In the course of the discussion in the House of Commons last week on a resolution to guarantee, at any time within three years from August 31st next, the payment of principal and interest on loans for capital expenditure on schemes for development, reconstruction or re-equipment in connection with public utility undertakings, up to £25 000 000, Mr. J. H. Thomas (Lord Privy Seal) said the Government did not intend to ignore the wider aspect of the question. The whole problem of electrification was the next stage, and he would include the question of export credits, but it was no use coming to the House with a partial scheme. He wanted sufficient transport and cheap power, and he would take into consideration not only the unskilled, but the skilled men out of work. Municipalities were tied by the percentage of 15% unemployment before they could be given certain grants. He wanted to reduce it to 10%. The resolution was passed.

Replies to Questions.

The following are points from recent answers to questions in the House of Commons :—

The Postmaster-General is pressing forward with the provision of telephone call offices in rural districts. A survey is being made of all rural post offices and stations now without telephone facilities.

The Minister of Agriculture states that the provision of electric power apparatus for buildings (including farm buildings, etc.), is included among the purposes for which loans may be sanctioned under the Improvement of Land Acts.

Telegrams exchanged during the first quarter of this year by Post Office beam stations were 506 000, against 451 000 in the corresponding quarter last year, and by the Imperial cables 123 000 in the past quarter, against 115 000 in the corresponding period last year.

The Minister of Transport (Mr. Herbert Morrison) states that an electricity scheme for South-West England and South Wales, including Carmarthenshire, is at present being prepared by the Electricity Commissioners, and will be ready for transmission to the Central Electricity Board before the end of the present year.

The railway companies have been asked to suggest comprehensive schemes of development and improvement, including an extension of electrification. The Minister of Transport will bring to the notice of the railway companies concerned a suggestion by Mr. J. C. Ede with regard to electrification of the railway between Newcastle-on-Tyne and South Shields.

The Postmaster-General (Mr. H. B. Lees-Smith) says the automatic system of telephony, involving dialling by subscribers, has long been in use in a number of provincial areas with satisfactory results. In London the system, on the whole, is giving efficient service. The conditions of working are necessarily much more complicated than in the smaller provincial areas, and he has received a certain number of complaints into which he is instituting a special inquiry.

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THE E.P.E.A.

London Technical Group Pays Interesting Visit to Electrical Works.

THE London Technical Group of the E.P.E.A. paid a visit to the works of the Hackbridge Electric Construction Co., Ltd., and the Hewittic Electric Co., Ltd., at Hersham, Walton-on-Thames, on July 6th.

The parties first entered the glass shop, where various glass blowing operations were being carried out in the manufacture of the rectifier bulbs and quartz tube burners. From there the parties passed into the main erecting rectifier bay, where they inspected the following equipments:—One 96 kW three wire set (two bulbs) to feed a 240/0/240 V three wire network from a 6 600 V three-phase 50 cycle supply, for Maidenhead Corporation; one 500 kW (four bulbs) set for Llanvanor Road sub-station of the North Metropolitan Electric Power Co., to feed a 550 V two wire traction system from a 11 000 V three-phase 50 cycle supply, and one 500 kW two-wire (four bulbs) set for the Kensal Green sub-station, to feed a 550 V two wire traction system from a 3 300 V three-phase 50 cycle supply; one 135 kW (two bulbs), three wire set to deliver 260/0/260 A at 260/260 V d.c. from 6 600 V three-phase 50 cycle supply, for Delhi; a 1 500 kW sub-station equipment (12 bulbs), and a 750 kW sub-station equipment (six bulbs) for West Ham Electricity Department, both to feed into a 550 V, two-wire traction system from a 6 200 V two-phase 50 cycle supply; a 450 kW two wire (four bulbs) set to feed the outers of a 460/230 V three wire light and power network, and to feed into 550 V traction system, for Bournemouth and Poole Electricity Supply Co., and a 120 kW three wire set (two bulbs) to feed into the inners of a 460/230 V three wire system for balancing, for the same company; both these equipments to operate off an 11 000 V three-phase 100 cycle supply. Other equipment inspected consisted of a 75 kW equipment (one bulb) to deliver 520 V d.c. two wire from a 415 V three-phase 50 cycle supply, to feed crane motors at Timaru Harbour, New Zealand, while apparatus for the Finchley U.D.C. consisted of (*a*) for Hamilton Road sub-station, two 200 kW equipments (four bulbs); (*b*) for Percy Road sub-station, one 300 kW equipment (four bulbs); (*c*) for Hill Rise sub-station, one 220 kW equipment (two bulbs); (*d*) for Holly Bank sub-station, two 150 kW equipments (four bulbs). All to feed into the outers of a three-wire d.c. light and power network 500 V from a 6 600 V three-phase 50 cycle supply. A 75 kW equipment (one bulb) to deliver 550 V d.c. two wire from 6 600 V three-phase 50 cycle supply—for a power load for the Public Works Department, Sydney, N.S.W., was seen, while a 2 000 kW rectifier equipment (16 bulbs) to feed into a light and power network 480 V d.c. from a 6 600 V three-phase 50 cycle supply, for Shoreditch, was also examined. Various lift rectifier equipments, of 2, 4, 5, 10 and 15 H.P. capacity, for Messrs. Waygood Otis, Express Lift, Hammond Bros. and Champness, J. and E. Hall, etc., also some equipments for charging batteries for the Commodore Theatre and some for feeding projection arcs for the Dominion Theatre, and sundry other sets, were also seen. Various models of ultra violet ray lamps, service light lamps for industrial illumination, and photographic lighting equipments both for still studios and cinema studios, and for printing and enlarging copy, were other interesting items.

After leaving the rectifier bay, the party proceeded to the core steel cutting and core erecting shop where a number of large cores were in process of construction. The main erecting bay was then visited, and here was on view a 10 000 kVA transformer for the North Western Scheme of the Central Electricity Board for installation at Stockport, stepping up from the Stockport generating station to the overhead line which is running to Marples, Buxton and Macclesfield. This transformer is to be provided with a special type of voltage regulator for on-load voltage control.

There were also a very large number of other transformers in various stages of construction, including some large 2/12-phase units for West Ham for operation in conjunction with a bank of Hewittic rectifiers, and three 4 000 kVA three-phase 25 cycle units for Birmingham Corporation, the company having received an order for 21 of these transformers. Those at present in the shop are the last to go through. There were also some 2 500 kVA units for the Central Electricity Board and a 3 000 kVA 33 kV transformer for Messrs. Merz and McLellan, also the completed windings of some of the 45 000 kVA three-phase transformers which are being built for the Central Electricity Board's S.E. England scheme. See page 123.

FACTORY LIGHTING.

Report on the E.D.A.-E.L.M.A. Factory and Workshop Lighting Campaign.

THE inadequate lighting conditions of the workshops and factories in Great Britain had been known for some years, and in order to obtain more definite information an intensive survey was carried out under the auspices of the E.L.M.A. Lighting Service Bureau during 1927, which indicated that some 70% of the workshops and factories were badly and incorrectly lighted. It was therefore arranged to conduct an educational Factory Lighting Campaign during the autumn of 1928, the campaign being planned by the E.L.M.A. Lighting Service Bureau and conducted by the Electrical Development Association, and a full report of the campaign has just been published.

In all 96 towns co-operated in the campaign, during which 72 addresses were delivered to the electrical trade and 120 lecture-demonstrations were given to industrialists. The total attendances at these meetings were 5 931, the attendances at individual meetings ranging from 30 to 150 persons.

The majority of the lectures were given by members of the E.L.M.A. Lighting Service Bureau, and, although it was not found possible in the majority of instances to secure a factory or part of a factory for lecture demonstration purposes, other methods were adopted with very satisfactory results. In one area 95% of the lectures were given in public halls, model factories, technical colleges, and showrooms, all of which were arranged for demonstrating old and modern systems of lighting. The cost of providing these demonstrations varied from £5 to £50, according to the size of the room or the building available, excluding this cost of lighting equipment or buildings which were loaned to the Electric Circles by the manufacturers and supply authorities respectively. In another area, advantage was taken of an engineering exhibition to organise a factory lighting exhibit and an information bureau. In another part of the country one of the largest manufacturing firms placed their workshops at the disposal of the Area Committee for lecture-demonstration purposes and some 350 industrial consumers attended one of the lectures.

Over 100 000 postal communications were mailed direct to factories and workshops, while 112 advertisements appeared in various trade journals during the period of the campaign. Over 2 400 inquiries were received as a result of this publicity, and followed up by propaganda material or a personal call.

The accounts of the campaign show a balance in hand at May 21st last of £1 015 15s. 9d., and this amount, less £70 for preparation, printing, circulating, etc., the report, is to be expended on a further booklet dealing with factory lighting, and will contain reproductions of photographs of good industrial lighting in modern factories.

RURAL ELECTRICITY.

Further Meeting of Conference on Electricity Supply in Rural Areas.

ON July 16th, a further meeting of the Conference on Electricity Supply in Rural Areas (convened by the Electricity Commissioners) was attended by 22 representatives of Government Departments and of various associations and other bodies interested in the subject. The main purpose of the meeting was to consider the action which had been taken on the various recommendations embodied in the report of their proceedings published by the Commissioners in July, 1928. A summary of the action taken on the matters dealt with since June, 1928, was considered, with documents relating to various aspects of electricity supply in rural areas which had been furnished by or through the medium of the Ministry of Agriculture, the Department of Agriculture for Scotland, etc. It was noted that various important schemes for the development of supply in different parts of the country under Electricity Acts and Orders had been or were about to be approved by the Electricity Commissioners; that the Commissioners, with the concurrence of the Minister of Transport, had appointed a technical officer whose duties would be specially concerned with the fostering of rural electrification, and that the Commissioners had appointed committees which were at present investigating the questions of uniformity of electricity charges and tariffs, and the provision of facilities for assisted wiring and the hire and/or hire purchase of electrical apparatus.

A further meeting of the conference is to be convened as soon as the reports of the committees have been received.

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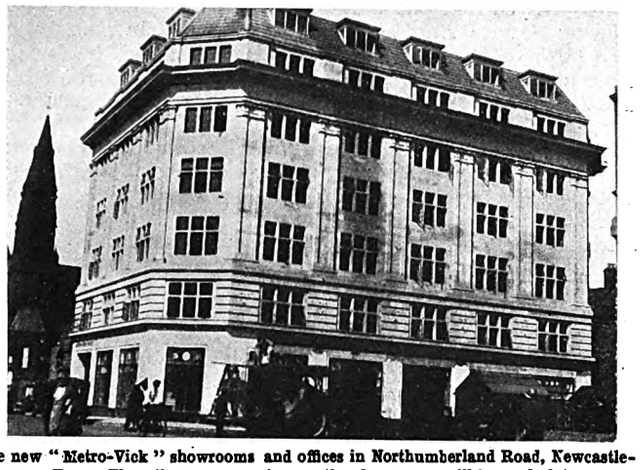
BUSINESS ITEMS.

YOUNG, OSMOND AND YOUNG, LTD., announce that the Bexley Heath Works have been closed and new premises opened at Welwyn Garden City, Herts.

The ELECTRIC HEATING Co., George Street, Croydon, announces that Mr. N. Weatherston, jun., of Union Chambers,



The new "Metro-Vick" showrooms and offices in Northumberland Road, Newcastle-on-Tyne. The offices are now in use, the showrooms will be ready later.

32, Granger Street West, Newcastle-on-Tyne, has been appointed to act as agent in the Tyne and Tees district

At the Royal Agricultural Show at Harrogate, DAVEY, PAXMAN AND CO., LTD., engineers and boilermakers, of Colchester, and Aldwych House, Aldwych, London, W.C.2, are exhibiting a 120/138 B.H.P. 3 cylinder vertical heavy fuel oil engine, which will be representative of this firm's wide range of oil power plants.

The HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD., announces that the works and offices at Molesley Road, Hersham, Walton-on-Thames, will be closed for the annual holidays from 12 noon, August 3rd, until 9 o'clock on Monday morning, August 12th. An emergency staff will be in attendance to deal with correspondence requiring urgent attention.

A big explosion of a cylinder of carbonic acid gas took place at the back of the Cardiff offices of TUNGSRAM ELECTRIC LAMP WORKS (GREAT BRITAIN,) LTD. Considerable damage was done to the doors and windows leading into the store room. The lamps which were stored in the affected premises proved, however, on test, to be none the worse for the explosion.

The engineers' holidays arranged between the Huddersfield Engineering Employers' Association and the various trades unions concerned this year extended from Friday, July 19th, until Monday, July 29th. The directors of Hopkinsons, Ltd., Britannia Works, Huddersfield, have decided to pay a full week's wages to all employees who are not in receipt of standing wages and who have been in the employment of the company for more than 12 months, so that they will not be losers by the week's stoppage.

Amongst several orders recently received by the HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, London, E.15, for "Hart" batteries for telephone exchanges, may be mentioned Dewsbury—2 batteries each consisting of 11 "STC. 13" type cells having a capacity of 588 Ah; Grimsby—1 battery consisting of 30 "STD. 17" cells having a capacity of 1 322 Ah; Stanmore—2 batteries of 11 "STC. 5" cells each (in 19 plate boxes), of 195 Ah; Santiago—2 batteries of 30 "D. 51" cells, of 3 525 Ah; Malta—2 batteries of 25 "STB. 7" cells, of 150 Ah; Edinburgh, Granton—2 batteries of 30 "STC. 9" cells (in 15 plate boxes) having a capacity of 391 Ah. There are already three telephone exchanges in Edinburgh in which "Hart" batteries are installed, and the two additional equipments mentioned will make a total of five exchanges in Edinburgh in which batteries they manufacture are fitted.

A contract has just been placed with the GENERAL ELECTRIC CO., LTD., of Magnet House, Kingsway, London, W.C.2, for electrical equipment for the rolling stock required in connection with the Manchester-Altrincham electrification scheme. The contract covers 100 heavy railway motors each rated at 328 B.H.P. on the one-hour rating, together with electro-pneumatic contactor type control equipments for 24 motor coaches, 22 driving trailer coaches, and 22 trailer coaches. Air operated pantagraphs for current collection from an overhead wire and also motor-generator sets for supplying low tension current for the control and lighting circuits are also included. The order also covers the complete heating and lighting equipment for the 68 coaches, and it is interesting to note that the heating will be carried out at the line voltage of 1 500. The contract amounts to a total value of over £100 000.

The ELECTRIC FURNACE CO., LTD., of 17, Victoria Street, London, S.W.1, has recently concluded an agreement with Hirsch, Kupfer und Messingwerke A.G., Eberswalde, Germany, in accordance with which they have the right to the British and French patents, and the use of drawings and information relating to the various types of electric resistance furnace developed by the latter company. Messrs. Hirsch have, we are informed, applied electricity to metal melting, annealing and reheating to a greater extent than any other non-ferrous metal manufacturers. Their furnace equipment includes continuous strip annealing plant, side-charged tube annealing furnaces, bright annealing furnaces, and furnaces for reheating ingots, in addition to a large battery of Ajax-Wyatt and Ajax-Northrup furnaces. The total consumption of electricity for furnaces at these works is about 18 000 000 kWh per annum.

The London Power Co., Ltd., has notified FERRANTI, LTD., that their tender for three 80 000 kVA 11/66 kV three-phase transformers has been accepted. These units are for direct connection to 67 250 kW turbo-alternators to be installed at the new Battersea power station, one alternator and its associated transformer forming a single unit, switching being carried out on the 66 kV side. This order for such large three-phase units, following similar orders placed by the Central Electricity Board, shows that the gain in economy resulting from the use of one three-phase unit in place of three single-phase is fully appreciated—at least by the larger undertakings. Included in the order for the 80 000 kVA units are: four 20 000 kVA 66 kV/22 kV and two 4 000 kVA 66 kV/3·3 kV. It is interesting to note here that Ferranti, Ltd., have in course of construction two 60 000 kVA 132/66 kV transformers for the "grid" connection to Battersea. The total kVA of Ferranti transformers to be installed at Battersea will therefore approach half a million.

DORKING SPECIAL ORDER INQUIRY.

Opposition by the London and Home Counties Joint Electricity Authority.

SIR William Marwood, on behalf of the Ministry of Transport, held an inquiry at Dorking on July 19th into an Electricity Special Order which embodies an agreement between Dorking U.D.C. and Edmundson's Electricity Corporation, Ltd., for leasing the Dorking electricity undertaking to the latter for a further 40 years. The Order has been approved by the Electricity Commissioners, is now before the Minister of Transport for confirmation, and its confirmation was opposed by the London and Home Counties Joint Electricity Authority and by residents in the area.

Mr. W. Craig Henderson, K.C., for Edmundson's, said the new agreement provided that the Dorking Electricity Supply Co. should be formed, that Edmundson's should repay to the council all the outstanding loans, that the maximum prices should be 10d. per kWh for lighting and 3d. for power (with a sliding scale for price) and a dividend on the basis of 8%. If the Joint Electricity Authority's intervention meant anything, it meant, "You advise the Minister to withhold his consent to the Order because we (the Joint Authority) might in the future possibly be enabled to do something."

Mr. R. Sanders, opposing the Order on behalf of the villages of Buckland and Betchworth, said they knew Edmundson's had sold the whole of the ordinary capital to the Greater London Trust, Ltd., which was registered in England as an English company, but was controlled by American citizens.

Sir Lynden Macassey, K.C., for the Joint Electricity Authority, said his authority had no object save to secure in their district the cheapest and most efficient supply of electricity which could be secured. A condition of things had been created by quite bona fide action on the part of the Dorking Council and the company which had prevented consideration of the Joint Electricity Authority's powers and obligations in regard to the supply of electricity.

Expert evidence was given, and it was stated that the Joint Electricity Authority had made arrangements for bulk supply between Kingston and Walton-on-Thames, and within twelve months the mains could be extended to Dorking.

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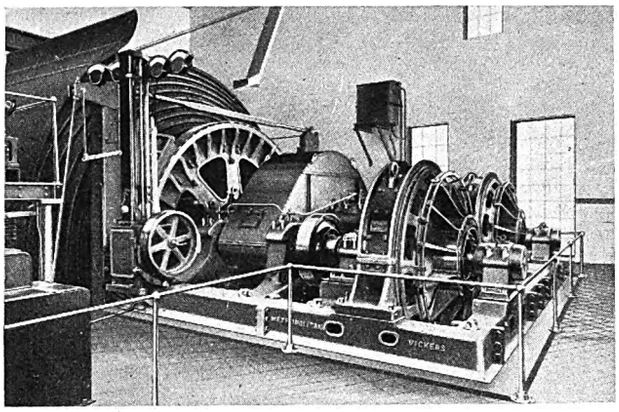
ELECTRIC WINDERS.

Recent Contracts for Large Equipments with Important New Features.

FIVE large electric winder sets are included among recent orders for winding equipment placed with the METROPOLITAN-VICKERS ELECTRICAL CO., LTD. All five sets are to be arranged with Ward-Leonard control, three with direct coupled motors and two with geared motors. The sets represent an interesting variety of applications, two being for a deep gold mine on the Rand, two for a new copper mine in Northern Rhodesia, and one for service involving exceptionally heavy output at a colliery in New South Wales.



An example of winding equipment manufactured by the Metropolitan-Vickers Electrical Co., Ltd.

New features of special interest are included in two of the equipments, those for Rhodesia, one development being a hydraulic slip regulator between the motor and the flywheel of the motor generator set and the other an improved system of automatic braking control.

The two winders for the Rand are equipments of 2 150 r.m.s. and 4 310 H.P. working peak capacity ordered by the Union Corporation, Ltd., for East Feduld Mines, Ltd. The electric winders are to replace two steam engine equipments, one carrying men and the other hoisting ore, in an installation 5 600 feet above sea level. The depth of the shaft is 3 350 feet and the net load to be handled in the case of the ore hoist is 7 short tons (14 000 lb.), the output required being 230 tons per hour. The two equipments will be similar, the winder motor in each case having a normal speed of 58 r.p.m. and being coupled to two cylindrical drums 14 feet in diameter and 5 feet between flanges. The normal maximum winding speed will thus be 2 580 f.p.m. The two motor generator sets will each consist of an 1 800 H.P. 2 000 V induction motor direct coupled to a 1 550 kW 640 V D.C. generator. The sets will not be equipped with flywheels as the power will be taken from the Victoria Falls and Transvaal Power Co. It is intended ultimately to increase the working peak capacity of the equipments to 4 570 H.P. by taking out part of the permanent resistance in the generator field circuit, thereby increasing the winding speed by about 5% and the output capacity to 245 tons per hour. The Metropolitan-Vickers Company is the main contractor for the installation including the cable work; the sub-contract for the mechanical parts has been placed with BLANE AND CO., LTD., of Johannesburg, who will supply parts manufactured by FULLERTON, HODGART AND BARCLAY, LTD.

Caledonian Collieries, Ltd., of New South Wales, have ordered, through their managing agents, HOWARD SMITH, LTD., of London and Sydney, an electric winder of 1 900/4 000 H.P. to replace a steam engine equipment at a shaft of Aberdare Colliery, where it is required to increase the output to 557 tons per hour. The new equipment is to do this by a schedule of 133 trips per hour with a net load of 4¼ tons. The time for the trip of 530 feet is thus only 27 seconds, of which 7 seconds is allowed for decking. The acceleration is 5·53 feet per second and the maximum winding speed 2 555 feet per minute. The motor is designed for operation at 70·5 r.p.m. and will be direct coupled to a cylindrical drum 12 feet in diameter and 6½ feet wide. The motor generator set will consist of a 680 H.P. induction motor coupled, with a flywheel, to a 1 170 kW d.c. generator, this equipment being housed in a separate building about 50 yards from the winder house. The Metropolitan-Vickers Company is the main contractor for the installation, including cable work. The sub-contract for the mechanical parts has been placed with VICKERS-ARMSTRONGS, LTD. It is interesting to note that at another shaft of the Aberdare Colliery there is installed another Metrovick equipment, rated at 4 500/11 250 H.P. This winder raises a net load of 7½ tons from a depth of 1 260 feet and maintains an output of 490 tons per hour.

The Roan Antelope Copper Mines, Ltd., which is operating in the opening up of a large new field of copper mining concessions in Northern Rhodesia, has ordered two geared d.c. winders of 1 290/2 580 H.P. with Ward-Leonard control for a new shaft 1 100 feet deep. In this installation also the two winders, one for men and one for ore, will be similar. The loads to be dealt with are 12 short tons and 10 short tons respectively, and the output of ore will be 500 tons per hour. The winding drums will be cylindrical of 16½ feet diameter for the man hoist and 14½ feet diameter for the ore hoist, with gear ratios to give the same winding speed, 1 400 feet per minute, in each case. Power will be supplied from the company's own system at 3 000 V three-phase 50 cycles and converted by a motor generator set consisting of a 960 kW generator with a flywheel of 6½ tons.

TRADE PUBLICATIONS.

THE July stock list has been received from HIGGS MOTORS, Witton, Birmingham.

BLACKSTONE AND CO., LTD., Stamford, have issued a new folder describing portable power and pumping plants.

The July blotter of the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Square, London, S.W.1, illustrates the "Junior" cooker, No. 501.

The ELECTRIC HEATING CO., George Street, Croydon, has issued a new leaflet dealing with the "Utility" frame, whereby an electric iron may be used as a hot-plate.

The "P.B." thermo-electric surface pyrometer is the subject of publication L.124, issued by the DRAYTON REGULATOR AND INSTRUMENT CO., LTD., of West Drayton, Middlesex.

BRITISH INSULATED CABLES LTD., Prescot, have published a new bridge marker, P.248, dealing with butt welders, and a July telephone circular. Publication P.248 replaces P.231.

Among the latest publications of RADIO INSTRUMENTS, LTD., 12, Hyde Street, London, W.C.1, is a special leaflet describing the "Dual Astatic" high frequency choke for use in radio circuits.

Some useful wiring hints with the "Callender Kalibond" wiring system are given in a special publication of CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, London, E.C.4. The publication takes the form of a covered folder of linen bearing printed illustrations of the system, with suitable descriptions.

CROSSLEY BROTHERS, LTD., Manchester, have sent us publication 1 048a, entitled "Crossley Products." A copy of the new refuse fuel gas plant catalogue No. 1 275, together with souvenir booklet, publication No. 1 286, have also been received. The latter deals with the visit of the Institution of Mechanical Engineers on the occasion of the summer meeting and visit to Manchester.

EVERSHED AND VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.4, have published a new "Megger" earth tester catalogue. This publication has been entirely re-written since the first edition, as knowledge of earth testing has advanced considerably during the past few years. The catalogue contains an explanation of the purpose and importance of earth testing, and notes on the general theory of the "Megger" earth tester.

The FULLER ACCUMULATOR CO. (1926), LTD., Woodland Works, Chadwell Heath, Essex, has published a complete list of car replacement batteries in the form of a sheet which may be hung on the wall. The list is tabulated under four headings, these being make of car, year of manufacture, model number, and horse-power, and the series number of the accumulator which is most suitable. This sheet should be used in conjunction with the company's No. 103, which gives full particulars of sizes and prices.

A similar list, but giving in addition information as to voltage, capacity, dimensions, height over terminals, prices uncharged, and prices for acid and first charge, has also been published relating to "Lucas," "C.A.V.," and "Rotax" batteries. This is the fourth edition, and forms an easy reference to the correct type of battery for any make of British and foreign car or commercial vehicle. This list is obtainable from C. A. VANDERVELL AND CO., LTD., Acton, London, W.3.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

HULL CORPORATION.—Tramway overhead equipment, including poles, cable, trolley wire, etc. Schedules from the General Manager, Tramway Offices, Albion Street, Hull.

ABERTILLERY URBAN DISTRICT COUNCIL, July 26th.—Static transformer and low pressure switchgear for new central sub-station at Carlyle Street, Abertillery. Specifications from Mr. Dawson Thomas, engineer and manager, Electricity Offices, Abertillery, Mon.

HOUSE WIRING AT TORRY, July 26th.—Electrician's work of two houses at Balnagask Road, Torry, Aberdeen, for Mrs. W. Brebner and Mr. Alex Robb, respectively. Schedules, etc., from Mr. G. M. Hay, 177, Union Street, Aberdeen.

Electrical Generator for Gasworks.

MANCHESTER CORPORATION, July 26th.—Manufacture, supply, and erection of a heavy oil engine and a c.c. generator at Partington gasworks. Specification, etc., from Mr. J. H. Sillitoe, Gas Department, Town Hall, Manchester.

CENTRAL ELECTRICITY BOARD, July 27th.—Supply and erection of 132 000 V overhead transmission lines, in connection with the Mid-East England Electricity Scheme. Specification (No. M.E.E.-P.L. 1), etc., from Mr. R. H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, W.C.2; deposit £2 2s.

HARLOW (ESSEX) LIGHTING COMMITTEE, July 27th.—Lighting the district from September 20th, 1929, to April 30th, 1930, by electricity or by other means (57 lamps), and also one lamp at the "George," for 12 months. Further particulars from Mr. R. C. Cowlin, chairman of the Committee.

NEWCASTLE-ON-TYNE GUARDIANS, July 27th.—Supply of X-ray apparatus for Wingrove Hospital, Westgate Road, Newcastle-on-Tyne. Further information from the Medical Superintendent.

ROYSTON COUNCIL SCHOOL, July 27th.—Electric light installation. Specification, etc., from Mr. G. T. Tipps, divisional clerk, Education Offices, Cudworth, Yorks.

ASHTON-UNDER-LYNE AND DISTRICT SMALLPOX HOSPITAL BOARD, July 29th.—Electric light installation at smallpox hospital. Specifications from Mr. N. Appelbee, Corporation Electricity Department, Wellington Road, Ashton-under-Lyne.

AYRSHIRE EDUCATION COMMITTEE, July 29th.—Electric light installation in connection with extensions to the Royal Academy at Irvine. Schedules, until July 29th, from Mr. William Reid, master of works, Education Offices, Ayr.

CARDIFF RURAL DISTRICT COUNCIL, July 29th.—Supply, etc., of sub-station equipment, underground cables, overhead lines, etc., in parish of Radyr. Forms of tender, etc., from Mr. R. Howard Fletcher, 3, Park Place, Cardiff.

LANARKSHIRE COUNTY COUNCIL, July 29th.—Electric lighting work in connection with additions to Longriggend Sanatorium. Particulars from the architect, Mr. P. C. Smith, District Offices, Hamilton. Applications for schedules to be made before July 29th.

DUNDEE CORPORATION, July 30th.—Electric light installation in connection with Fleming Trust housing scheme, Particulars from Mr. G. Baxter, 91, Commercial Street. Dundee.

MANCHESTER GUARDIANS, July 30th.—Circulating pumps and electric cable, at Crumpsall Institution. Specification from Superintendent of Works, Union Offices, All Saints', Manchester.

BEXHILL CORPORATION, July 31st.—Electric light installation in the Pavilion. Specification from Borough Electrical Engineer, Ashdown Road, Bexhill.

COMMISSIONERS OF H.M. WORKS, ETC., July 31st.—Electric lighting and power wiring at Natural History Museum, South Kensington, London, S.W. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

MANCHESTER GUARDIANS, July 31st.—Supply of portable X-ray apparatus to Withington Hospitals, West Didsbury. Tenders to the Clerk, Union Offices, All Saints, Manchester.

SKIPTON URBAN DISTRICT COUNCIL, July 31st.—Supply of 500 yds. of 0·15×0·15×0·15×0·075 sq. in., l.t. cable, paper insulated for 660 V, lead covered, double steel tape armoured, compounded, shaped conductors. Tenders to the Clerk, Town Hall, Skipton.

CARDIFF GUARDIANS, August 1st.—Electrical installations and main distribution cables. Further particulars from the Clerk, 11, Park Place, Cardiff, until August 1st.

ROCHFORD GUARDIANS, August 7th.—Underground cables, switchgear instruments, wiring, 25 H.P. motor, starting gear, etc. Specification, etc., from Mr. H. Tomlinson-Lee, 26, Victoria Street, Westminster, S.W.1; deposit £2 2s.

SALFORD CORPORATION, August 10th.—Low tension, paper insulated, lead covered and armoured cables. Forms of tender from the City Electrical Engineer.

LONDON COUNTY COUNCIL, August 12th.—Supply and installation of nine 1 000 kW rotary convertors, with static transformers. Specification, etc., from the General Manager, Tramways Offices, 23, Belvedere Road, London, S.E.1; deposit £1 1s.

UTTOXETER URBAN DISTRICT COUNCIL, August 12th.—Overhead 11 000 V transmission line; e.h.t. and l.t. cables and roadwork and public lighting; and sub-station equipment. Persons desiring to tender must notify Mr. W. C. C. Hawtayne, 9, Queen Street Place, London, E.C.4.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., August 13th.—Supply of ironclad unit type switchgear, at the National Physical Laboratory, Teddington. Specifications, etc., from the Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1; deposit £1 1s.

NEWCASTLE ENDOWED SCHOOLS, August 24th.—Electric light installation in a new wing to be erected at each of two schools, viz.: Newcastle-under-Lyme High School, and Newcastle-under-Lyme Orme Girls' School. Specifications, etc., from Messrs. Cramp and Frith, 1, Dickinson Street, Manchester; deposit £3 3s. in respect of one contract, or £6 6s. in respect of both contracts. Tenders are invited only from firms on the National Register of Electrical Installation Contractors.

COMMITTEE OF VISITORS OF GLOUCESTERSHIRE MENTAL HOSPITALS, August 26th.—Electric wiring of Wotton and Coney Hill Mental Hospitals, on "Stannos" earthed concentric system. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5, on and after July 30th; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled, duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links, one 30 000 kVA busbar coupler equipment with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £3.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, W.S.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., July 26th.—Supply of electric overhead travelling cranes etc. Forms of tender and specification (£1, not returnable) from Mr. S. G. S. Young, secretary, 91, Petty France, Westminster, S.W.1.

MIDDLEBURG (S. AFRICA) MUNICIPALITY, July 29th.—Supply and erection of steam raising plant, steam driven alternator, condensing plant, 6 600 V. transmission line and switchgear. (Reference B.X. 5 348.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 30th.—Motor driven centrifugal pump, to deliver 400 gallons per minute against total head of 50 feet, the motor to be wound for 230 V d.c. (Reference A.X. 8 150.)

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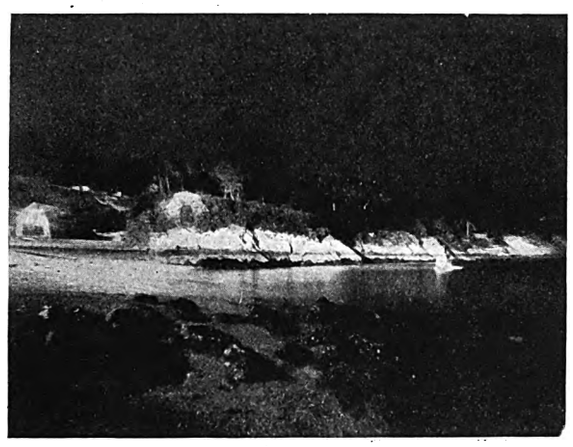
CAPE TOWN MUNICIPALITY, July 31st.—Supply of paper-insulated, lead-sheathed cables (specification No. 467/1929). (Reference B.X. 5 486.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 1st.—One 10-ton electrically-driven overhead travelling crane, for Maritzburg workshops (tender No. 1 487). (Reference A.X. 8 105.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 1st.—Supply of telephone cable (tender No. 160). (Reference B.X. 5 345.)



THE bathing beach adjoining the medical baths at Torquay, where over 20 B.T.H. type 599 projectors fitted with 1 000 W. gasfilled lamps and colour screens are used for illumination of rocky portions of the cliffs and of the beach. Projectors with flame-colour screens are employed, while green screens are fitted to those units which are trained on the shrub-covered parts of the cliffs and to projectors provided to illuminate the sea.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 6th.—Supply of 120-ton, four-motor, overhead travelling crane and runway (specification No. S.M. 358). (Reference A.X. 7 810.)

NEW ZEALAND POSTS AND TELEGRAPHS, August 7th.—Enamelled and silk-covered resistance wire (No. P. and T. 151/1 497). (Reference B.X. 5 322.)

PORT ELIZABETH MUNICIPALITY, August 8th.—One 250 kVA, 3-phase, self-cooled type, indoor transformer (specification No. 30). (Reference B.X. 5 487.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 8th.—Telegraph material, including g.i. tubular side-arms, insulators, paper sleeves, insulator spindles, etc. (tender No. 161). (Reference A.X. 8 112.)

CHILEAN MINISTRY OF MARINE, August 9th (extension of time).—Supply and erection of two aerial towers for new wireless station at Arica. (Reference A. 8 244.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, August 12th.—Supply and erection at Burrinjuck of auxiliary hydro electric generating plant. (Reference B.X. 5 365.)

EGYPTIAN MINISTRY OF THE INTERIOR, August 13th.—Supply of electric power plant, with underground and overhead network, for the town of Maghagha, Minieh Province. (Reference B.X. 5 318.)

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., August 13th.—Supply of 70 a.c. motors and starters, with spares, for Perambur works remodelling. Forms of tender (£1, not returnable) from the Company's Office, 25, Buckingham Palace Road, London, S.W.1.

Telegraph Stores Contracts.

NEW ZEALAND POSTS AND TELEGRAPHS, September 7th.—Supply of v.i.r. wire. (No. P. and T. 151/1 573.) (Reference B.X. 5 416.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 10th.—Two-conductor cores (P. and T. 151/1 600). (Reference B.X. 5 462.)

LOURENCO MARQUES PORT AND RAILWAYS, September 11th.—Battery tractors and trailers. (Reference A.X. 8 172.)

BULAWAYO MUNICIPALITY, September 13th.—Supply of h.t. overhead transmission lines, stepdown transformers, pumps with motors, etc. (Reference A.X. 8 181.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, September 16th.—Supply of automatic sub-station at Remuera (two 500 kW machines and switchgear); automatic sub-station at Point Chevalier (two 1 000 kW machines and switchgear); 22 000 V switchgear; 6 600 V switchgear, and supervisory control apparatus. (Reference B.X. 5 506.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 23rd.—Electric light installation and distribution system for the town of Kafr-el-Cheikh (Gharbick Province). (Reference B.X. 5 502.)

INVERCARGILL (N.Z.) BOROUGH COUNCIL, September 23rd.—Supply of draw-out truck type or totally armour clad type switchboard, for controlling 11 000 V, three-phase, 50-cycle current. (Reference B.X. 5 507.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 24th.—Supply of condensers (schedule C. 461). (Reference B.X. 5 488.)

DURBAN CORPORATION, September 27th.—Supply of three-phase ironclad, compound filled switch panels (specification S. 778). (Reference B.X. 5 505.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General, Victoria House, Strand, London, W.C.; deposit, £2 2s.

EGYPTIAN MINISTRY OF PUBLIC WORKS (TANZIM DEPARTMENT), October 1st.—Supply of electric lamp standards. (Reference A.X. 8 251.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

Tenders Accepted.

GENERAL POST OFFICE.—Edison Swan Electric Co., Ltd., supply of cells.

DEWSBURY CORPORATION.—Greenwich Cable Co., Ltd., cables, £1 028 10s.

AYLESBURY CORPORATION.—English Electric Co., Ltd. 15 transformers, £477 5s.

SHEFFIELD CORPORATION.—Bruce Peebles and Co., Ltd., supply of transformers, £386.

ADMIRALTY.—Edison Swan Electric Co., Ltd., combined switch and socket and plugs.

ENNISKILLEN URBAN DISTRICT COUNCIL.—Enniskillen Electric Lighting Co., public lighting.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL.—Edison Swan Electric Co., Ltd., supply of electric lamps.

STIRLINGSHIRE COUNTY COUNCIL.—J. & J. Duff, wiring houses for electric light at Plean, Cowie, and Fallin.

HULL CORPORATION.—J. C. Couleham, electric light installation at central library extension, £662 (Recommended).

GLASGOW CORPORATION.—P. R. Jackson and Co., Ltd., armature coils; Edgar Allen and Co., Ltd., tramway points and crossings.

EPSOM URBAN DISTRICT COUNCIL.—English Electric Co., Ltd., l.t., d.c. switchboard, £945, plus erection on time and material basis.

LONG SUTTON URBAN DISTRICT COUNCIL.—Boston Electricity Supply Co., street lighting by 60 W lamps, £3 2s. 6d. each per annum.

MARAZION PAROCHIAL CHURCH COUNCIL.—West Cornwall Electric Light and Power Co., electric lighting in parish church and church hall.

GREAT WESTERN RAILWAY CO.—Electrical Apparatus Co., Ltd., provision of controllers and resistances 50-ton cranes at locomotive works, Swindon.

BROADSTAIRS URBAN DISTRICT COUNCIL.—Isle of Thanet Electric Supply Co., Ltd., lighting 13 lamps in new arterial road, £9 per lamp per annum.

ROBERT GORDON'S COLLEGE, ABERDEEN.—Bell and Robertson, Ltd., electrical work in connection with erection of new McRobert Hall at the College.

BASINGSTOKE CORPORATION.—British Thomson-Houston Co., Ltd., additional electrical plant, £2 718. Ten tenders were received; highest £3 832.

HULL TELEPHONES COMMITTEE.—Equipment and Engineering Co., Ltd., insulators, £83 2s. 6d.; Ericsson Telephones, Ltd., switchboards, £84 16s. 6d.

HULL CORPORATION.—A. Shaw and Son, electric light and bell installation required at Maternity Home and Infants' Hospital, Hedon Road, Hull, £2 079.

READING CORPORATION.—Hy. Willis and Son, Ltd., supply and installation of electric blowing apparatus for organ in large Town Hall; Reading Electric Supply Co., Ltd., electric wiring in connection with same.

GLASGOW CORPORATION.—M'Geoch and Co., Cartwright and Sons, Brown and Co., Z. Electric Lamps and Supplies,

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Sloan Electrical Co., Malcolm and Allan, T. Land and Sons, Bayley, March and Newry and Credenda Conduits, electrical fittings and accessories.

LEEDS CORPORATION.—Supply of cables, W. T. Henley's Telegraph Works Co., Ltd., £1 281 2s. 9d.; Enfield Cable Works, Ltd., £3 146; Macintosh Cable Co., Ltd., £5 313 7s. 1d.; Hackbridge Cable Co., Ltd., £2 700. William Wadsworth and Sons, installation of electric goods lift at town hall, £324.

BIRKENHEAD CORPORATION.—Transformers: English Electric Co., Ltd., five 100 kVA, £445; Brush Electrical Engineering Co., Ltd., one 200 kVA, £139; C. A. Parsons and Co., Ltd., one 300 kVA, £156. Cable: Liverpool Electric Cable Co., Ltd., £148 5s.; Hackbridge Cable Co., Ltd., £745. W. T. Henley's Telegraph Works Co., Ltd., erection of overhead lines to Wirral, at schedule rates.

ROTHERHAM CORPORATION.—A. Reyrolle and Co., Ltd., supply of two pairs of truck-type switches, £256 per pair; Metropolitan-Vickers Co., supply of spare armature, £215. (Both recommended.) Brown Boveri, Ltd., supply of rectifying plant, £2 375. (Recommended provisionally.) Electrical Engineer is to inspect plant at Delft, and if it is not considered satisfactory, the tender of the Hewittic Electric Co., Ltd., at £2 139, is recommended.

COLCHESTER CORPORATION.—Electric Construction Co., Ltd., one e.h.t. generator panel, two l.t. a.c. feeder panels, earthing cubicle, and cable connections, £1 650; W. T. Henley's Telegraph Works Co., Ltd., e.h.t. cable, £5 882 18s. 1d. supply and erection of overhead l.t. distribution lines (4 480 yd.) and poles in the Wivenhoe urban district, £2 493 16s.; and e.h.t. and l.t. cable, £13 107 19s., subject to disc. 5 %; Crompton Parkinson, Ltd., three 11 000 V and 6 600 V kiosks, £1 274 12s. 6d.

LIVERPOOL CORPORATION.—Mersey Welding Co., electric welding of 600 tramway rail joints, 11s. per joint; Premier Electric Welding Co. (Mersey), Ltd., 700 joints, 11s. per joint; Murex, Ltd., 100 joints, 35s. per joint; Mersey Welding Co., Ltd., welding and retreading 350 tramway rail joints and retreading rail heads, 11s. per joint and 11d. per lin. in.; 500 lin. in. of railhead surfaces, 1s. per in.; Ferguson, Pailin, Ltd., supply and erection of two h.t. metal-clad switch units at Waterloo sub-station, £741.

MANCHESTER CORPORATION.—Etchells, Congdon and Muir, Ltd., supply of electric goods lift; Rail Welding Co., Ltd., Delmez rail grinder; Metropolitan-Vickers Electrical Co., Ltd., traction motors, automatic circuit breakers and lightning arresters; British Thomson-Houston Co., Ltd., controllers; Rheostatic Co., Ltd., resistances; English Electric Co., Ltd., magnetic sanders. Maitland and Co. (Manchester), Ltd., electric light installations at Chorlton baths and at Newton Street police station. R. Seddon and Sons, electrical installation at Mobberley open-air school.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—British Electric Transformer Co., Ltd., supply of (*a*) four 1 000 kVA transformers, £1 590, and (*c*) one 50 kVA transformer, £204 15s.; Hackbridge Electric Transformer Co., Ltd., supply of (*b*) two 500 kVA transformers, £456. (All recommended.) British Electric Transformer Co., Ltd., tendered for (*b*) at £534, and the Hackbridge Co. for (*a*) at £1 380 or £1 640. Also tendered: Foster Engineering Co., Ltd., (*a*) £1 524, (*b*) £480, (*c*) £243; Ferranti, Ltd., (*a*) £1 770, (*b*) £504, (*c*) £183; Yorkshire Electric Co., Ltd., (*a*) £1 276, (*b*) £472; Bruce Peebles and Co., Ltd., (*a*) £1 396, (*b*) £460.

Work and Materials for London Councils.

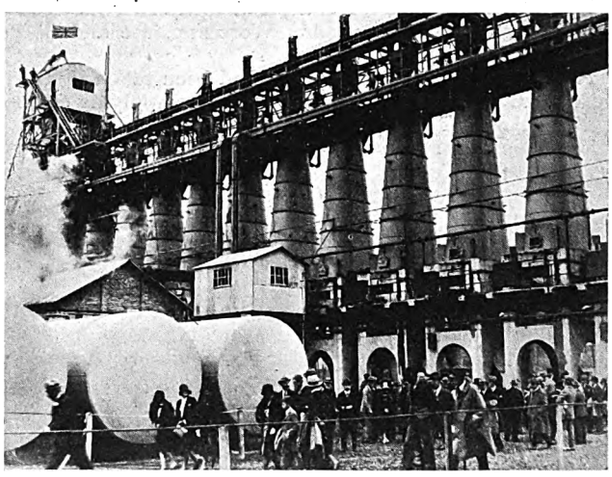
BATTERSEA (LONDON) BOROUGH COUNCIL.—Babcock and Wilcox, Ltd., pipework for boilers at power station, £1 495; Callender's Cable and Construction Co., Ltd., supply of three feeder pillars, £290 2s. 6d.; General Electric Co., Ltd., l.t. switchgear, for Lavender Hill sub-station, £322; Bertram Thomas, l.t. panel for sub-station at Albert Bridge flour mills, £95; Ferguson, Pailin, Ltd., kiosk, with transformer and switchgear, for Battersea Park area, £336 18s.; A. Reyrolle and Co., Ltd., h.t. switchgear, £408 1s.; and General Electric Co., Ltd., l.t. switchgear, £244, for Chatham House sub-station; British Electric Transformer Co., Ltd., supply of 500 kVA transformer for Chatham House sub-station, £297. (All recommended.)

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Revo Electric Co., Ltd., supply of electric irons, 8s. 3d. each; City Electrical Co., wiring flats at Drummond Crescent, £245; F. and E. Pickering, wiring flats at Thanet House, etc., £652; E. S. Russell and Co., wiring flats at Hastings House, £227 14s. 6d.; Hackbridge Cable Co., Ltd., supply of l.t. cable, £4 359; W. H. Allen, Sons and Co., Ltd., supply of electrically-driven condensing water pump, £2 050; Metropolitan-Vickers Electrical Co., Ltd., supply of 1 000 kW motor-convertor, for Grafton Road sub-station, £2 740 2s.; Babcock and Wilcox, Ltd., carrying out scheme to prevent emission of grit and dust from power station, £3 250 (estimated); General Electric Co., Ltd., supply of electric kettles, 19s. 10d. each. (All recommended.)

COAL DISTILLATION.

Electrical Equipment of the Bussey Coal Distillation Plant.

THE Bussey coal distillation plant at Glenboig—the largest installation of its kind in the world—was opened on July 19th by Viscount Elmley, M.P. This plant consists of fourteen retorts capable of dealing with a total of 700 tons of coal per day, which is converted into about 450 tons of semi-coke residue, 20 000 gallons of oil and 20 million cubic feet of gas. The retorts are fed and operated by Parkinson "Klosd" motors which are automatically controlled, as to speed, by heat variation in the process. Conditions for electrical plant are particularly severe, since the motors are mounted at the base of the retorts and are exposed to the heat of the retort on one side and open to the weather on



A general view of the retorts at Bussey.

the other. The motors drive through reduction gearing, and the control panels are let into the railings of the operating gallery.

Current supplying the motors is obtained from a 250 kW "Crompton Parkinson" reversible frequency changer, which is provided with a rocking stator, enabling it to synchronise with oil engine driven alternators. The frequency changer runs from the 25 cycle system of the Clyde Valley Electrical Power Company; when the 50-cycle oil engine driven alternators are generating, the frequency changer, operating in reverse, supplies 25 cycle current to adjacent firebrick works.

The main switchboard and distribution switchgear, motor generator sets for laboratory use, and motors for water and oil-pumping duties are also of Crompton Parkinson make.

On the occasion of the opening ceremony Viscount Elmley closed a pilot switch which started up the frequency changer, followed by the motors driving the retorts.

EXPORT PACKING OF ELECTRIC COOKERS.

In contrast with the photographs of American methods of packing electric cookers, published in our last issue, we now publish photographs of English methods of packing for export, which show that America has not the monopoly of ingenuity and thought in this direction. The method of packing a single cooker illustrated on another page is similar to the American method, except that the cooker is not bolted to the base board, but is secured by close fitting battens, and the legs, etc., are securely packed inside the hot chamber of the oven, instead of being fastened to the case. When we come to the method of packing two cookers in one case, we see that the problem of packing has not been left until after manufacture, but has been thought out in the early stage of the actual designing of the cooker, the oven and the hob having been so designed that two cookers nest into one another, and less space is occupied by a case containing two cookers than by two cases each containing a single cooker.

(See p. 111.)

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ELECTRICITY SUPPLY.

Proposed Supply for Oakham Rural District—The Hereford Undertaking—Supply in the Isle of Man—Sidmouth Undertaking—Supply for the Becontree Estate—Extension of Mains at Swansea—Newport and the West Midlands Joint Authority.

WEST Bromwich T.C. has applied for a loan of £30 000 for mains.

Bedford Electricity Committee has authorised mains extensions at a cost of £1 650.

Lowestoft Corporation has voted £2 500 for providing for the electric lighting of Normanston Drive.

Canterbury Corporation has applied for a loan of £5 000 for a new feeder cable and other mains extensions.

Swansea Electricity Committee seeks sanction to borrow £150 000 for mains and services and £10 000 for meters.

Mr. R. Borlase Matthews is seeking powers to supply electricity in an area which will include Oakham rural district.

Barnsley Electricity Committee has obtained sanction to borrow £6 693 for mains, services, and sub-station equipment.

Chichester Corporation has applied for a loan of £8 000 for past and prospective expenditure on unspecified distribution works.

Hereford City Council has decided to transfer its electricity undertaking to the Shropshire, Worcestershire and Staffordshire Electric Power Co.

It is announced that final steps had been taken by Stirlingshire Central District Committee towards supplying electricity to the villages of Fallin, Plean, and Cowie.

The Electricity Commissioners have sanctioned the borrowing by Croydon Corporation of £37 846 for mains, transformers, switchgear, generating plant, and sub-station buildings.

Aylesbury T.C. has received sanction to a loan of £3 000 for meters, and has applied for a loan of £1 787 for supplying the Manor House, Bradenham, for which a Fringe Order is being sought.

Barking U.D.C. is to lay a service to each block of the London County Council's houses on the Barking section of the Becontree estate free of cost to the L.C.C. and to supply current at ordinary rates. The cost of wiring the houses is estimated at £12 300.

An application to the Commissioners is to be made by Uckfield R.D.C. for the revocation of the powers of the Uckfield Gas and Electricity Co. for the supply of electricity to Buxted and Hadlow Down, and for the transfer of the powers to the Weald Electricity Co.

Hastings Electricity Committee has obtained sanction to borrow £1 552 for the purchase of Messrs. Jenner and Simpson's electricity undertaking at Battle.—The Committee is seeking sanction to borrow £15 000 for mains and £10 000 for house wiring installations.

Stoke Newington (London) Electricity Committee recommends that meter rents and the charge for fuse calls be abolished except in cases of negligence or misuse of supply, and that scale E for power supply be reduced to 1½d. per kWh for the first 10 000 and 1d. for all beyond that consumption.

Godalming T.C. has arranged with the Urban Electric Supply Co. to supply the new Council houses at Binscombe Lane. Tenants will each pay a minimum of £3 per annum for 120 kWh, 3d. per kWh for the next 120, and 1½d. per kWh beyond. The company will carry out the installations free of initial cost.

Whitehaven Corporation is to carry out a scheme for the installation of electric light on the hire purchase system upon payment of a deposit of 20 % of the capital cost, and a flat rate charge 2d. per kWh free of meter rent, until a maximum consumption has been registered of 150 kWh for each £1 of the capital cost.

Leyton T.C. has received sanction to a loan of £24 590 for work in connection with the change-over from d.c. to a.c. A loan of £3 000 for the provision and equipment of a sub-station at Whipps Cross Hospital, and the laying of a new main from the Leyton Green sub-station to the new one, has been applied for.

Stockton-on-Tees T.C. has applied for loans of £8 550 in connection with supply for the housing scheme of Synthetic Ammonia and Nitrates, Ltd., £10 000 for mains and services, and £1 000 for assisted wiring. Arrangements have been made to give a temporary supply to the North Shore Shipyard to be opened by Smith's Dock Co.

Sidmouth U.D.C. has decided to sell its electricity undertaking to the Whitehall Securities Corporation, Ltd., for £35 000. It is stated that there will be a profit of nearly £18 000 on the deal. The purchasers have agreed to a maximum price of 9d. per kWh, whereas the Council was charging 11d. The Council is to get its current at 2½d. per kWh.

Newport (Salop) R.D.C. has been informed by the West Midland Joint Authority that that body has undertaken to give a supply to Wellington on December 1st, and that it is intended to have a supply available for Newport by February 1st. The prices will be 4½d. per kWh for lighting, and 1½d. for industrial purposes, with a fluctuation of ¼d. either way, according to the result of the canvass in regard to the demand.

Bradford Markets Committee has voted £520 for electric lighting improvements at Kirkgate market, and has instructed the City Electrical Engineer to obtain tenders. The Electricity Commissioners have issued sanction to borrow £50 000 on account, in connection with the reorganisation of the e.h.t. switchgear at the Valley Road power station, and the Central Electricity Board has suggested certain modifications in the scheme to make provision for the connecting of the grid to the Valley Road station.

The Law and Parliamentary Committee of Westminster City Council recommends that the Chelsea and Kensington Councils be invited to join in the promotion of a Bill in Parliament to revoke the consent given by the Electricity Commissioners to the erection of the London Power Co.'s Battersea station, and to prevent the Electricity Commissioners giving consent to the erection of any further super-electricity stations or the extension on a large scale of existing generating stations within the county of London.

Birkenhead Electricity Committee has agreed to accept Wallasey's offer to reduce the kW charge for the supply in bulk to Birkenhead from 18s. 9d. to 17s. per quarter. It will result in a saving to Birkenhead of about £2 000 a year.—Birkenhead Electricity Committee has received sanction to borrow £1 754 for h.t. main extensions to Leighton Hall Estate kiosk and the Pensby kiosk.—The Committee has adopted the Electrical Engineer's scheme for electrical installations to be paid for through automatic meters.

Stoke Newington (London) B.C. considered last week Mr. A. M. Sillar's report on the best means of meeting in future the rapid increase in the demand for electricity in the borough. Mr. Sillar suggested that the d.c. supply be augmented by the provision of two new sub-stations equipped with modern converting apparatus, that one of these sub-stations (in the Southern portion of the borough be supplied by the Edwards Lane station through a 10 000 V ring main and the other in the northern part of the district) through a single 10 000 V main, and the provision of new distribution cables from the sub-stations was also proposed. The Council adopted the scheme in principle, and decided to apply for sanction to a loan of £30 000.

Battersea (London) Electricity Committee has now confirmed the provisional arrangements made with the Central Electricity Board as to the site for the transforming station at the generating station. The switch house will be constructed by the Council, and it is proposed to make it sufficiently large for the Council's future plant as well as that of the Board.—The Committee has decided to arrange for supply in the Portslade Road district, at a cost of £6 162, and has granted an application from the Foundation Co., Ltd., for a supply of electricity in connection with its contract work at the London Power Co.'s generating station at Nine Elms. The cost of the necessary e.h.t. mains, switchgear, and transformer will be £1 658.

The Electricity Committee appointed by the Governor of the Isle of Man to consider the question of a supply of electricity to parts of the island not already served has issued its report. The Committee finds that it is economically possible to supply the areas in question at an average price of 4·2d. per kWh, dropping to 3·5d. as the consumption gradually increases. The alternative methods of supply are to obtain electricity in bulk from Douglas Corporation, or to set up an all-island hydro-electric station. The only suitable source for hydro-electric power is the water power in Sulby Glen, and to set up this would mean an annual cost of £10 000. It is recommended that a supply be obtained at the outset from Douglas Corporation. It is recommended that a concession be granted to the Electric Development Trust for a term of years—50 years is suggested.

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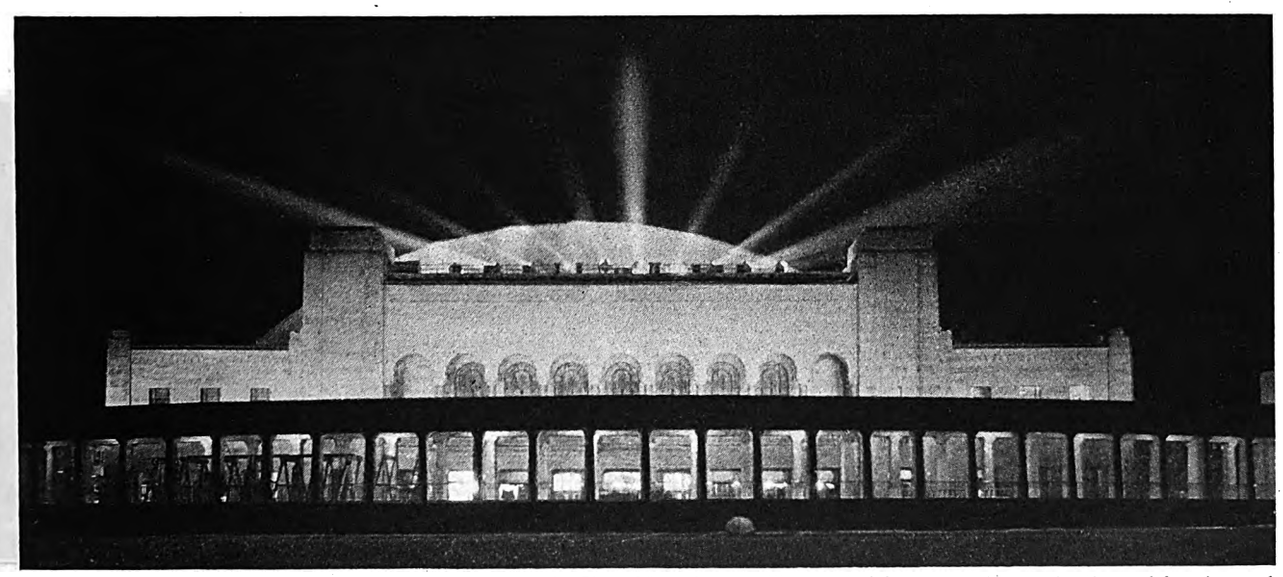
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

The London Technical Group of the Electrical Power Engineers' Association paid a visit to the works of the Hackbridge Electric Construction Co., Ltd., and the Hewittic Electric Co., Ltd., at Hersham, Walton-on-Thames, on July 6th. Details of the proceedings and a list of the more important plant inspected are given on page 115.

Under special arrangements introduced by the Post Office for the extension of telephone facilities in rural areas, there has been opened at Longhoughton, Northumberland, the first rural automatic exchange in N.E. England.

At a new estate off Selsdon Road, South Croydon, all-electric houses are being erected, and sell immediately. Such houses are easily recognisable, because the roofs are devoid of chimneys.



The new Auditorium and Convention Hall at Atlantic City, New Jersey, illuminated in connection with the celebrations of "Light's Golden Jubilee." The hall is claimed to be the largest in the world, and has seating accommodation for 41 000 persons. The Festival of Light came into being when Preston S. Arkwright, President of the N.E.L.A., pressed a button in the auditorium, which brought into operation a searchlight on the roof. Upon the release of this signal, the pilot of an aeroplane, hovering overhead, released a wind-driven siren, the note of which was picked up electrically and then actuated the floodlight control of the building.

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COMPANY NEWS.

Fa llof Cables and Wireless Stock Prices—W. T. Henley's Telegraph Works Co.'s Fiftieth General Meeting—Western Union Telegraph Co.'s Increased Revenue—Metropole Gramophone Co.'s Change of Name—Reports and Dividends.

CABLES and Wireless descriptions, the quotations for which a week ago appeared to have settled down at round about 90, have been sold during the first week, the "B" ordinary dropping to 80 and the "A" ordinary to 84½. In the electrical manufacturing department, British Insulated Cables ordinary, at 75s., are 2s. 6d. down, Electrical Constructions have fallen from 16s. 3d. to 15s., and Ever-Readies from 19s. 6d. to 18s. General Electrics and Siemens shares are also a little lower. Yorkshire Electric Power ordinary shares have improved 6d.; County of London are 2s. down.

Last Annl. Divd.	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
%	**Electricity Supply.**				
(d)	Brompton & Kensington Ord. ..	26/–	26/–	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6•	26/6	51/–	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	26/–	26/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	,, ,, ,, ,, 6% C.P.	23/–	23/–	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	54/–	56/–	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	23/–	23/–	24/–	21/3
(e)	Kensington & K'bridge Ord. (£1)	20/–*	26/–	27/6	23/9
1/9⅜	Lon. Elec. Sup. Ord. (£1).. ..	28/6	28/6	37/6	23/–
1/9⅜	Metro. Elec. Sup. Ord.	45/7½	46/3	53/–	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/0
1/2½	N'castle-upon-Tyne Elec. Sup.Ord.	26/10½	20/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P.	23/–	23/–	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(c)	St. James & P.M. Ord. (£1) ..	27/6	27/6	28/6	23/6
6	Shrops.Worcs.& Staffs.Power Pref.	22/6	22/6	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	26/–	26/–	52/9	24/–
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	17/10½	10/7½
8	Yorks. Elec. Power Ord.	37/–	36/6	38/9	24/6
6	,, ,, ,, 6% C.P. ..	24/–	24/–	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	128½	128½	152	117
7·67	,, ,, ,, 6% Pf. Stk.	126½	126½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4	,, ,, ,, 4% Deb. ..	77	78	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	76½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	73½	75½	42½
4	,, ,, ,, ,, 4% pf. Stk.	73	73	77	68
4	,, ,, ,, ,, 4% Deb. ..	77*	78	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	59	59	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	71	71	73½	02
5	,, ,, ,, 5% Deb. ..	07½	67½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	58	58½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	03	03	67	00½
3½	,, ,, ,, 3½% Deb. ..	00	00	73½	67½
5	Met. Dis. Rly. Ord. Stk.	74½	75	77½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	81½	81½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	08	08	70	04½
7	Underground Electric Rlys. Ord.	22/6	22/6	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	10/–	3/–
4½	,, ,, ,, 1st Deb. ..	57	57	78	00
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	13/9	13/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/–	77/6	80/3	50/–
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	23/–	23/–	24/9	19/7
7	,, ,, ,, 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	134	134	153½	120
15	Callender's Cable Ord.	75/–	75/–	91/3	66/–
6½	,, ,, 6½% C.P. ..	25/–	25/–	25/9	22/–
7½	,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	,, ,, 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	25/7½	25/7½	13/–	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/–	10/3	32/6	23/6
7	,, ,, 7% C.P. ..	21/3	21/3	22/9	21/–
—	English Elec. Ord.	6/3	6/3	15/9	5/–
—	,, ,, 6% C.P.	7/0	7/0	16/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/–	19/0	92/3	18/1
6	Ferranti 6% Pref.	18/–	10/–	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord...	52/0	43/9	40/0	20/0
25	W. T. Henley's Ord.	130/–	130/–	120/–	69/3
10	Johnson & Phillips Ord.	30/3	30/3	67/11	34/–
7½	Lon. Elec. Wire. & Smith's Pref.	43/9	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	20/10½	27/0	30/0	24/9
10	Telegraph Const. Ord. (£12) ..	23½	23½	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	60½	60½	63½	56½
—	Cables and Wireless "A" Ord.	84½	87	—	—
—	,, ,, ,, "B" Ord. ..	80	94	—	—
3½	Eastern 3½% Pref. Stk.	62½	62½	70½	59
4	,, 4% Deb.	78½	78½	81½	74
4	Eastern Extension 4% Deb. Stk.	78½	79½	80	74½
22	Gt. Northern Telegraph (£10) ..	31	30½	43½	20
10	Indo-European (£25)	49½	49½	40½	30
15	Marconi's Int. Mar.	00/–	00/–	90/–	16/6
4	Western Tel. 4% Deb. Stk. ..	77½	77½	82	70

(a) 19.8d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share.
(d) 1s. 8.706d. per share. (e) 1s. 7·181d. per share. * Ex. Dividend.

SCOTTISH POWER CO., LTD.—Subscriptions were invited last week for an issue of 1 000 000 £1 ord. shs. at 25s. p. sh.

CHELSEA ELECTRICITY SUPPLY CO., LTD.—Intm. div. of 10 d. p. sh., less tax, on ord. shs. will be payable on Sept. 10.

SMITHFIELD MARKETS ELECTRIC SUPPLY CO., LTD.—Intm. div. of 3%, less tax, on ord. shs. will be payable on Aug. 13.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Intm. div. of 3%, less tax, on ord. shs. will be payable on Sept. 16.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO., LTD.—Intm. div. of 6%, less tax, on ord. shs. will be payable on Aug. 15.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. of 3%, less tax, on ord. shs. will be payable on Sept. 16.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Intm. div. of 3%, less tax, on ord. shs. will be payable on Aug. 31.

RICHMOND (SURREY) ELECTRIC LIGHT AND POWER CO., LTD.—Intm. div. of 4%, less tax, on ord. shs. will be payable on Aug. 15.

BROMPTON AND KENSINGTON ELECTRICITY SUPPLY CO., LTD.—Intm. div. of £4 3s. 4d.% (10d. p. sh.), less tax, has been declared.

HYDRO-ELECTRIC SECURITIES CORPORATION.—Semi-annual div. at rate of 5% p.a. on 5% class "B" participatg. pfd. stk. will be payable on Aug. 1st.

HERBERT MORRIS, LTD.—Full div. for half-year to July 31, 1929, on the 6% (less tax) and the 5% (tax free up to 6s.) cum. pref. shs. have been declared.

MATHER AND PLATT, LTD.—Div. at rate of 5% p.a. on pref. shs. for half year ended June 30 last, and intm. div. on ord. shs. of 5% actual, tax free, for same period are announced.

CABLE, TELEPHONE AND GENERAL TRUST.—Divs. on 6% cum. pref. shs. for six months ended June 30 and 3½% on "A" 7% non. cum. pref. shs. for same period will be payable on Aug. 1.

LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Intm. divs. at rate of 6% p.a. (3s. p. sh.), less tax, on the 6% £5 pref. shs. and at rate of 8% p.a. (9·6d. p. sh.), less tax, on £1 ord. shs. for six months ended June 30, 1929, will be payable on Sept. 2.

WESTERN UNION TELEGRAPH CO.—Gross revs. for six months ended June 30, 1929, were $72 610 036, agst. $67 276 475 for correspondg. six months of 1928; total exes. were $63 296 470, agst. $58 169 072; int. on bonded debt required $1 805 033, agst. $1 802 245; net income was $7 508 533, agst. $7 305 158.

OFFICIAL QUOTATIONS.—Stock Exchange Committee has granted official quotations to 26 950 £1, fully paid, ord. shs. of the Anglo-Portuguese Telephone Co., Ltd.; £3 000 000 4% stk. and partly paid scrip of the Central Electricity Board; 13 035 £1, fully paid, ord. shs. of the Underground Electric Railways Co., of London, Ltd.

BRAZILIAN TRACTION LIGHT AND POWER CO., LTD.—Gross earngs. from operatn. of the tramway, electricity supply and other services operated by subsidiary cos. for June, 1929, amtd. to $4 210 893, increase $579 564. Aggregate gross earngs. from Jan. 1, $24 037 025, increase $3 498 065; and net earngs. $13 760 385, increase $1 864 446.

WEST GLOUCESTERSHIRE POWER CO.—This co. invited subscriptions last week by holders of the 6½% participatg. pref. stk. for an additional £85 000 6½% participatg. pref. shs. of £1 each at par, which are to be converted into stk. The British Empire Trust undertook to subscribe any portion of the new shs. which might not have been subscribed by to-day, July 26th.

KIDDERMINSTER AND DISTRICT ELECTRIC LIGHTING AND TRACTION CO., LTD.—Net receipts and other rev. for 1928 amtd. to £9 769, agst. £9 994, plus £505 brt. in. After provisn. for administratn. and gen. exes. and int. on temporary loans, blce. is £7 376. To depreciatn. and res. £2 080, div. on 5% pref. shs. for year, £2 500; div. on ord. shs. of 5% for year, £2 350; fwd. £446.

AMERICAN TELEPHONE AND TELEGRAPH CO.—Divs. received by co. during six months ended June 30 last amtd. to $66 341 283, compared with $57 551 183 for first half of 1928. Telephone operating revenue was $54 847 044, agst.

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$48 495 536, total rev. $130 899 849, compared with $112 686 085. Net earngs. increased from $79 555 980 to $92 149 775, available total, after allowing for int., being $80 202 095, compared with $68 671 768.

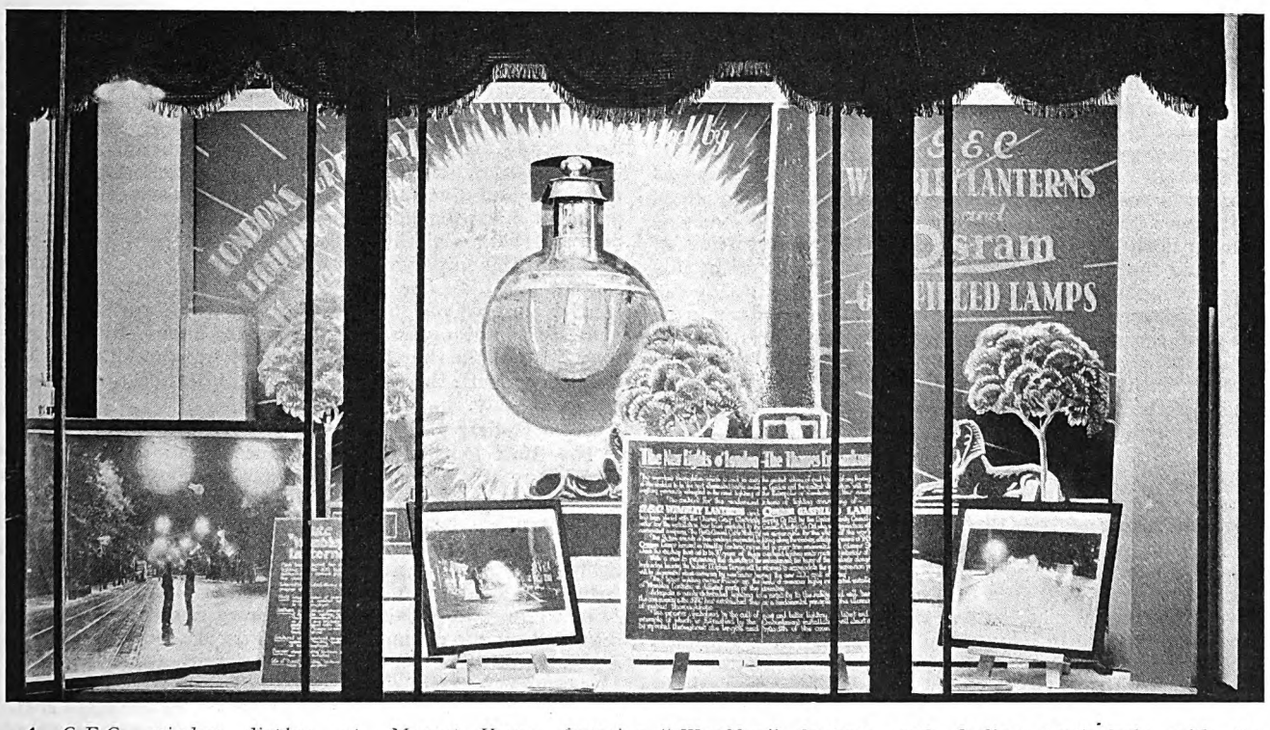
City of San Paulo Improvements and Freehold Land Co.—Rpt. for year ended Feb. 28, 1929, states that a contract has been entered into between the State of San Paulo and the San Paulo Tramway Light and Power Co. for a large extsn. of the hydro-electric scheme of the latter co., the carrying out of which will entail the canalisatn. of the River Pinheiros and the drainage of the large area of the low-lying lands belonging to the co. This should enhance the value of these lands.

Anglo-Argentine Tramways Co., Ltd.—Gross receipts in 1928, £4 719 180, agst. £4 658 617; exes, £3 693 048, agst. £3 646 977. Passengers carried, 570 079 027, agst. 560 747 554. Deductg. exes. from receipts left surplus is £1 026 132, agst. £1 011 640, and, after deductg. deb. service and other requirements and addg. amt. £61 216 brt. fwd., there was a blce. of £444 928. After allowg. for 1928 divs. on two classes of pref. shs., there remains £85 928, which it is proposed to carry fwd. Working exes. were 73·50% on receipts, agst. 74·57. Renewals expndtre. was £279 742, agst. £335 473. To renewals res. £372 416, agst. £368 666. Rpt. again refers to competitn. in Buenos Aires by motor omnibuses. Co.'s own 'bus services have run at a loss, but provided a valuable auxiliary to other services. Co.'s *ad referendum* agreemt. on subject of tariffs has not yet received necessary ratificatn. of Municipal Council. Pressure of the general traffic situatn. and consequent need of underground line extensns. render this step one of ever-increasing urgency, and it is hoped that it will be dealt with definitely at an early sessn. of the council.

Company Meetings.

Oswestry Electric Lighting and Power Co., Ltd.—At the annual general meeting, on July 16th, the report and accounts were adopted and the dividend of 10% was approved. The report stated that Oswestry Borough Council had given notice to exercise its option to purchase the company's undertaking when its period of tenure expires. Income for 1928 was £10 141, and after provision for all charges, including depreciation, the balance was £1 145, plus £743 brought in. The dividend absorbed £640, leaving available balance, £1 248. The electricity generated and purchased was 598 659 kWh, increase 112 947, and total connections increased from 519 to 774 kW.

Metropole Industries.—At the first annual general meeting of the Metropole Gramophone Co., Ltd., on Monday, the Marquis of Winchester (chairman) said the ordinary general meeting would be followed by an extraordinary meeting, the object of which was to change the name of the company to bring it more in conformity with their present activities. Their cash position, amounting to £164 762, was a strong one. Investments in subsidiary and other controlled companies, at cost, amounted to £86 238. They had written down patents and trade marks to a nominal figure of £1, and had written off preliminary, underwriting and issue expenses, expenditure on advertising, loss on trading, etc., amounting to £94 146. At the statutory meeting of Everlite, Ltd., he had predicted that that company would produce Everlite lamps by the end of April. They did produce several thousand lamps in that month. These were made of metal, and, after careful consideration, the directors decided to defer marketing this lamp, which was not considered the best that the company could produce, until such time as they were able to make it of Metduro instead of metal. The company had now produced standard cycle lamps made in Metduro, and the directors were satisfied that they could offer these to the public as a cheap and reliable lamp. The lamps would shortly be available at the showrooms of the company, which were being got ready at Metropole House. The Metduro Co. acquired in March last a freehold property at Waltham Abbey consisting of 24½ acres of land, together with substantial and well laid out factories and buildings, covering about eight acres of ground. It had been found possible to let off a portion to the Everlite Co. and to the Metropole Gramophone Co. The remaining buildings were available for the Metduro Co. In handling new commercial discoveries or inventions the first question to be decided as a policy was what line one's first production should take. In the case of Metduro they were laying themselves out to supply: —(*a*) the Everlite lamp container, and (*b*) electrical requirements such as tubes, rods and sheets for switchboard purposes. The material had been tested by the two leading testing institutions—the National Physical Laboratory and Faraday House. Their reports showed that Metduro was suitable for all grades of insulating material. The company is making satisfactory progress towards the attainment of commercial production. At a subsequent extraordinary general meeting it was resolved: "That the name of the company be changed to Metropole Industries, Ltd."



A G.E.C. window display at Magnet House, featuring "Wembley" lanterns, and dealing particularly with the recent opening of a section of the new Thames Embankment lighting by means of these lanterns. The display, featuring a 1 500 W lantern illuminated throughout the day and night, has created a tremendous amount of interest, and crowds have congregated around these lighting details of the new scheme. The setting was accompanied by some actual enlargements of night photographs secured on the Embankment recently by means of the new system of lighting.

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W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.

Record Results of Fiftieth Year's Work—Satisfactory Operation of Arrangement with Other Companies—Bonus for Hourly-Paid Workers.

THE 50th ordinary general meeting of W. T. Henley's Telegraph Works Co., Ltd., was held at the Abercorn Rooms, Great Eastern Hotel, London, E.C.2, on Friday, July 12th.

SIR GEORGE SUTTON, Bart. (Chairman), said: Ladies and Gentlemen, the report is in your hands, and I assume that you will take it as read. I am not going to detain you very long this morning, because I recognise that the temperature is not equable and I do not think that there is anything in connection with this company that will be objectionable to anybody. The accounts presented to you as has been the custom at the annual meetings of shareholders for the last few years show the comparison with the previous year's figures, so it is not necessary for me to refer to very many of the items.

Now coming to the profit and loss account, the figures do not differ very greatly from last year's. As to depreciation, the important item of machinery is £47 800 and in addition to that the business has spent £34 500 for maintenance of plant and maintenance of the property generally, which is not shown separately in the accounts although naturally included in the general accounts. The amount written off for depreciation and maintenance comes to the large sum of £82 000.

Increased Carry Forward.

I think the shareholders must be satisfied with the board's stewardship in their interests, and if you adopt the recommendations they make to you this morning there will be a balance carried forward to the unknown future of £545 000. That is rather larger than the balance brought in. I think the balance brought in was £532 930. Now no doubt the shareholders will, as usual, wish to know how this prosperous state of affairs has arisen? It is really a matter of secondary importance to the shareholders. Of first importance is the amount of dividend they are going to get. Of course, that is made up by the prosperity of the company and I will briefly deal with the main causes for this very fine account which you have before you. I suppose we must, in the first place, put the goodwill of the company, the goodwill which has been made by many, many years of hard work and good service. And then, in the next place, I should place the organisation We have a very wonderful organisation in this business. That has been built up during half a century. You cannot build an organisation—a good, a nearly perfect organisation—in half a dozen years and this has been built up in 50 years with a growing business all the time. That organisation enables your staff to follow the course of the manufacture and the sales, and to direct the business in those channels which is to be preferred. The industry is a very live one and the turnover during the past year has been a record. I do not like the word record, but I do not know a better one to use. We have so many records now. It is the largest business that this company has ever done in its turnover. The home and overseas trade have both contributed to it; it will be interesting to you to know that—the overseas trade to which we all in this country are looking so much to restore the industries of the country, the overseas trade of Henley's represents about 40% of the total turnover of the business.

Two years ago I reported to you that we had entered into agreements with two or three other cable manufacturers—working agreements in regard to manufacture, research and so on. Last year I said nothing at all about these agreements; I felt that sufficient time had not elapsed to enable us to form an opinion as to how they would work. Now we have had two years' experience, and I think it is due to you to know something of how that arrangement has turned out in the interests of this company and in the interests of our British cable industry. The difficulties have been very great; I do not want to conceal that. It has been to me personally a time of very great anxiety—these two years—as to how these agreements would work. And even now modifications in the agreements may have to be made. But although we have not absolutely got into smooth seas the benefits already realised have been considerable. These allied undertakings were very individualistic in the control of their affairs; they always have been. To get the best out of an alliance we had to get a perfectly free interchange of methods of manufacture and organisation and the directions in which research was being made and the results of research. There had to be an endeavour to take the same interest in their line of business and they in ours as we took in our own. It has not been very easy to attain that atmosphere. The progress has perhaps been slow, but I assure you that it has been very sure. And there have been other firms who, knowing what we have been doing, have sought to join the alliance, and indeed one or two have already come in and negotiations are even now going on with certain other firms. Besides our endeavour to improve the methods of distribution of electricity—by that I mean, of course, our own cable business, the designing of electric cables and accessories to give increased efficiency—success has been achieved in the lowering of the cost of production. I want the shareholders to be under no misapprehension as to what that means to them. It does not mean that the lower cost of production is directly an increase of the balance on the profit and loss account available for dividends. The lower costs obtained by Rationalisation, which is the name applied to this sort of agreement, mean lower prices to meet competition both at home and abroad. They have a two-fold effect. They lower prices to the user or consumer, and so possibly they add to the demand. We know that the cheaper the articles are, no matter what the business, the demand increases. An increased demand also, of course, should bring increased business to the allies. It is this increased business by meeting competition and increasing demand that will bring more business to the allies and so add to the amount available for dividends shown by the profit and loss accounts. I do not want Henley's to be satisfied at the expense of competitors. We want to satisfy them as well as ourselves and I think we have a scheme that will do it.

I want to say a word with regard to the bonus which is referred to in the report. A resolution will be moved presently in regard to that bonus which the report states is to be paid to the hourly-paid workers. The report also states that other members of the staff are provided for by the prosperity of the company through the bonuses which are granted annually. The hourly-paid workpeople in the shops have not been provided for in the form of a bonus. It is rather difficult. We cannot put them on a profit-sharing scheme—such a scheme as we have for the permanent staff. You have a floating body, also, of workpeople; although the prosperity of this company has been so long and great that we have a very large permanent staff of hourly-paid workers. A large number of our people do not know what unemployment means. We have two or three funds which operate for their benefit. We have pension funds of a kind—not a trustee fund. We have benefit funds, benevolent funds and so on; and you may be assured from me that there is no case of hardship of any one of our workpeople, and no case of old age or retirement goes unheeded by the board of directors. The bonus will consist of two weeks' pay, based on a normal week of 47 hours, excluding any extra payment made for night work or overtime. It will be paid to men and women alike and to every hourly paid worker who is to-day in the employment of the company, and who has been for not less than one year ended 31st March this year—that is, the close of our financial period. The authority of this meeting is not necessary to pay this bonus, but the board thought that the shareholders themselves would like to identify themselves with the gift, and so the resolution appears on the agenda to-day.

Staff Pension and Insurance Fund.

The Staff Pension and Insurance Fund amounts to the large sum of £290 000, the greater part of which has been contributed by this company; and the expenditure on funds for employees last year—that is, the year under review—amounted to £58 000, of which £11 000 was national and compulsory, and £47 000 was voluntary on the part of you ladies and gentlemen.

The report and balance sheet were adopted and the final dividend on the ordinary shares of 2s. 6d. per share, less tax, and a bonus of 2s. per share, less tax, were approved.

Resolutions "*that unless and until otherwise determined by the company in general meeting, each of the directors shall, as from the 1st April, 1928, be entitled to additional remuneration at the rate of £500 per annum,*" and "*that this meeting of the shareholders of W. T. Henley's Telegraph Works Co., Ltd., cordially approves of the action of the board in marking the fiftieth anniversary of the company by granting a bonus to hourly-paid workers*" were also carried.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BATES, T. H., Radio Supply Stores, Linton, wireless agent. £32 8s. June 12th.

COLES, A. J. (Mr.), 2A, Pinner Road, Harrow, electrical engineer. £15 4s. 3d. May 10th.

COOKE, R. R. (Mr.), High Bank Cottage, Eagle Brow, Lymm, wireless agent. £11 7s. 2d. June 13th.

DAFT, Hugh E., Monument Street, Peterborough, wireless dealer. £20 18s. June 12th.

LUDWIN, B. A. (Mr.), 31, High Holborn, W.C., electrical apparatus dealer. £18 (February 13th) and £20 10s. (June 7th).

SENIOR, S. A. (Mr.), 961, Abbeydale Road, Sheffield, wireless dealer. £12 14s. 2d. June 7th.

SOPER, H. (Mr.), 85, Athlone Road, Tulse Hill, S.W., radio manufacturer. £18 7s. 4d. May 17th.

STEWART AND CO., 95, Sutton Street, Southend, electrical engineers. £31 6s. May 16th.

WEST LEIGH WIRELESS STORES, 1337, London Road, Leigh-on-Sea, wireless dealers. £10 12s. 9d. May 28th.

WILLIAMS (D. O.) AND CO., LTD., High Street, Clydach, wireless dealers. £12 18s. 10d. June 13th.

WIRELESS MAINTENANCE SERVICE, 17, The Promenade, Church End, Finchley, engineers. £15 7s. 8d. June 6th.

Bill of Sale.

THOMAS, William Henry, 111, Addison Road, Hove, electrical engineer. Dated July 16th, filed July 22nd. £100.

Deeds of Arrangement.

FLETCHER, John Hubert, and THURLEY, William Abraham, trading at 184, Stockport Road, Ardwick, and 56, Victoria Street, Littleborough, as FLETCHER AND THURLEY, electrical engineers. Dated July 16th, filed July 20th. Trustee, J. Park, 22, Bridge Street, Manchester, C.A. Liabilities unsecured, £1 349; assets, less secured claims, £232.

KEYWOOD, Gordon, late 584, Main Street, now 1, Greenhill Road, Carlton, electrical engineer. Liabilities unsecured, £408; assets, less secured claims, £110. Trustee, T. W. Pell, Bentinck Buildings, Wheeler Gate, Nottingham, C.A.

SEYMOUR, Charles, trading as WESTON ELECTRIC LAMP CO., 47, Victoria Street, S.W., and 15, Chicheley Street, S.E., electric lamp factor. Dated July 12th, filed July 18th. Trustees, W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., certified accountant, and another. Liabilities unsecured, £3 050; assets, less secured claims, £1 606.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

ATLAS LIGHT AND POWER CO., LTD. (late CORDOBA LIGHT POWER AND TRACTION CO., LTD.), London, E.C.—Registered July 5th, trust deed dated June 20th, 1929, securing £1 000 000 5% debenture stock, with liberty to issue further stock, the total amount not to exceed two-thirds of the nominal amount of capital for the time being issued, present issue £750 000; general charge. *£2 552 665. November 22, 1928.

HARMONY, LTD., London, W., manufacturers of wireless instruments.—Registered July 5th, £2 500 debenture, to Aeonic Radio, Ltd., 94, Regent Street, W.; general charge.

RUSKINGTON ELECTRIC SUPPLY CO., LTD.—Registered June 27th, £200 mortgage, to Matilda Green, Osbournby, spinster; charged on premises at Silver Street, Ruskington. *——. December 31, 1927.

SERCK (H. O.), LTD., Manchester, motor radiator manufacturers.—Registered June 26th, £4 000 debenture, to Serck Radiators, Ltd., Warwick Road, Greet, Birmingham; general charge.

Satisfactions.

COURTIN AND WALSH, LTD., London, E.C., manufacturers of electrical fittings.—Satisfaction registered July 5th, £960, part of amount registered October 10th, 1928.

FERRANTI, LTD., Hollinwood, electrical manufacturers.—Satisfactions registered July 4th, trust deed registered August 9th, 1905; supplemental deed registered March 10th, 1910; and supplemental deed registered November 26th, 1912, all securing debenture stock fully satisfied.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

DUFFNER, J. and W., 116, Charlton Street, Euston Road, London, N.W.1, electrical engineers, etc. A meeting of the creditors of the above was held recently when the debtor's solicitor reported that the liabilities were £1 294, of which £493 was due to the trade and £801 to the debtor's father for cash advanced. The assets consisted of stock at cost £600, and book debts £40, making a total of £640, or a deficiency of £654. It was stated that the debtor commenced trading on his own account in July 1926 with stock to the value of £50, which he had purchased with his savings. The business had never been a very profitable one and the debtor's father had assisted him from time to time by making advances and also by settling creditors' claims. The present position was attributed to the fact that there had been alterations in the neighbourhood which had been detrimental to the trade carried on. The turnover had been about £30 a week, but it had recently fallen to £10 weekly. It was believed that if the business was continued it could be carried on profitably. The debtor had drawn nothing from the business and had supported himself by doing outdoor work.

It was decided that a deed of assignment should be executed in favour of Mr. E. H. Hawkins, of Poppleton, Appleby and Hawkins, 4, Charterhouse Square, E.C., with a committee consisting of the representatives of the Electrical Importers' and Traders' Association, Blundell Spence and Co., Ltd., and Falk Stadelman and Co., Ltd.

HIGHTENSITE AND EBONITE MANUFACTURING CO., LTD., Normandy Works, Custom House, E.16, insulated material manufacturers. The statutory meeting of creditors in the voluntary winding up of this company was held on July 18th at 8, Frederick's Place, Old Jewry, E.C., when Mr. A. A. Lough, C.A., the liquidator of the company, presided. According to the statement of affairs the liquid assets included stocks as valued by the manager, £2 492; sundry debtors put down at £2 320, and cash in hand, £8, making total liquid assets of £4 820, from which had to be deducted preferential claims amounting to £816, leaving net liquid assets of £4 004. Against that amount, however, there were debentures and interest outstanding amounting to £16 782, which showed a deficit of liquid assets so far as the debenture holders were concerned of £12 778. The unsecured creditors' claims amounted to £2 112, and there was a bank overdraft of £1 388. The fixed assets including the land, buildings, plant and machinery, cost in 1923 the sum of £7 396. The present book value as valued in 1927 as a going concern was £21 606.

The liquidator explained that the company was incorporated in 1923 to take over the business of the Hightensite Co., Ltd., which was then in the hands of the receiver for the debenture holders. The present company was formed with a capital of £3 002 paid up in cash and £10 000 worth of debentures also subscribed in cash. The business was purchased for £10 000, of which approximately £7 400 was the price for the land, buildings, plant and machinery, and £2 600 for the stocks. During the first two or three years to September, 1925, the company was fairly successful and made profits. In 1926 there was a heavy loss. In May, 1927, it became necessary to find additional working capital. In January of this year third debentures were issued for the sum of £1 400, which made a total issue of debentures of £16 400. The receiver was carrying on the business, and he wished if possible to sell it as a going concern. There had been negotiations carried out for the purpose of disposing of the business, but nothing definite had been arrived at at the moment. The debenture holder was the chairman of the company. The liquidator said that if an offer was received for the business he would call a further meeting of the creditors to see whether the unsecured creditors approved of the offer, and likewise if it was decided to sell the business by auction the creditors would again be invited by the liquidator to attend a further meeting. It was decided to appoint an informal committee of inspection consisting of three of the creditors. The matter remains in the hands of Mr. Lough as liquidator.

The following are creditors:—Buck and Hickman, £70; Bubell Bros., £158; Ebonite Containers, £88; L. M. S. Railway, £50; Osborn and Sons, £280; Fickering, A. H., £120; Rubber Regenerating, Ltd., £230.

KAY (P.), LTD., wireless factors, lately 183, Old Street, London, E.C. The statutory meeting of the creditors of the above was held on July 22nd at the Cannon Street Hotel, London, E.C. The chair was occupied by Mr. Philip M. Mordant, of Philip Mordant, Jarvis and Co., C.A., 115-117, Cannon Street, E.C., who reported that, following the appointment of a receiver for the debenture holders, the company went into voluntary liquidation, and appointed him to act as liquidator in conjunction with Mr. W. A. J. Osborne, of Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C. The statement of affairs showed ranking liabilities of £4 481, of which £2 643 was due to the trade, and £1 838 to Mr. P. Kay and the members of his family in respect of cash advanced.

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The assets were estimated to realise £3 115, from which had to be deducted £83 for preferential claims and £2 150 in respect of debentures and interest. The net assets therefore were £882, or a deficiency of £3 599. The assets comprised stock, £2 000; book debts, £1 050; fixtures and fittings, £25; and cash at bank, £40.

The chairman reported that Mr. G. C. Jarvis was appointed as receiver on May 15th last by the Court. The debenture holders were Mr. and Mrs. Kay. They each held a debenture for £1 000. The receiver was also the manager, and he carried on the business for the purpose of liquidating the stock. By July 5th the receiver had collected sufficient to satisfy the claims of the debenture holders, and voluntary liquidation then took place. Mr. Osborne was appointed as representing the trade.

Mr. P. Houstoun, of Corfield and Cripwell, stated that the stock at cost or market value amounted to £2 781, whilst the gross value of the book debts was £1 625. The fixtures and fittings appeared in the books at £148. The company was registered in March, 1928, with a nominal capital of £5 000 in £1 shares, and Mr. Kay subscribed £1 000 for shares and also found a further £2 000 for which he was given debentures. At the date of the liquidation Mr. Kay and his family were cash creditors for sums aggregating £1 838. The company had carried on both a wholesale and retail business, with a gross profit of approximately 10 or 11 per cent. Since the commencement the turnover had been something like £23 000. The receiver had realised £2 821, and after satisfying the debentures, costs and trading payments, it was estimated that there would be £100 to £200 to come to the liquidators, and book debts of £300. In other words, the assets available for the creditors would probably be £400 to £500.

In answer to a question, it was stated that the assets had been disposed of in the ordinary way of trade, and had not been slaughtered. Mr. Kay stated that he was prepared to withdraw the cash claims totalling £1 838, and a resolution was passed confirming the voluntary liquidation of the company with the present liquidators, and a committee. The representative of one of the French creditors stated that he had instructions to present a petition if there was a dividend of less than 10s. in the £.

London Gazette, etc.

Company Winding-up Voluntarily.

DECORATIVE LIGHTING, LTD. By reason of its liabilities, July 12th. T. Taylor, 12, Wood Street, Cheapside, London, E.C., appointed as liquidator.

Bankruptcy Information.

BAINES, Gerald Talbot, 66, High Street, Gorleston, Suffolk, electrical engineer. First meeting, July 27th, 12 noon, Official Receiver's Office, 9, Queen Street Chambers, Norwich. Public examination, September 19th, 10.15 a.m., Town Hall, Great Yarmouth.

PENMAN, Alexander N., electrical engineer, 35, Ivanhoe Crescent, Wishaw, Lanarkshire. Hugh M. Mackie, C.A., 124, St. Vincent Street, Glasgow, has been elected Trustee. Examination of the bankrupt within the Sheriff Court House, County Buildings, Hamilton, Monday, July 29th, at 10.15 a.m. Creditors' meeting in the chambers of Mackie and Clark, C.A., 124, St. Vincent Street, Glasgow, on Friday, August 30th, at 12 noon.

READ, Roland Arthur, 9, The Pavement, Middle Lane, Crouch End, N.8, electrical engineer. Receiving order, July 16th. Debtor's petition. First meeting, July 29th, 11 a.m., and public examination, September 3rd, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

TEMPEST, Colonel, 4, Manns Court, Bradford, electrician. First meeting, July 26th, 11 a.m. Official Receiver's office, 12, Duke Street, Bradford. Public examination, September 17th, 10 a.m., County Court, Manor Row, Bradford.

Notices of Intended Dividends.

DAWSON, Joseph Edward, High Street, Boston, wireless engineer. Last day for receiving proofs, August 3rd. Trustee, C. G. Compton, 5, Church Close, Boston, Lincs.

MARSDEN, Charles Bertie, 60, Pisgah Street, Kenfig Hill, Glamorgan, electrical engineer. Last day for receiving proofs, August 3rd. Trustee, E. Owen, 34, Park Place, Cardiff, Official Receiver.

Order Made on Application for Discharge.

JOLIVARD, Kenneth Paul James, described in the Receiving Order as K. Jolivard and Co., 66, Victoria Street, London, S.W., electrical engineer. Discharge suspended for three weeks until July 12th.

Partnership Dissolved.

R. G. ACCUMULATOR COMPANY (Arnold Henry RILEY and Walter GLASCODINE), accumulator makers and repairers, 31, John Street, Bradford, by mutual consent, July 15th, 1929. Debts received and paid by A. H. Riley. W. Glascodine will continue the business.

Bankruptcy Proceedings.

EARLSDON RADIO SUPPLIES, LTD., 44, Albert Street, Newark-on-Trent. The first meeting of the creditors herein was held on July 20th at the Official Receiver's offices, 22, Regent Street, Park Row, Nottingham. According to the statement of affairs there were gross liabilities amounting to £1 252, against assets of £31, or a deficiency of £1 221. The company was registered on October 10th, 1928, with a capital of £500, divided into 500 shares of £1 each. Certain goods were obtained, and in December, 1928, a writ was issued against the company for £83 for goods supplied. A man who had been a solicitor was consulted and upon his advice the remaining goods were removed to the premises at Newark. All sums received from book debts and from the sale of further goods by the company were paid to him with the intention of effecting a voluntary liquidation. The company's books of account were also handed to him. Nothing further had been done towards effecting a voluntary liquidation. It was stated that £121 had been paid to the man and no account had been received from him. The affairs of the company remain in the hands of the Official Receiver.

HUNT, Sydney Everest, 8a, Torwood Street, Torquay, electrical engineer and contractor. At his public examination the Official Receiver stated that the debtor had committed himself to special charges for rent, rates, interest on loans and mortgages, and other charges, totalling from £9 to £10 per week. The gross charges on the business were about £30 a week, and there were wages and other business expenses to meet. Debtor: Yes, but my turnover was, say, £3 000 a year, and on ordinary normal working figures that would be £300 net profit. Debtor said he received his first serious debt summons in June, 1927, and they had been getting steadily worse, until, when he filed his petition, there were twenty against him. Until the beginning of May he did not realise he could not carry on. He had expected a Torquay Corporation electricity scheme, which had been in the air for a couple of years, to come into operation, and if this had happened he would have benefited to the extent of £5 a week. He was hoping also to get rid of the shop. Debtor admitted that certain accounts had been omitted from his statement of affairs, and would slightly increase his deficiency, which had been estimated at £1 813, there being more than 100 unsecured creditors. Law costs since May, 1928, amounted to £226. The examination was closed.

METAL AND CHEMICAL PRICES.

TUESDAY, July 23rd.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£75 10 0	£1 0 0	—
Electro Wirebars	,,	£84 10 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	,,	11 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2⅛d.	—	—
Brass 60/40—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10⅞d.	—	—
Wire ,,	,,	11⅛d.	—	—
Pig Iron—			—	
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,	£14 15 0	—	—
Lead Pig—				
English	per ton	£24 5 0	—	—
Foreign or Colonial	,,	£22 15 0	—	—
Tin—				
Ingot	per ton	£215 0 0	£4 10 0	—
Wire, basis	per lb.	2s. 10d.	1d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£25 7 6	2s. 6d.	—
Mercury	per bottle	£22 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £30 0 0

Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¾d.
Sodium Bichromate—Per lb. 3¼d.

Rubber—Para fine, 11½d.; plantation, 1st latex, 11¾d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.

THE LEAD MARKET.

The lead market opened last week with a steady tone on Monday, but, according to James Forster and Co., later relapsed, July lead touching £22 10s. and forward £22 12s. 6d. Closing prices on July 19th were £22 13s. 9d. for July, £22 15s. for August, £22 16s. 3d. for September and October, or practically unchanged on the week.

The Newcastle-on-Tyne Electricity and Transport Committee has recommended approval of the provisions in the Central Electricity Board's scheme for the North-East area so far as they have reference to the Manors power station. The proposals include the conversion of the Manors power station into a transforming station supplied from a power station to be operated by the Newcastle-upon-Tyne Electric Supply Co. for the Central Board.

Whitwell P.C. is to oppose the application of Worksop U.D.C. for an Order to supply electricity in the parish. Mr. L. W. Walters, agent of the Shireoaks Colliery Co., has written to Whitwell Council stating that it has always been the intention of the company to supply electricity in the parish, and that negotiations are well in hand for the distribution of the current through a private company. The Council has decided to adopt the scheme if it materialises, and to call a parish meeting to discuss the question.

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THE ELECTRICIAN

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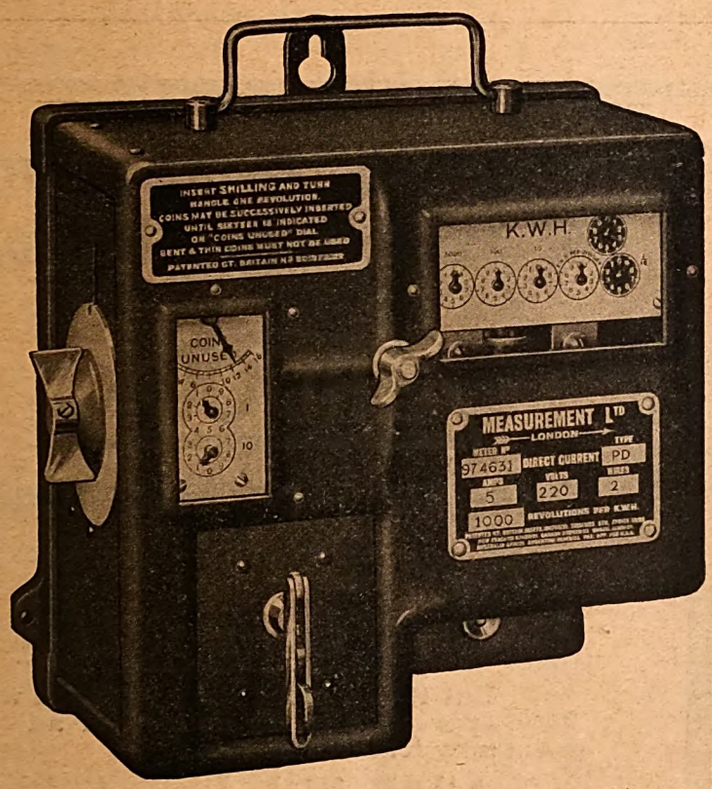

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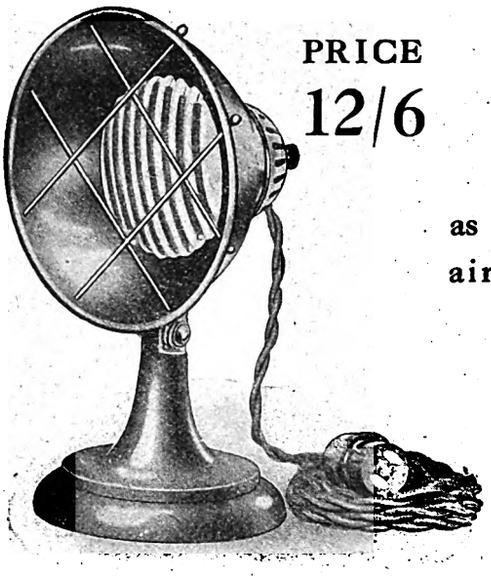

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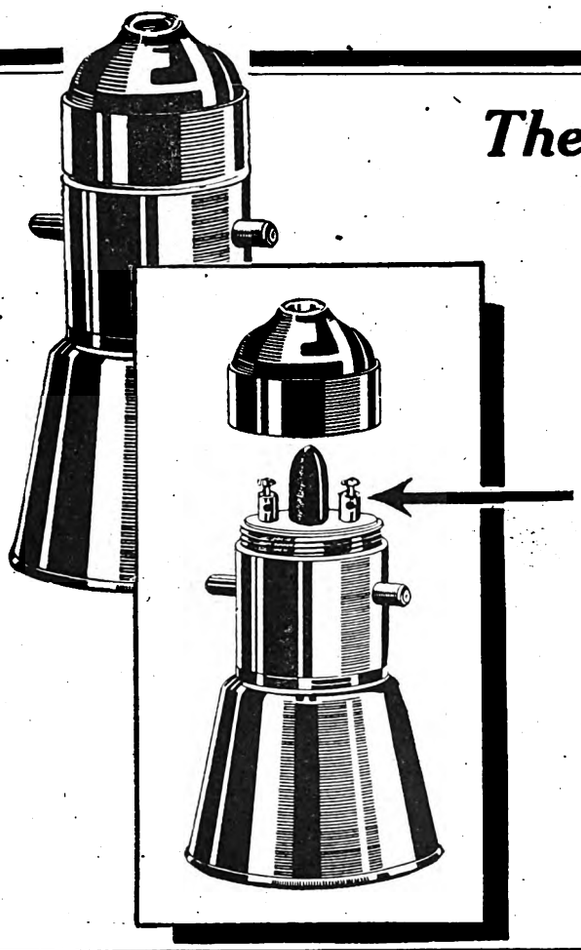

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Current Topics.

"Light's Golden Jubilee."

IT has been observed that once a misstatement of fact has been made, no correction can hope to overtake it. We rather fear that this must be the case in regard to the unintentionally misleading—but nevertheless misleading—statements which have been made by sections of the electrical industry in the United States of America as to the invention of the first electric incandescent lamp, which—as we have repeatedly shown on unassailable evidence, supported by the Institution of Electrical Engineers—was the work of that great British scientist, the late Sir JOSEPH SWAN. We have heard from America all sorts of explanations why the N.E.L.A. should persist in making a similar claim on behalf of Mr. EDISON, but in no case have these apologists even attempted to explain by what system of relativity they claim priority for an invention which, according to their own statements, was not produced until ten months after Swan had publicly demonstrated his lamp in England. We have already pointed out that the American celebrations, which reach their grand climax on October 21st, are intended to be world-wide, and evidence is already forthcoming of several decisions to co-operate in marking the occasion. At a recent meeting of the South African Institute of Electrical Engineers the President announced that South Africa had been asked to co-operate in the celebration of "the fiftieth anniversary of the invention of the incandescent lamp as we know it to-day," and we learnt this week from Japan that a joint meeting of the Japanese Institute of Electrical Engineers, the Illuminating Engineering Society, the Electrical Industrial Association, the Nippon Radio Broadcasting Society, and numerous other professional and scientific bodies "unanimously passed, with great enthusiasm," a decision to celebrate the occasion on October 21st throughout Japan, a sum of 300 000 yen being voted for the purpose. While regretting the necessity to refer again to this matter we would express the hope that our American friends will realise the injustice they are unwittingly doing to the memory of a great Englishman, and will arrange to make suitable acknowledgment of SWAN'S work during the remainder of the jubilee celebrations.

The Government and Public Utility Loans.

IT is early yet to express an opinion as to the help that electricity supply undertakings may derive from the Government's Development (Loan Guarantees and Grants) Bill, the text of which has recently been issued. As it stands at present, the Treasury is to be authorised to guarantee certain loans to be raised in connection with public utility undertakings and to authorise the giving of financial assistance in respect of expenditure incurred on loans raised for development purposes. At first glance this suggests a simple way out of the difficulties which many electricity suppliers are finding in financing the development of the less densely populated portions of their areas, but as the Bill does not include in its definition of a public utility undertaking one which is carried on by a local authority, the possibility of benefiting electrical development is considerably lessened. However, the local authorities are not entirely excluded from participation, for by a circuitous procedure the Minister of Labour, with the approval of the Treasury, and on the recommendation of a Committee appointed by him, may make grants to local authorities towards expenditure to be incurred for carrying out works of public utility calculated to promote employment in the United Kingdom. As local authorities are greatly in the majority in the total number of authorised electricity supply undertakings in this country the Bill's definition of a public utility undertaking should certainly be modified.

Monotony in Work.

BOREDOM as a result of doing work of a monotonous character is a phenomenon sufficiently widespread to exert a noticeable reduction in industrial output, and anything that is likely to make the work of operatives less boring will be welcomed by manufacturers. The conclusions of an inquiry conducted by the Industrial Fatigue Research Board, which has now been issued in the form of a report, are, therefore, worthy of study by manufacturers desirous of increasing the productivity of their workers. One of the most interesting points arising out of this study is that boredom is less likely to occur where the work

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is either entirely automatic, or, at the other extreme, when attention is entirely concentrated on the task. Boredom is most marked in semi-automatic processes which require enough attention to prevent mind-wandering, but not enough for the complete absorption of mental activity. As the amount of boredom experienced appears to bear some relation to the conditions of work its occurrence can be checked by suitable changes in the form of activity, when the operatives are paid on output, when the work is conceived as a series of self-contained tasks, when the operatives are allowed to work in compact social groups, and when suitable rest periods are introduced. The report is interesting and suggests various helpful ways of dealing with a definite industrial problem, in spite of the final conclusion that " continued exposure to monotonous conditions of work causes adaptation to such conditions, so that work which initially is tedious and unpleasant may afterwards be tolerated or even mildly enjoyed."

The Railways and Electric Cooking.

THE main line railways of this country which have in the past been so blind to the possibilities of electricity, not only for traction purposes, but also for lighting and cooking, seem to be turning over a new leaf. In fact, the L.N.E.R., in advertising the " features of a famous train "—the Flying Scotsman—proudly mentions electric cooking as a special attraction. In the necessarily confined space available for cooking on trains electric cooking is a most attractive proposition, and it is remarkable that the cooking facilities on the Flying Scotsman have not been extended to many other trains. Naturally, the cost of conversion of existing restaurant cars will be advanced as an insuperable obstacle, and while there is still a considerable proportion of gas-lighted rolling stock in use it is perhaps unduly optimistic to look for such an ultra-modern convenience as electric cooking. Excuses for failure to use electricity for cooking at the terminal stations are, however, not so easily found, especially when it is remembered that in India the G.I.P. Railway gives its passengers the advantage of electric cooking in the restaurant at its Victoria terminal.

Corrosion and Water Flow.

AN interesting experiment on corrosion shown before members of the Institution of Civil Engineers demonstrated the action on steel of water at different velocities. A simple apparatus maintained a flow of water on to the centre of a circular steel plate of about 10 in. dia., which rested on a platform over a tank. The plate was placed horizontally, and over its centre was mounted a pipe with a stop valve and a $\frac{1}{2}$ in. dia. nozzle, which delivered a jet of water perpendicular to the plate, the nozzle being about 1 in. from the plate. The stream of water issuing from this nozzle completely covered the surface of the plate, and formed a circular wave of a diameter between 4 and 5 in. The flow of water over the plate's surface inside this wave was radial, and small bubbles could be seen moving radially from the jet centre to the wave. On the other side of the wave, that is, between the wave at the edge of the plate, the water was much deeper, and of a much slower velocity; also, the small oxygen bubbles were not swept radially to the edge, but remained stationary on the plate's surface. After a time it was seen that around these bubbles oxide was forming, and eventually the plate's surface outside the wave circle was found to be corroded, while inside the wave circle the surface was still quite bright. After the experiment had been in progress for some hours, the plate was removed and wiped; the portion which had been in contact with the water inside the wave was quite bright, while the portion which had been in contact with the water outside the wave was etched by the small oxygen bubbles. Another plate was shown which had been used in a similar experiment for a period of 170 hours. Half this plate had been brushed to remove the oxide from the surface, and there was a distinct line of demarcation between the smooth inner circumferential area and the corroded outside area. The object of the experiment was to demonstrate that water passing through the tubes of an economiser with a high velocity, and having " turbulent flow," will brush off any small bubbles of oxygen, which would otherwise adhere to the inside surface of the metal tubes and cause internal corrosion; while water passing through the tubes at a low velocity will not be able to brush off the bubbles, and therefore corrosion will take place. The point between the two velocities is the " critical velocity," and, in the case of this experiment, was indicated by the wave. A similar experiment was originally made to determine what velocity should be used through the tubes of the Foster economiser, in order to prevent internal corrosion.

Electric Signs Give Public Service.

THE E.L.M.A. Lighting Service Bureau has convincingly shown, by means of its miniature street model, how great a factor in the illumination of city streets is the shop window and other commercial lighting in such thoroughfares, and how, when this form of lighting is switched off, generally quite early in the evening, many apparently well-lighted thoroughfares take on the gloomiest aspect due to poor public illumination. A striking practical example of the public value of commercial window lighting and electric signs was recently afforded in New York, when, as a protest against an attempt to ban electric signs in a certain district, it was arranged that practically all the elaborate signs on Broadway should be extinguished for three minutes one evening. It was expected that many people would visit the area to see how dark the streets would be without electric signs. But the police, fearing that the demonstration would make the theatre district so dark as to disorganise the traffic, intervened, and, as they acknowledged that though the primary purpose of electric advertising signs is purely commercial, they perform an indispensable public service, the demonstration was abandoned. Over here the electric sign business is in its infancy, and though the industry is partly to blame for its slow progress, outside attempts to limit the use of such signs have been a formidable obstacle. Electric sign advertising, if only it is developed in the right way, represents a big potential revenue for the sign and lamp manufacturers, and a very useful load for the supply authorities. And if obstructive efforts are countered with demonstrations of the civic value of this form of advertising, development in the future should proceed on a much larger scale.

The Sulphur Problem.

ALTHOUGH we have on occasion criticised the promoters of the new Battersea power station for their apparent disregard of fears that were at the time quite justifiably expressed by the general public, and also by quite a number of electricity supply engineers, we do not feel justified in extending any support to the latest agitation which found vent at a Westminster City Council meeting in references by a dignitary of the Church to " this horrible inferno over at Battersea." Although Mr. FLADGATE's statement of the case which was issued some months ago definitely suggested that hope was held of finding a satisfactory means for overcoming the sulphur fume problem, the objectors to the project still had on their side a body of technical opinion which believed those hopes to be unfounded. Now, however, as a letter on our correspondence page shows, the company most emphatically asserts that a perfectly practicable and commercial solution of the sulphur problem has been evolved, and that the fears that have been expressed as to possible damage through sulphur fumes are consequently groundless. On such a categorical statement it would seem that the opposition would retire. As it has not done so, and is rather renewing its efforts, it can only be assumed that the real objection is not to any anticipated damage that might be caused to property and health by fume emission, but to the erection of a station of the completely innocuous type which Mr. FLADGATE has so definitely undertaken to provide.

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THE K.V.A. CHARGE IN A.C. TWO-PART TARIFFS.

Is it Adequate or Not?—Difficulties with the Hopkinson Method—Allocating the Standing Charges on a System—Concessions for Large Consumers who Correct Power Factor.

By E. V. CLARK, B.Sc., M.Inst.C.E., A.M.I.E.E., M.I.E.Aust.

INTRODUCTORY.—Electrical undertakings whose load consists largely of a.c. motors have usually found it desirable to adopt some form of tariff which takes power factor into consideration; but it has not been found possible to devise any form of tariff that cannot readily be shown to have serious defects in certain circumstances. The late Prof. Kapp in his paper "The Improvement of Power Factor,"* gave examples of various tariffs to this end in force in Great Britain and elsewhere; and Prof. Miles Walker summarised the discussion on this topic as showing a fairly general opinion that a two-part tariff based on kVA maximum demand and kWh supplied, constitutes "not only a simple but also probably as fair a method as any other." The recent informal discussion before the I.E.E., opened by Mr. E. W. Dorey (ELECTRICIAN, December 21st, 1928), shows, however, that there is at present no unanimity among responsible engineers concerning the most appropriate manner in which discrimination between consumers of good and bad power factor should be made.

In his paper "Power Factor and Tariff,"† dealing mainly with the influence of power factor on running costs, the writer rashly stated that a tariff basing the standing charges upon the peak demand in kVA, though not strictly rational, was undoubtedly advisable. In the discussion, this view which received endorsement from at least one prominent engineer was declared by another to be distinctly inequitable.

Analysis of Standing Charges.

In this diversity of opinion, it has seemed desirable to analyse the standing charges entailed in supplying consumers of different power factors, with a view to determine the adequacy or otherwise of the kVA charge. Naturally, such an analysis must be made on the basis of a number of arbitrary assumptions, which do not hold in practice; but, so far as possible, these have been indicated in the letterpress, and liberal use made of footnotes to indicate briefly the general effect of any departure from the assumed conditions. To the writer's considerable surprise, he reached the conclusion that, subject to these limitations, the appropriate standing charges of any consumer can be expressed in terms of a small number of factors, which should be readily evaluated with some degree of approximation in any particular undertaking. Introducing numerical values for the factors involved enables a series of straight line graphs to be drawn, showing how the ideal standing charges, per kW of consumer's peak load vary with his power factor under different circumstances. Their consideration shows that in general a standing charge based on consumer's maximum demand in kVA, though purely an empirical rule having no logical basis, happens to come reasonably close to the ideal charge for ordinary induction motor loads on any system where the power factor of the system's peak load is poor, the distribution mains extensive, and the diversity factor high; but departs very widely from the ideal where these conditions do not hold.

In Part II of this article, the suitability of a tariff based directly on the ideal standing charges attributable to the consumer is discussed; and the conclusion is reached that the kVA charge, where reasonably appropriate to the conditions of supply, has important practical advantages over the alternative form of tariff.

SYMBOLS.—The following are the principal symbols used in this article:—

P = kilowatts in consumer's peak load
Q = Lagging wattless kVA in ditto.
S = Total kVA in ditto.
Po, Qo, and So = the corresponding elements of the station peak load.
φ = lagging phase angle of consumer's peak load.
θ = lagging phase angle of station peak load.
Dp = diversity factor of power loads = $\Sigma P/Po$.
Dq = diversity factor of wattless component = $\Sigma Q/Qo$.
£X = Annual (standing) revenue required by a d.c. undertaking, per kW of peak load on station, to cover the annual charges on the system.
£Y = Annual (standing) revenue required by an a.c. undertaking, per kW of peak load, to cover the annual charges on that part of the system whose cost may be regarded as depending on kW capacity.
£Z = Annual (standing) revenue required by this a.c. undertaking, per kVA of peak load, to cover annual charges on that part of the system whose cost may be regarded as depending on kVA capacity.

With the above symbols, the requisite annual revenue to be derived from consumers' standing charges must, therefore, total

£XPo on a d.c. system; and
£$YPo+ZSo$ on an a.c. system.

Part I.—Influence of Power Factor on Standing Charges.

ASSUMPTIONS INVOLVED IN A TWO-PART TARIFF.—A two-part tariff is normally based on the Hopkinson principle that the cost of any supply of electricity is divisible into two parts—the running costs, depending on the number of units supplied, and the standing charges, depending on the contribution that that particular consumer makes to the peak load on the system. In this article, the possibility of separating running costs and standing charges is assumed; and running costs are ignored, as outside its scope. Naturally, any weaknesses of this method of charging that arise on a d.c. system will also be apparent on one of a.c., in addition to the troubles caused by power factor. A brief survey of the limitations of the two-part tariff on a d.c. system should, therefore, help to clear the air.

With an industrial load, the standing charge in a d.c. system may be levied, either upon the sustained maximum demand as measured, or upon the rated capacity of the plant installed. Of these, the former is usually regarded as the more satisfactory; and hence with a.c., one may assume that the consumer's peak load should form the basis on which his standing charge is to be computed.* Practical considerations usually require that maximum demands be read monthly or quarterly, but the assumption of an annual reading simplifies matters. Again, a uniform charge per kW of peak load assumes that capital charges are proportional to load, and that distribution losses and charges are unaffected by the locality of the consumer. Some correction for such errors may be made by sliding scales depending on magnitude of load, or distance from power station. Similar types of correction may be adopted with an a.c. tariff if desired, so these matters may be ignored; though it may be pointed out that the small change of phase angle introduced by the distribution system introduces a slight additional error.

The Fundamental Cause.

The fundamental cause which prevents a Hopkinson type of tariff from being of universal application on a d.c. system is, of course, the matter of diversity factor. If all consumers' peak loads synchronised with one another, and therefore with that of the system, the case for such a tariff would be irresistible. But actually, owing to diversity of time of peak loads, it is impossible to frame a single Hopkinson type of tariff which shall levy an adequate but not excessive charge on every consumer, irrespective of the nature of his load; and hence such a tariff is usually accompanied by other tariffs for special classes of load. In postulating ideal conditions for the application of a two-part tariff one must therefore make the further assumptions that the whole of the consumers are of a single type, and either that their peak loads practically synchronise with one another and with that of the system, so that the diversity factor is unity, or else, that all consumers must be considered as contributing equally to the diversity factor, so that all should share proportionately in the financial benefit that diversity factor allows. This last assumption implies that if a consumer has a peak load of P on a system of diversity factor D, then the addition to the station peak that his load causes is P/D. Further, on a d.c. system, if the annual revenue per kW of the station peak requisite to

* J.I.E.E., Vol. 61, No. 314.
† J.I.E.E., Vol. 64, No. 354.

* The essence of the argument is the same, whether peak load as measured, or as estimated, form the basis of computation; but some difference arises in the definition of diversity factor.

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cover standing charges with the desired margin of profit is £X, then on a system of unity diversity factor the appropriate rate for the standing charge to the consumer should be £X, but on a system of diversity factor D it is £X/D.*

Three Diversity Factors.

But on account of power factor, an a.c. system differs very materially from one of d.c., in that there are three diversity factors to be considered, namely, diversity factor of kW loads, of wattless kVA loads, and of total kVA loads. Thus, if a consumer has a peak load of P kW plus Q lagging wattless kVA, giving together a total load of S kVA, and if Po, Qo and So are the corresponding measures of the peak load on the station, the three diversity factors are—

$Dp = \Sigma P/Po$, the kW diversity factor.
$Dq = \Sigma Q/Qo$, the wattless kVA diversity factor.
$Ds = \Sigma S/So$, the total kVA diversity factor.

With an ordinary induction motor, throughout its working range, but exclusive of starting conditions, increase in kW load is accompanied by increase in wattless current; and hence its sustained peak loads in kW, in wattless kVA, and in total kVA occur simultaneously. It seems probable, therefore, that in the majority of cases a consumer's three peaks will occur together; though this is not necessarily so, and certainly will not be the case where some types of phase correcting apparatus are in use. The calculations below assume that the three peaks on the station occur together; and if they do not, it will usually suffice to consider the peak load in total kVA, and regard the power and wattless components of this as the other two peaks.

It is thus seen that the existence of a power factor introduces complexities quite unknown in d.c. systems. And, further, it should be pointed out that even though all consumers' peaks synchronise—the normal condition for unity diversity factor—yet owing to the vectorial addition of total kVA's the ratio $\Sigma S/So$ will be appreciably greater than unity, unless all consumers have approximately the same power factor.

A.C. System with Unity Diversity Factor.—To investigate the influence of power factor on the standing charges attributable to a particular consumer, one may consider, first, a system having consumers all of one type, save for differences in power factor; and with peak loads occurring simultaneously, so that the diversity factors Dp and Dq are unity, but not so Ds. The other assumptions involved are generally those indicated in the last section.

Let the peak load on the station have components Po kW, and Qo lagging wattless kVA, giving a total load of So kVA at a lagging phase angle θ. If a consumer has a peak load of components P kW and Q lagging wattless kVA, making a total of S kVA at a lagging phase angle φ, then the portions of the power and wattless components of the station peak that he contributes are P and Q respectively; but, owing to the laws of vector addition, his contribution to the kVA peak So is not S but $S \cos(\varphi - \theta)$.

The capital charges on the steam end of the power station depend on its capacity in kilowatts; but the capital charges on the electrical end of the station and on the entire distribution system must be regarded as depending on their capacity in kilovolt amperes. Hence the proper standing charge upon the consumer should be based partly on the kW addition he makes to the station peak, and partly on the kVA addition. If, therefore, the requisite annual return to the undertaking, with the desired margin of profit, is £Y per kW of peak load, to cover the standing charges on the steam end of the station, plus £Z per kVA of peak load to cover standing charges on the electrical part of the system, then evidently the portion of the total standing charges attributable to this individual consumer is £$YP + ZS \cos(\varphi - \theta)$.*

Since $P = S \cos\varphi$, and $Q = S \sin\varphi$, the above expression readily reduces to £$P(Y + Z\cos\theta) + QZ \sin\theta$, where P is the consumer's peak load in kW, Q the consumer's simultaneous peak load in wattless kVA (negative if leading), and Y, Z and θ are factors of the supply undertaking unaffected by the particular consumer.†

One thus reaches the conclusion that on a system of unity diversity factor the actual standing charges incurred in supplying a consumer of any power factor depend partly on his peak load in kW, and partly on the wattless component of that peak, but that no values of Y, Z and θ will make his actual standing charges proportional to his peak load in kVA. A tariff basing the standing charge on kVA peak can, therefore, only be justified on grounds other than those of expediency, if it can be shown that over a reasonable range of power factor it happens to approximate fairly closely to the actual costs incurred.

It is also seen that θ, the phase angle of the undertaking at time of peak load, has very marked influence on the surcharge that should be made for bad power factor. Should a system be such that the peak load power factor is exactly unity, so that $\sin\theta = 0$, then consumers' standing charges should be based on kW alone, independent of what their kVA peaks may be.‡

Allocating the Charges.

To allocate the standing charges upon a system to kW and kVA, one may say roughly that the electrical end of the power station—alternators and accessories, switchgear, and step up transformers if used—will cost from one-third to one-fifth as much as the steam end—turbines, condensers and pumps, boilers, piping, coal handling plant, etc. Cost of land and buildings may be allocated in the same proportion, as a first approximation. The cost of transmission lines and distribution system must be regarded as wholly dependent on kVA, and may roughly be taken as varying from 70% to 150% of the cost of the power station or stations. Taking power factor into consideration, and assuming that annual standing charges are proportional to capital expenditure, though this is not necessarily the case, the conclusion is reached that the ratio of Z to Y, that is the ratio of the annual charges per kVA on the electrical part of the system to those per kW on the mechanical part of the station, may vary between limits of 80 to 100 and 170 to 100, with 125 to 100 as a reasonable mean figure for a typical a.c. undertaking not giving or receiving any appreciable bulk supply.

It was deduced above that the standing charges attributable to any consumer amount to £ $Y + Z\cos\theta$ per kW of his peak

* In any ordinary undertaking a two-part tariff framed for an industrial load may have to conform to any position between two extremes. The first is that it must carry the whole of the standing charges due to its own peak load, other supplies being regarded as partial by-products; and the second is that this is regarded as the partial by-product, other services being debited with the charges on the whole of the peak that they would cause alone. In the former case, Po, the ideal peak load caused by the industrial load, is equal in magnitude to the peak that would be caused by this load alone. In the latter case it is the difference between the actual peak on the system and the imaginary peak whose charges are met by other supplies, and may readily be allowed for by an appropriate increase of the diversity factor D. In a.c. operation, however, it is in either case the effect of the industrial load on the actual peak load of the system that must be considered when studying the influence of power factor, and undue complexity should only arise in those cases where an undertaking has two distinct and nearly equal peaks, one in kVA of low power factor, and the other in kW of high.

* The apparent discrepancy that annual charges depend on plant installed rather than on the station's peak load is common to d.c. and a.c. alike, so need not be discussed here.

† A large consumer will affect θ to a small extent, and the contribution of a very large consumer to the kVA station peak is not quite $S\cos(\varphi - \theta)$, but errors caused by this are negligible. A more serious source of error arises from the fact that the phase angle on the station, θ_1 may differ appreciably from the phase angle θ_2, on the particular part of the distribution system concerned, as for example in the case of an undertaking supplying d.c. power through convertors in one area and a.c. industrial power in another. In such a case one may expand the above expression to

$$£P(Y + Z_1\cos\theta_1 + Z_2\cos\theta_2) + Q(Z_1\sin\theta_1 + Z_2\sin\theta_2)$$

where Z_1 represents the requisite standing charges per kVA on that part of the electrical system operating at a peak load phase angle of θ_1, and Z_2 the standing charges on that part operating at a peak load phase angle of θ_2.

‡ To push one's conclusions to extremes affords a good test of the soundness of one's arguments. This conclusion explains how it is that in the early days of the single phase induction motor its poor power factor was ignored without serious financial disability to the undertaking. At the present day this conclusion would be quite sound on an ideal undertaking where unity power factor was caused by the presence of a large number of consumers using ordinary induction motors, together with a large number using plant operating at leading p.f., due, for example, to the invention of a cheap and reliable motor which needed leading current for its use. But in any actual system where unity power factor in the station is brought about by the deliberate over-correction of a few large units, the conclusion is palpably unsound, both from the fact that the peak load power factor on the distribution system will not be unity (*vide* preceding footnote) and also because consumers who over-correct will only do so if given some rebate in tariff, which must be recouped from those who do not correct.

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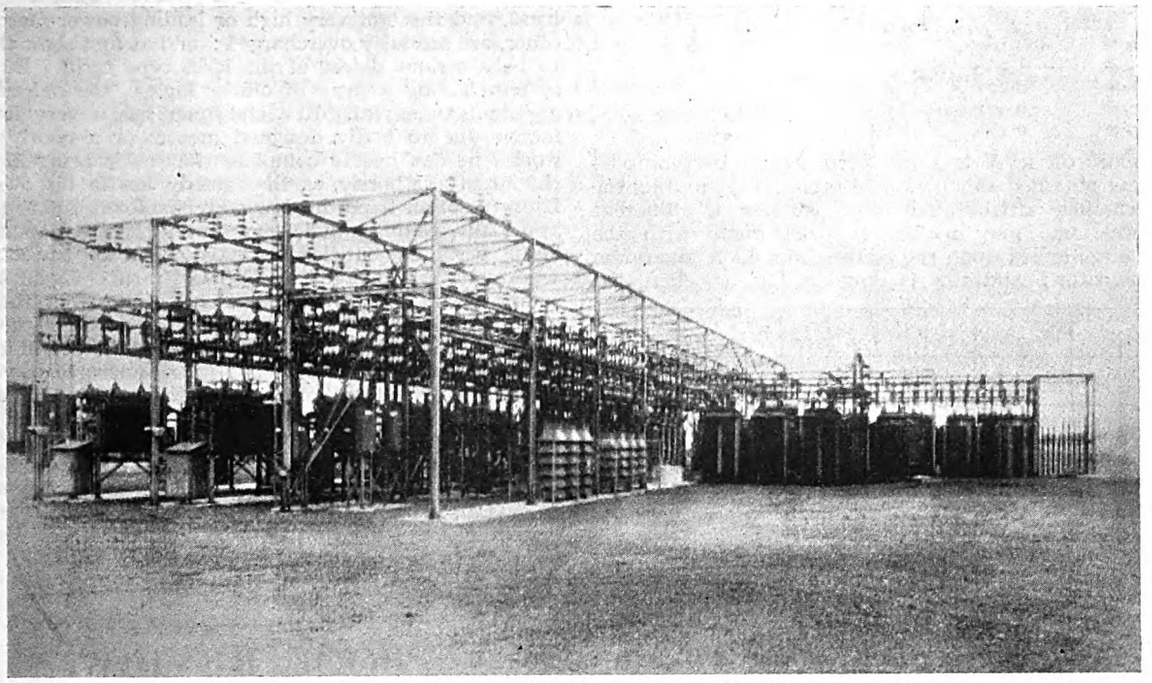

FIRST OUTDOOR SUB-STATION TELEPHOTOGRAPH.

ABOVE we are able to show, by courtesy of the Delta-Star Electric Co., Chicago, what is believed to be the first telephotographed picture of an outdoor sub-station. The photograph from which our reproduction is made has not been re-touched in any way. The sub-station, which furnishes supplies to the suburban area situated immediately west of Chicago, has both English and American equipment installed.

load, plus £ $Z\sin\theta$ per wattless kVA of that peak. The ratio of $Z\sin\theta$ to $Y+Z\cos\theta$, expressed as a decimal, is given in Table I for systems having peak load power factors of 0·9, 0·8, and 0·7, and having ratios of Z to Y of 80 to 100, 125 to 100, and 170 to 100.

Table I.—Systems with Unity Diversity Factor.

Ratio of charges, $Z\sin\theta$ per wattless kVA of consumer's peak load, and $Y+Z\cos\theta$ per kW of such load, for stations with peak-load power factors of 0·9, 0·8, and 0·7, and with ratios Z/Y of 80/100, 125/100, and 170/100.

Power Factor.	Ratio Z to Y.		
cos θ	80 : 100	125 : 100	170 : 190
0·9	0·203	0·256	0·294
0·8	0·293	0·375	0·433
0·7	0·366	0·477	0·555

Effect of Diversity Factor.—In a d.c. system, diversity factor introduces but little theoretical complication, so far as concerns consumers whose loads are such that it is impossible to attribute to any one special influence upon the diversity factor, since one merely assesses a consumer of peak load P as adding P/D to the station peak. But on an a.c. system, one may expect the power diversity factor to differ from the wattless component diversity factor; and both of these must be considered.

With the same notation as before, the peak load on the station is Po kW, plus Qo kVA of wattless component, giving a total load of So kVA, with a lagging phase angle θ. A consumer has corresponding peak loads of P, Q, and S, at a lagging phase angle φ. But if the power diversity factor is Dp, and the wattless component diversity factor is Dq, then this consumer must be regarded as having at time of station peak load a load of $P_1=P/Dp$ kilowatts, plus $Q_1=Q/Dq$ wattless kVA, making a total load of S_1 kVA at a lagging phase angle of φ_1 This consumer's contribution to the kW peak of the station is therefore $P_1=P/Dp$ kW, and his contribution to the total kVA peak is by vectorial addition $S_1\cos(\varphi_1-\theta)$. Thus the standing charges attributable to him are £ YP/Dp, to cover the annual charges on the steam end of the station, plus £ $ZS_1\cos(\varphi_1-\theta)$ to cover those of the electrical portion of the system; and as $S_1\cos\varphi_1=P_1=P/Dp$, and $S_1\sin\varphi_1=Q_1=Q/Dq$, it follows that the total charges attributable to the consumer, £ $YP/Dp+ZS_1\cos(\varphi_1-\theta)$, may be written £ $(Y+Z\cos\theta)\,P/Dp+Z\sin\theta\,Q/Dq$.*

Now if a given group of consumers have a kW diversity factor of 2, their combined peak may in an extreme case be due to half the consumers operating at full load, with the rest entirely shut down; and, in such a case, the wattless diversity factor will also be approximately 2. But in general one may expect the diversity factor to be due to the majority of these consumers operating at partial load. Provided that uncorrected induction motors are in general use, it follows that the combined power factor of this group will be appreciably lower than if all were working at full load. In other words, the ratio of wattless current to power current is greater than at full load, which means that the diversity factor of the wattless component is less than that of the power component.†

Consideration of the curve connecting power factor with input for an ordinary induction motor suggests that a system having a kW diversity factor equal to 2 would probably have a wattless component diversity factor of about 1·5, on the assumptions that industrial load alone is considered, and that most motors are of the plain induction type. Table II gives the ratio of $Z\sin\theta/Dq$ to $(Y+Z\cos\theta)/Dp$, expressed as a decimal, for systems similar to those in Table I, except that a kW diversity factor of 2, and a wattless component diversity factor of 1·5 are taken into account. Naturally, the figures are 33% greater than those in Table I throughout.

Table II.—Systems with kW Diversity Factor of 2, and Wattless kVA Diversity Factor of 1·5.

Ratio of charges, $Z\sin\theta/1{\cdot}5$ per wattless kVA of consumer's peak load, and $(Y+Z\cos\theta)/2$ per kW of such peak, for

* As it may happen that both peak load phase angles and diversity factors differ on various parts of the system, the above expression may be expanded to

$$£\,P(Y/Dp+\Sigma Z_1\cos\theta_1/Dp_1)+Q\Sigma Z_1\sin\theta_1/Dq_1$$

where Z_1 represents the requisite annual revenue per kVA of peak load, to cover standing charges on that particular section of the electrical system which has peak load phase angle θ_1 and diversity factors Dp_1 and Dq_1.

† Where phase corrected motors are considerably used, the reverse condition may hold; and if the use of static condensers to improve power factor were general, the diversity factor of the wattless component might be very high.

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stations with peak-load power factors of 0·9, 0·8, and 0·7, and with ratios Z/Y of 80/100, 125/100, and 170/100.

Power Factor. cos θ	Ratio Z to Y. 80 : 100	125 : 100	170 : 100
0·9	0·271	0·342	0·392
0·8	0·391	0·500	0·578
0·7	0·488	0·636	0·740

COMPARISON OF KVA CHARGE WITH COSTS INCURRED.—Having thus obtained some rational basis for computing the standing charges attributable to consumers in different circumstances, one may readily compare these with the standing charge levied upon the reading of a kVA maximum demand indicator; and this is done in Fig. 1, where the

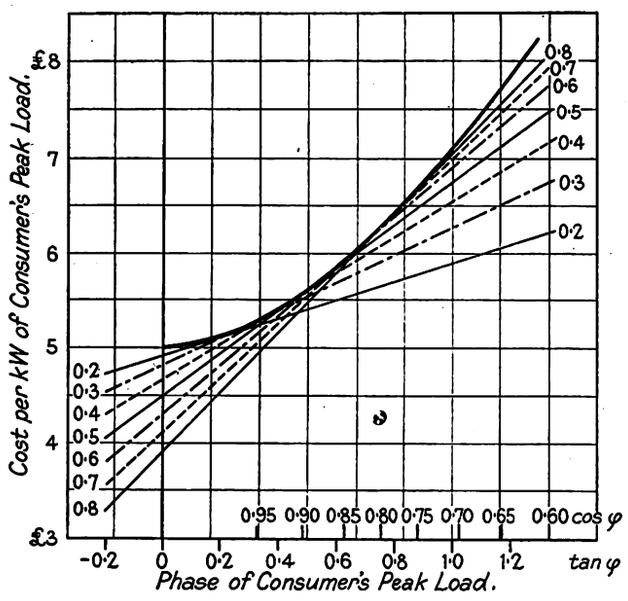

Fig. 1.

heavy curve represents the charge per kW of peak load levied on consumers of different power factors by a tariff of £5 per kVA of peak load, and the straight lines represent the standing charges attributable to them, with ratios of charge per wattless kVA to charge per kW running from 0·2 to 0·8. It will be noted that the figure is plotted to a scale of tan φ, in order that the "Costs Attributable" curves shall be straight lines; and that these have, in each instance, been drawn, at the required slope, tangential to the kVA curve, in order that the region over which they approximately coincide may be more manifest. Reference to Tables I and II will indicate the general conditions of a system to which each straight line corresponds.

Divergent Views Explained.

This figure explains very clearly why it is that the kVA charge is regarded as eminently suitable by the responsible heads of some undertakings, and utterly unsatisfactory by others. Take, for example, an undertaking whose relative capital costs of station and distribution, peak-load power factor, and diversity factor, are such that the ratio of standing charge for wattless component to that for power component is in the neighbourhood of 0·6, as may be brought about by a peak-load power factor of 0·75, a kW diversity factor of 2, and an extensive distribution system. The figure shows that in these circumstances the kVA charge accords quite reasonably with the cost line for all consumers whose peak-load power factors lie between limits of say 0·93 and 0·75; and this should cover practically every user of plain induction motors except those whose works are so badly laid out that their motors are habitually much underloaded. On the other hand, on a system having this ratio equal to about 0·3—such as may be caused by a high peak-load power factor, due to a tramway load supplied through rotary convertors—the range of coincidence lies between power factors of about 0·98 and 0·88; and all consumers having peak-load power factors much below the latter figure would be seriously overcharged on a kVA tariff.

The figure shows further that if a kVA tariff is adopted with the rate such that no consumer shall pay less than his proper share of the standing charges—that is, if the kVA charge is such that, when plotted, the theoretical cost line is tangential thereto—then whatever the nature of the system, consumers of exceptionally low power factor on the one hand, and those of very high or leading power factor on the other, are seriously overcharged; and at first sight this seems to be a serious defect of the kVA type tariff. But with a system having a ratio of 0·6 or higher, the defect is more apparent than real. If a consumer has a very low power factor, due to badly designed motors or a poorly laid out works, he can hardly complain that he is being ill used by the supply authority, as the remedy lies in his own hands. If on the other hand, his low-power factor is due to abnormal apparatus, taking wattless current rather than power, then he is certainly entitled to have such apparatus metered separately, and charged at a special tariff. Again, any consumer having a peak-load power factor higher than 0·9 is not a normal user of induction motors only. Either he has special apparatus installed, for which a special tariff is logical; or else he has deliberately put in considerable power factor correcting plant, and presumably has satisfied himself that this is profitable on the existing tariff. Nevertheless, it would appear that wherever a kVA type of tariff is adopted, special concessions should be made for those of the larger consumers who correct their power factors to unity or thereabouts, since in general, much less capital is required for a given amount of system phase improvement if a few consumers overcorrect than if a large number partially correct.

(*To be continued.*)

BOOK REVIEW.

Kabeltechnik. Die Theorie, Berechnung und Herstellung des Elektrischen Kabels. By DR. M. KLEIN. (Berlin: Julius Springer.) Pp. 486. 57 Reichsmarks.

Under this attractive title the author introduces the theory and practice of a special branch of cable-making with considerable skill and success. That the title is so much broader than the contents is a defect, but in view of the care bestowed upon definitions in the introductory chapter this is easily forgiven. The book is concerned almost entirely with lead-sheathed cables having paper dielectric. It immediately discriminates between high-tension power cables and telephone cables of air-space type. In the historical note with which the story begins, in the treatment of theory, and in the details and illustrations appertaining to design and manufacture, Dr. Klein has presented his subject with justice to all nations and to all contributors. The result is a work that will be widely appreciated.

General theory leading to the telegraph equation is neatly condensed in about 20 pages. Here the text will remind English readers of the style of Breisig, and Dr. Klein could scarcely have taken a better model. Then follows more extended treatment of power cable theory and design, with frequent references to British and American authorities, and welcome tables of numerical data and results. The same mode of explanation is adopted for the telephone cable, and to the whole is added a useful summary of methods of testing cables of both types. To complete his task, Dr. Klein has included some instructive chapters on modern methods of manufacture, transporting, erecting, laying, and protecting such cables. There is also an account of loading-coils and the general problem of loading. A special feature of the book is the array of sections of cables of most of the types described. By adopting concise treatment it has been possible to present the whole in 486 pages, with 474 illustrations.

BOOKS RECEIVED.

"Estimating." By T. H. Hargrave. (London: Sir Isaac Pitman and Sons.) Pp. viii+120. 7s. 6d. net.

"Electrification of Steam Railroads." By Kent T. Healy. (London: McGraw-Hill Publishing Co.) Pp. xiii+395. 25s. net.

"Tait's Electrical Directory of Australia and New Zealand," 1929 ed. (Melbourne and Sydney: Tait Publishing Co.) Pp. 298. 7s. 6d. net.

"Radio Telegraphy and Telephony." By R. L. Duncan and C. E. Drew. (London: Chapman and Hall). Pp. x+950. 37s. 6d. net.

"Applied Geophysics in the Search for Minerals." By A. S. Eve and D. A. Keys. (London: Cambridge University Press). Pp. x+253. 12s. 6d. net.

Science Abstracts. Secs. A and B. Vol. 32, No. 376, Part 4. (April.) Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s.; annual subscription, 30s., or 50s. for both sections.

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SWITCHGEAR AND TRANSFORMER MANUFACTURE.

Developments at a Stafford Works—New Designs in Compound-filled Gear—The Mid-Point Auto-Transformer Scheme—Large Induction Regulators.

IT was interesting to note, on a recent tour of the Stafford Works of the English Electric Co., that switchgear manufacture was commenced at these works more than 25 years ago, though in those days switchgear was quite a minor accessory.

During recent years the switchgear department has been considerably extended, and the latest addition of a second large erecting bay of 18 000 sq. ft. brings the total of the area devoted to switchgear to over 100 000 sq. ft., this area being exclusive of the usual auxiliary shops, such as foundry, pattern shops, smithies, tool shops, main testing and despatch departments, which serve the whole works. In spite of the recent additions to the manufacturing plant we noticed that the switchgear shops were very busy.

Provision is made in the general layout of the switchgear works for economical routing of the processes. In the eastern block of buildings there are a number of bays, with the main stores running transversely across them at the northern end. On the extreme east is the machine shop with the special finish annexe at one end. In a small building outside the machine shop on the foundry side is installed the sand blasting equipment for removing scale, etc., from castings used in compound filled switchgear, and for giving a fine finish to special castings.

Parallel to the machine shops are the detail assembly and small assembly shops. To facilitate their work there is a calibration, flashing and general testing section attached to the shop, so that sub-assemblies and individual apparatus can be adjusted and checked before final assembly or transference to the adjacent finished goods store.

On the western side is a larger and higher block forming the large assembly shops, leading at its northern end into the main test bay and despatch department. These shops consist of two well-lighted bays 370 ft. long and 23 ft. 9 in. to the crane rail, and in addition to the erection of the larger classes of switchgear, a part of one bay is set aside as a sheet metal shop. The latter deals with the fabrication of angle and channel iron frameworks and sheet metalwork for kiosks, sheet steel cubicles, trucks, circuit breaker tanks, and the like, including the necessary electric welding and their own associated machining.

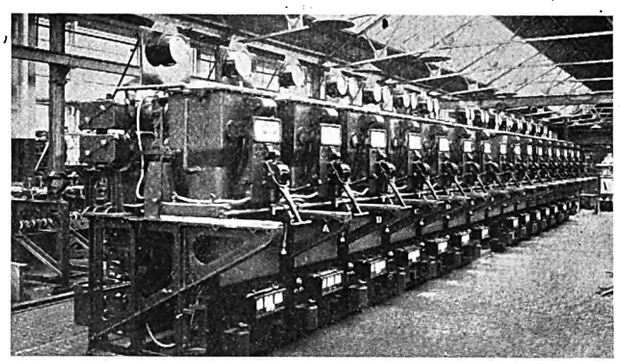
The four large assembly shops are served by five travelling cranes, and are devoted to the erection of large oil circuit breakers, steel structures, kiosks, metal-clad switchgear and similar large control gear. To facilitate the manufacture of the larger metal-clad pillars, use is made of plates let into the floor in suitable positions, to which can be bolted the pedestals of various pillars.

Compound Filling.

Special electrically heated ovens and boilers are installed at the end given over to the erection of compound-filled switchgear. The ovens are used for drying the castings before pouring, and for other miscellaneous work. The boilers, fitted with stirring blades to prevent local heating, are arranged for the direct filling of the compound-filled castings at the correct temperature.

Avoiding Leakage at Joints.

To avoid compound leakage at the joints, the compound-filled chambers are filled at the works, and despatched with cover plates bolted over their openings. On erection at site these plates are removed and small expansion chambers are fitted, which allow the compound to expand without being

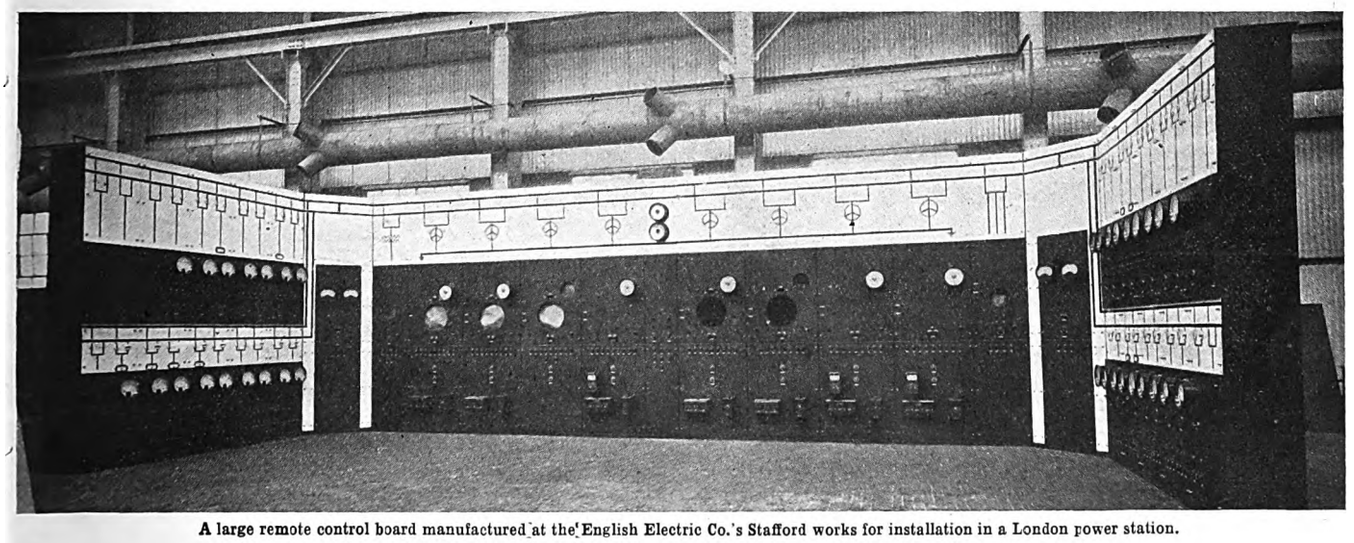


A 16-pillar compound-filled unit being dismantled for despatch from the Stafford works.

forced out between the joints. The compound can return to its place when the temperature falls, so that by this means it is ensured that air spaces and cavities cannot be formed inside the compound-filled chambers. Another important feature of the English Electric design is the provision of dust and moisture-tight shutters. When the pillar is withdrawn, the shutters, which are provided with a flexible steel lining edged with felt, are pressed on to the spout faces by an ingenious cam arrangement on the shutter mechanism. This prevents the accumulation of dust and moisture on the inside lower part of the spout face, which, incidentally, is the one part which cannot be cleaned without making the whole of the switchboard dead.

Special Finishes.

The special finish annexe, a busy and important auxiliary to the main processes, is equipped for plating with tin, copper, zinc, silver and nickel, for spray coating and for stove enamelling. Finish plays an important part in switchgear of all kinds, for while protection from corrosion, adaptability to cleanliness, and good appearance are valuable features, there are also certain problems arising from the Peltier effect which can be largely diminished or eliminated by suitably plating contact surfaces which, for one reason or another, are of different



A large remote control board manufactured at the English Electric Co.'s Stafford works for installation in a London power station.

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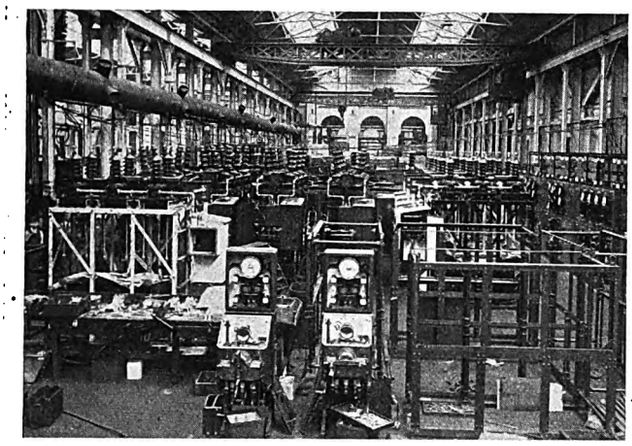
metals. Considerable use is now made of cellulose paint in various colours for spray coating the interior of relay casings, and other similar purposes.

The requisite voltages for flash tests for apparatus up to



Some 22 and 33 kV oil circuit breakers at Stafford. They are destined for use in various schemes at home and abroad.

66 kV working pressure are provided by means of portable testing sets. Facilities are also provided for carrying out motor and solenoid operation tests, mechanical tests and endurance tests in situ, so that it is not usually necessary to move finished apparatus into a special test area.

For the higher voltages and for testing outdoor apparatus under artificial rain, etc., a special portion of the erecting shop is set aside between the assembly shop and despatch departments. In this section tests can be carried out up to 500 000 V.

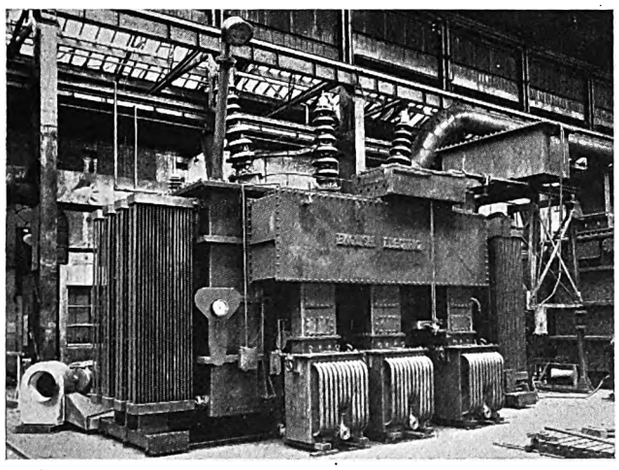
Testing of complete apparatus in conjunction with the plant which it has to control is carried out in the main test bay of the works.

The advantage of this method is obvious, as, for example, automatic sub-stations tested at the works with their own transformers, machines and switchgear can be despatched correct in every detail, without having to rely on site tests to any great extent.

On-load Tap-changing.

During the visit transformers totalling several hundred thousand kVA were seen in various processes of manufacture in the works. They include a number of 132 kV transformers for the Central Scotland Scheme. These are three-phase units with on-load tap-changing equipment on the 132 kV side.

The English Electric method of on-load tap-changing can be described as the mid-point auto-transformer scheme.



An English Electric 15 000 kVA, 132 kV, three-phase transformer, with on-load tap-changing equipment, for the Central Scotland Scheme.

Tappings are arranged on the main winding corresponding to half the number of voltages required, and intermediate voltages are procured from the mid-point of the auto-transformer. Connections are made in various combinations by means of external contactor mechanism and tap changing switches. There is only one regulating winding—there are no parallel circuits, and it is claimed that no part of the winding is subjected to overload during the tap-changing process. The company's view is that this scheme gives the simplest possible design of the main transformer, and the tap-changing equipment is entirely external to the maintank, thus facilitating easy inspection.

The Central Scotland transformers are arranged to give 75 % of their full load output by means of natural cooling, and for the higher loads an air blast is automatically brought into play on the radiating surface by means of a thermostat operating on the transformer temperature.

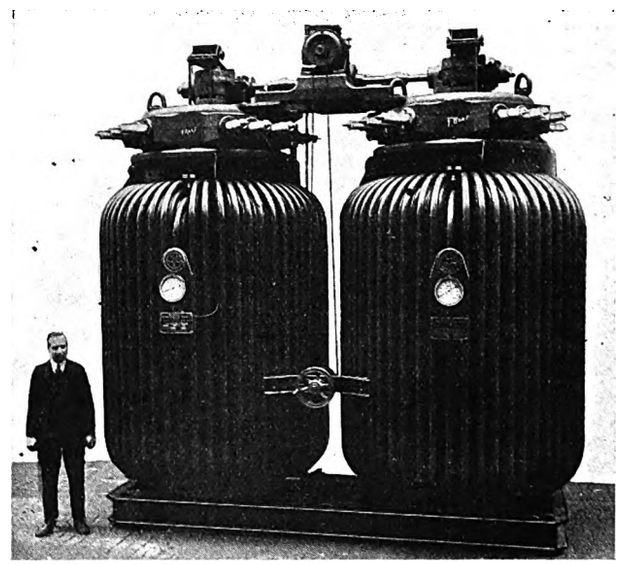
These transformers are despatched to site by rail in their own tanks and full of oil, so that no drying out on site is necessary and the minimum amount of work is required to put them into commission.

In addition to equipment for the Central Scotland scheme, the company is building a large number of 33 kV transformers for the Central Board's schemes in South-East England, Central England and North-West England. All are completely self-cooled, and all have on-load tap-changing equipment on the 33 kV side.

Induction Regulators.

During recent years the English Electric Co. has intensively developed induction regulators and at the time of our visit a large number were going through the works. There is one order of fifteen units for Australia, each unit being arranged automatically to control a 1 750 kVA, 6 600 V, three-phase feeder. Further orders are in hand for Australia, some of them for use on 3 600 kVA feeders.

The company has also built what it believes to be the largest twin unit induction regulator ever manufactured. These



A large twin unit induction regulator which gives plus and minus 10% regulation on 12 000 kVA 11 000 V three-phase feeders.

units, which are illustrated above, give plus and minus 10% regulation on 12 000 kVA, 11 000 V, three-phase feeders.

In addition to the larger units the English Electric Co. has developed a standard line of small induction regulators suitable for controlling low voltage distributors up to about 100 kVA capacity. These regulators are finding application in distribution networks where the increase in domestic requirements is causing poor regulation. It is claimed that not only does the use of the regulator cure the regulation trouble, but it increases the capacity of the distributor. The company has also developed a regulator for giving separate regulation on the three phases of an unbalanced three-phase, four-wire system.

Mr. J. H. Thomas (Minister of Employment), is considering a scheme, sponsored by Viscount Elibank, for the construction of an underground goods railway in London. It is claimed for the scheme that its construction would provide at least four years' work for 60 000 men, and the estimated cost is £40 000 000. The promoters ask for a Government guarantee of the interest on the capital outlay. The scheme includes a track of some 75 miles to link up the wharves with the various railway stations and big stores in the West End. Wherever possible the depots or stations will be on street level, but elsewhere they will be underground, and lifts will carry the trucks to the surface.

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MARINE ELECTRICITY

Over £13 000 000 is Now Being Spent on Groups of Electric Ships—Operating Schedule of a Large Electric Liner—The Central Power Station Goes to Sea—Marine Electricity —The New Era.

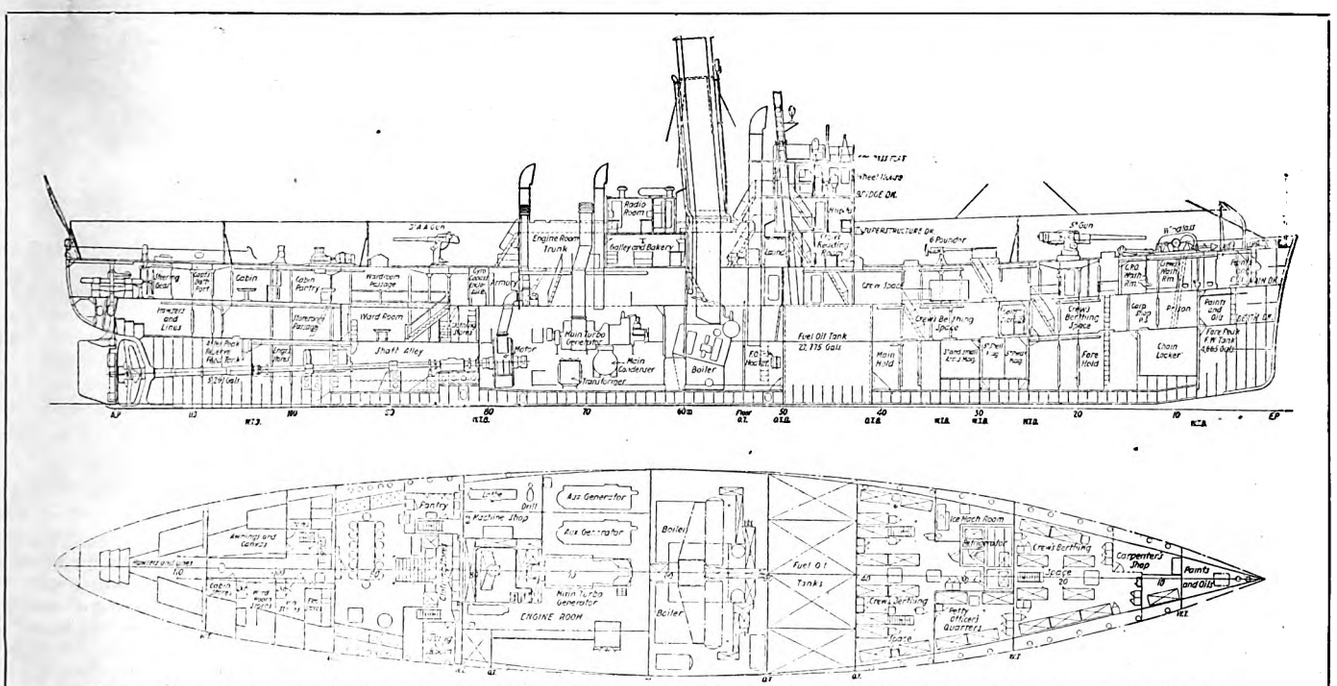
By A. C. HARDY, B.Sc., A.M.I.M.E. (Author of "Merchant Ship Types," etc.).

MARINE electricity continues very gratifyingly on the up-grade, both qualitatively and quantitatively. An important order has recently come to this country to a Belfast shipyard—for the entire remodelling and modernising of an existing electric ship, and for the conversion of the machinery from Diesel-electric drive into turbo-electric drive. In America, during July, the launch took place of the big turbo-electric liner "Pennsylvania," which is the third unit of the £4 200 000 building programme of the International Mercantile Marine Company. There are still rumours, which, unfortunately, as yet cannot be officially substantiated, that a British shipping company is to place a contract for a large electric liner.

Orders have been placed for several small electric ships of interesting type and trials have recently taken place of a new all-electric U.S. Coastguard cutter which is decidedly worth more than passing interest. As far as "auxiliary" electricity is concerned, a retrospective review of the situation reveals that shipowners are drawing upon the products of electrical firms to an ever-increasing extent. The applications of electricity in the "auxiliary" sense are widening and, together with this, electrical gear more and more is being adapted to, and built for, marine purposes only.

A great deal of capital, too, is now being locked up in electric ship propulsion. The Dollar Line, for example, is making a total expenditure of something like £9 000 000 on the construction of its six big passenger-cargo vessels for round-the-world trade. In addition to this, there is the £4 200 000 programme mentioned above. The "Pennsylvania" is to take her maiden sailing from New York for the Pacific coast on October 10th. The new vessel will be 613 ft. in length, with an 80 ft. beam, and a total displacement of 34 000 tons. Her total depth from keel to upper deck is 100 ft., and she will have a total possible S.H.P. on twin screws of about 17 500 H.P. This is just over twice the proposed power of a new electric passenger and cargo ship, which is to be built for particularly arduous service in Alaskan waters operating out of ports in Puget Sound, where fogs are very prevalent, navigation extremely difficult, and first class repair bases not always to hand. It is announced that some £600 000 will be spent on this ship, this totalling, even in the examples mentioned above, an expenditure in electric shipping of something like £13 800 000. Truly, with figures like this before us, we are justified in holding out electric ship propulsion as creating yet another era in modern sea transportation. And remember that this is a figure which includes certain propulsion orders and takes no account of the substantial contracts which are coming to the firms which make standardised electric motors for auxiliary purposes. What such a contract means for a batch of ships we shall see later. Neither does this total take into account, because it is confined to mercantile vessels, an expenditure made by the U.S. Government upon five fine turbo-electric coastguard cutters of 3 000 S.H.P., 17 knots speed, and of 2 075 tons displacement on a 15 ft. draft. The total cost per ship worked out at £180 000, of which individual total the machinery cost accounted for about £35 800.

It is, perhaps, indicative of the confidence with which the U.S. Government regards electric propulsion, that an electric ship should have been chosen to operate in Far Northern waters, occasionally within the Arctic Circle. This ship, the Diesel-electric ship "Northland," to which reference has often been made in these notes, has completed a long term of service with every satisfaction. But it is, perhaps, even more indicative of the confidence with which the private shipowner regards his electric ship when an examination is made, from a detailed point of view, of the work which Great Britain's first big electric liner, the "Viceroy of India" is now doing. The ship is, as was indicated in the last article, spending the summer cruising in the Mediterranean, and covering a total of about 21 000 miles. The series of cruises numbers five, and, for the whole of these, the first one of which started at Tilbury on May 31st and the last one of which terminates at Tilbury on August 23rd, only 108 hours are spent in a home port. The shortest period is 28 hours and the longest 30 hours, the average being 29 hours. Southampton is the port from which the cruises are starting, and the longest period in this port—30 hours—is actually four hours short of the longest stop in a cruise port—in this case 34 hours in Naples on August 3rd during the fifth cruise. After returning to Tilbury the "Viceroy of India" resumes her normal schedule in the London-Bombay mail with a sailing on August 30th—only one week after completing her cruise work. But when we consider that the average 29



The compactness of turbo-generators is well shown in this "central power station" for sea-going work—the 3 000 h.p. U.S. coastguard cutter "Chelan."
(Reproduced by courtesy of "Marine Engineering.")

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hours' home port spell has to allow time for repairs (if any), refuelling, revictualling, landing one set of passengers and embarking another set, and that of these 29 valuable hours a certain proportion necessarily is at night, then surely we are right in suggesting that, even an oil tanker, with her quick turn arounds, will not work as hard as will the "Viceroy of India" this summer. Her owners could not have chosen a better or more drastic method of "shaking down" the machinery.

A tremendous amount of manœuvring will be necessary, and here, of course, electric propulsion will be advantageous. The ship on her first cruise called at seven way ports, and the longest leg of the voyage is between Philippeville and Tangier—some 630 miles. The average time spent in port was just over 8½ hours.

A Glance at Recent Electric Propulsion Practice.

Ship Type	*Power at Shaft*	*Type of Propulsion*	*Elect. Output*	*Dimensions.*
Ferry	750 H.P.	Diesel-generators (2)	620 kW	178×43·5×14·7
Salvage ship	160 H.P.	Diesel-generators (2)	320 H.P.	119·5×32×—
Survey ship	640 H.P.	Diesel-generators (2)	520 H.P.	167·5×31·5×18
Coastguard Cutter	3 000 H.P.	Turbo-generator (1)	2 500 kW.	236×42×26·9
Passenger Ship	8 000 H.P.	Turbo-generators (—)	—	—×60×—
Passenger Liner	17 000 H.P.	Turbo-generators (2)	18 000 kW	612×78×82
Passenger Liner	26 500 H.P.	Turbo-generators	—	653×81×42·5

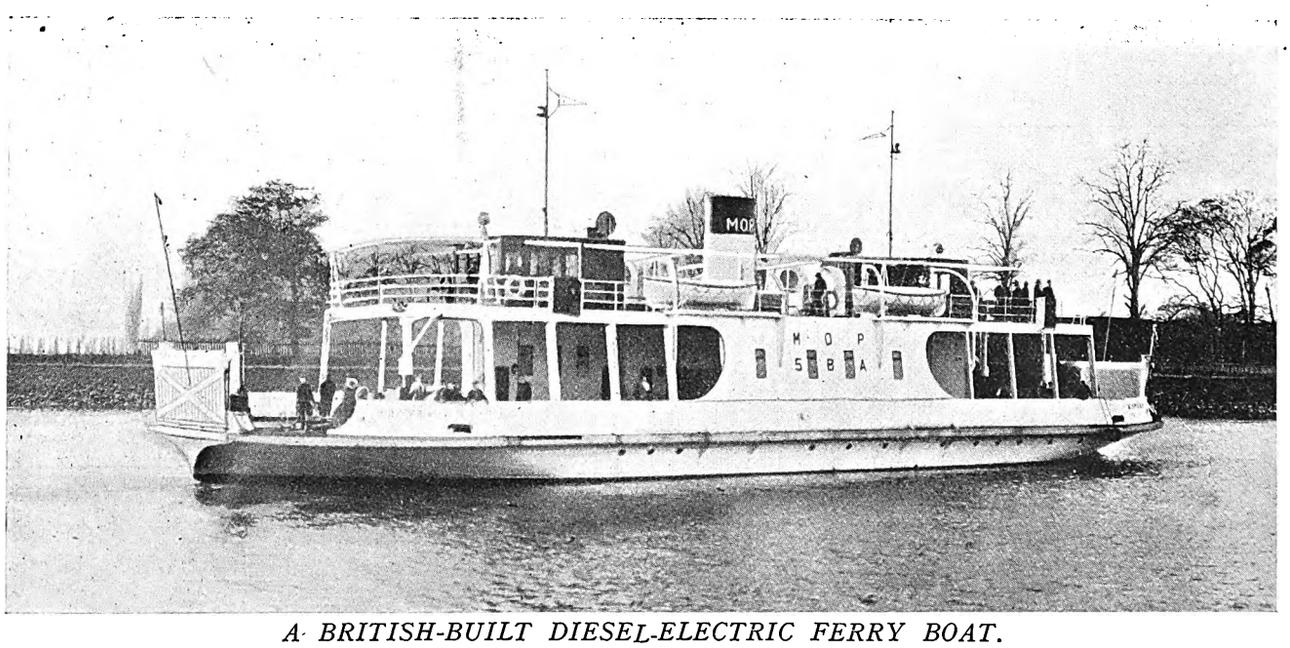
Returning now to the production side of marine electricity, those of us who are interested in marketing electric motors for driving pumps, winches, etc., may like to note that one order for a batch of three electric ships has produced recently for one firm no less than 10 149 H.P. in motors. Let us see what this amounts to in terms of auxiliary motors in the engine room and on deck. As far as the former are concerned, there are 16 motors per ship, with a total of 108 H.P. For the latter, there are three per ship, with a total of 75 H.P. Multiply these totals by three and add three propelling motors, each of 3 200 H.P., and we get the above-mentioned total of some 10 149 H.P. This, in itself, is no mean contract. The ships themselves are 232 ft. 6 in. by 34 ft. 6 in. by 14 ft. 6 in. in draft, and are the U.S. coastguard cutters to which attention has been called above, and they have a speed of about 16 knots with just over 3 000 S.H.P. They have recently been ordered to be constructed, and are practically repeats of the five ships of "Chelan" class, an inboard profile and hold plan of which is printed on page 137, and well repays study.

These little ships have been described with some truth as "central power stations sent to sea." An intelligent interpretation of this idea, on the part of the Westinghouse Company, has provided an extremely compact machinery layout for marine purposes. The ships are important, academically, on this account, and practically because they represent a successful electrification of a small fast ship which may not be without its effect upon British cross-channel ships.

Furthermore, for the first time practically on a turbo-electric ship, it has been possible to build the main turbo-generator to meet all power requirements, and most of the auxiliaries, including windlass and the principal deck auxiliaries and engine-room auxiliaries, take power from the main generating set through a transformer. At lower speeds than two-thirds of full power, however, this is not possible, and auxiliaries take their power from one of two auxiliary 3-unit generators on the port side of the power room, comprising a turbine, an a.c. generator and a d.c. generator. At certain speeds of the ship the a.c. generator is synchronised with the main generator set, the turbine cuts out and the auxiliary set, then becomes a motor. At the same time the auxiliary motors driving pumps, etc., take current from the main generator. As speed drops, the steam auxiliary turbine again picks up, and the whole procedure is reversed and the auxiliaries again feed off the auxiliary set. This arrangement is particularly worth noting in view of the possibility of its application to larger merchant ships. It is noteworthy that the superintendent engineer's report on the maiden voyage of a recent large electric liner contained a very definite complaint as to the noise of the auxiliary generators. This is one of the advantages of Diesel electric propulsion over turbo-electric propulsion—the main generator sets are also the auxiliary sets.

Layout of Plant.

On the "Chelan" class of electric ship the main generator unit comprises a turbine directly driving an a.c. generator set and supplying a 3 000 H.P. synchronous motor, developing its power at 163·5 r.p.m. The main turbine has an output of 2 500 kW at 2 300 V and 3 600 r.p.m. Steam for the main turbo-generator is supplied by two water-tube boilers, of Babcock and Wilcox type, burning oil. These operate at 250 lb. per sq. in. pressure and 250 deg. superheat, and represent the latest high pressure boiler practice. Fuel for these boilers



A BRITISH-BUILT DIESEL-ELECTRIC FERRY BOAT.

A RECENT addition to the steadily increasing number of electrically-propelled vessels is a shallow draught ferry boat built by Yarrow, Ltd., to the order of the Argentine Government for service on the River Parana. The electrical propulsion equipment and auxiliary electrical machinery and fittings were made by the Metropolitan-Vickers Electrical Co. The vessel is 145 ft. long and 40 ft. wide, and has a displacement of 340 tons. Propulsion is by twin screws at each end of the vessel, each of the four screws being direct driven by a separate motor rated at 200 H.P., 250 V, 350 r.p.m. Power is obtained from two main generating sets each consisting of a six-cylinder 350 r.p.m. M.A.N. Diesel engine direct-coupled to a 170 kW d.c. propulsion generator and to a 35 kW d.c. auxiliary generator. Manœuvring control is possible from each of three alternative stations—one in each of two pilot houses, situated at opposite ends of the bridge deck, and one in the engine room. Each pilot house controller controls one pair of motors driving the propellers at the opposite end of the vessel, and only one of the pilot house controllers can be used at a time. In the engine room there is only one controller, which is arranged to control whichever pair of motors is in operation or selected for operation, by the deck control gear.

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is supplied from four cross bunker tanks arranged as one compartment forward of the boiler room. These have a 90 000 gal. capacity which gives the ships an 8 000 mile cruising radius at about 14 knots. The boiler room is separated from the power room by a watertight bulkhead, inter-connection being by means of an air lock. Control of the main propelling motor is arranged on the upper platform in the main power room on the starboard side. There is no control in the pilot house. This would apparently indicate that although there are certain very definite advantages in pilot house control, a very sharp cleavage of opinion seems to exist in the matter. It is worth putting on record, for what it is worth, that Diesel-electric ships apparently use pilot house control more than turbo-electric ships. Its employment on small craft of the tug and ferry type which are electrically propelled seems very obvious.

Actually these cutters are large ocean-going tugs and salvage vessels, for part of their duties consists in proceeding to the assistance of vessels in distress. We may here note that it was an electric coastguard cutter which towed the disabled British motorship "Silvermaple" from mid-Atlantic to Bermuda, picking her up when she was rolling almost helpless with a broken rudder head. For purposes such as this the hulls are designed to be very sturdy and of flush decked type. All superstructure is amidships. But the most interesting part of the whole ship is the power room. And here we begin to see the development of an entirely new marine engineering technique—a technique which will probably do much to revive the flagging fortunes of steam propulsion as it existed in the days before the marine Diesel engine became such an important factor in propulsion.

For consider that the electric ships, big and small, which we are discussing month by month in these notes do not represent the final word by any means, and that even lower costs per unit for propulsion may be attained. As far as power room layout is concerned, improvement will be along the lines of increased compactness, although a great deal has been accomplished in this direction already. The early electric ships were "spread-out" affairs with the propelling motor usually segregated to a special compartment in the extreme aft end of the ship. To-day that is all changed. Specially ventilated motors are in the power room itself under the eye of the man on watch. The turbo-generator is neatly arranged above the condenser and transformer, and occupies, in relation to power developed, almost infinitesimal space. The electric power room is becoming a "double-deck" arrangement with generators, control panel, and switchboard on the top level, and all the many auxiliaries which a steam prime mover inevitably requires on tank top level. The boiler plant is really the most space-eating part of the power plant, but, even here, improvement in boiler design in the way of high pressures and high superheat is reducing this to a minimum.

A Significant Change.

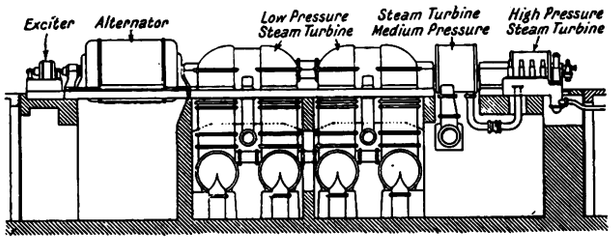
Notice also how the development of marine electricity has brought about a juxtaposition in the whole ship-constructing industry. Whereas formerly the electrical firm was a mere sub-contractor to the engine-building firm, in the case of the electric ship the electric firm takes the whole of the machinery work in its own hands, sub-letting such portions as pumps, and, in some cases, boiler, to the marine engineering firms. All this, however, requires a very special knowledge of marine conditions, so that when we visualise "marine" electricity as a special and specialised industry we see that this is indeed no exaggeration. It is an industry which deserves the closest of study in this country because, perhaps, in conjunction with some form of pulverised fuel, it may be of assistance to our bunker coal trade. Once we establish in our minds the idea that in electric propulsion the success or failure of the scheme depends upon the final cost per unit of power delivered to the propeller, and that on a tried, existing ship this has been established at 0·346d. per unit, we shall see that the type of fuel assumes slightly less importance. We are all searching round for an opportunity, for a channel, for a formula to apply to our coal industry. The electric ship for a certain limited field may provide all three. Let us examine it for fast cross channel ships, basing our designs upon the U.S. coastguard cutters. Let us consider it for new Liverpool ferries, and thereby eliminate much inefficient manœuvring which at present is in existence. Let us contemplate it for large tugs, although here Diesel-electricity has so much to offer that it is questionable whether turbo-electricity can compete—particularly with coal firing. Whatever be the future for electric ship propulsion, much will depend upon the drive and energy of the electrical industries, who, after all, must market their products to the shipowner.

STEAM TURBINE DESIGN.

Interesting High Pressure Unit for Paris Undertaking.

A 75 000 H.P. high-pressure steam turbine which the Société d'Electricité de Paris has ordered from the Oerlikon Co. for the extension of the St. Denis power station, marks an important advance in steam turbine design, as it is believed to be the first time that such high power has been generated in a multi-cylinder steam turbine set arranged with continuous shaft, and running throughout at a single speed of 3 000 r.p.m.

Under normal working conditions, the steam pressure



The Oerlikon turbine for the St. Denis power station.

measured immediately in front of the turbine amounts to 710 to 850 lb. per sq. in. (abs.) while the steam temperature is 842 deg. to 900 deg. F. In exceptional cases, the steam turbine must be capable of withstanding a pressure of 995 lb. per sq. in. and a temperature of 932 deg. F. The new turbine is thus built for steam pressures which have rarely been used up to now in conjunction with such high temperatures.

The installation is provided with plant for distilling, de-aerating and pre-heating feed water.

The steam turbine is coupled direct to a three-phase generator running at 3 000 r.p.m., and developing a continuous output of 50 000 kW at 0·7 power factor and a pressure of 10 500 V.

ELECTRICAL DEVELOPMENT PROSPECTS.

MR. R. P. Sloan, chairman and managing director of the Newcastle-upon-Tyne Electric Supply Co., Ltd., stated, in the course of an address to the Scottish Institute and North-East Coast Institution of Engineers and Shipbuilders at Newcastle recently, that no really substantial reduction in the price of electricity was likely to take place for a considerable time to come. With a recovery in trade the raising of capital should not offer any real difficulty to railway electrification, particularly as the establishment of the national grid should considerably reduce the amount of capital to be found by the railway companies both on mains and generating stations. To-day few factories of any size were without electric power in that district. Until recently, electricity had been commonly regarded as an extravagant heating agent. In practice, efficiency alone swung the balance of cost in favour of electricity and again items such as reduced labour costs, low maintenance charges, less rejects and spoilt work, cleanliness and ease of control were qualities of great value, and had greatly extended the field for electric heating.

AUSTRALASIAN ELECTRICAL DIRECTORY.

The eighth edition of "Tait's Electrical Directory of Australia and New Zealand" contains particulars of all electricity supply undertakings in Australia and New Zealand. These are arranged in alphabetical order, and the information given includes name of supply authority, type and capacity of plant, voltage and system of supply, mileage of distribution cables, number of consumers, population, prices charged, statistics of output, maximum demand, costs, etc., and name of engineer. In addition, particulars are given of all electric tramway undertakings. In the case of some cities having more than one authority or system of supply, maps are included showing the boundaries of the areas. There are also maps of the various States showing the electrically-supplied cities and towns and the principal transmission systems. Tables show the electric power installed in collieries in New South Wales, the number and generating capacity of electricity supply undertakings, the number of consumers and the population in the various States, the respective numbers and total capacity of steam, oil, gas, and water-power stations, the horse power of electrical and other power plant in factories, and mileages and other statistics of tramways. The price of the book is 7s. 6d., plus postage.

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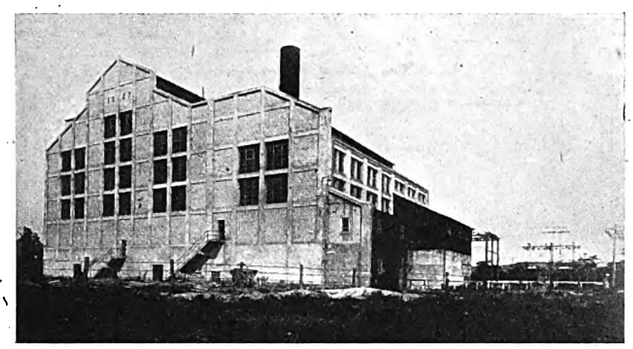
COCKLE CREEK.

New Central Power Station in Connection with Colliery Plant.

CONCENTRATION of electricity supply in larger stations is a policy which is finding application in many countries, and a notable recent example is to be found in the power station erected by Caledonian Collieries, Ltd., of Newcastle, New South Wales. This station, views of which are reproduced on this page, is designed to supply the requirements of all their own collieries and also a number of outside consumers. The new station thus takes the place of a number of medium-sized plants, each situated at the individual collieries of the group.



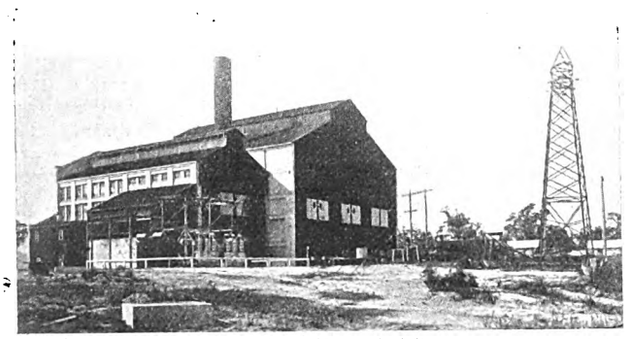
Exterior view of the Cockle Creek (N.S.W.) power station.

Already it has been found that the installation of the central plant has reduced generating costs considerably. As continuity of supply is an important consideration, the whole plant has been arranged in duplicate. The transmission line has to cross tracts of country where bush fires are frequent, so the whole of the transmission line has been erected on steel towers. In order further to safeguard the plant against involuntary shut downs due to line failure, insulators which are in excess of the rating usual for the voltage have been used, and results since starting up of the plant have fully justified this additional expense.

The power station is situated between the Barnsley and Cockle Creek stations on the Newcastle to Sydney, N.S.W. Government Railway, adjacent to Cockle Creek, from which salt water for condensing purposes is pumped. The building is of reinforced concrete, with brick panelling, ample provision being made for extensions as required.

Plant Installed.

The plant at present installed includes two 5 000 kW turbo-alternators generating three-phase 50 cycle current at 6 600 V. Steam is supplied by two Babcock and Wilcox C.T.M. boilers, each with a heating surface of 8 619 sq. ft., fitted with superheaters having a surface of 2 240 sq. ft., and Green's Tri-Tube economisors, 4 874 sq. ft. The condensing water gravitates from Cockle Creek through the necessary screens to circulating pumps, thence through the condensers, and is discharged by gravity race into an adjacent swamp.



Another view of the station showing outdoor sub-station and type of transmission line tower construction employed.

The boiler plant has been arranged for economical firing with low-grade fuel, and as large quantities of unsaleable pit waste are available adjacent to the power station, the generating costs are low. Furthermore, in the event of industrial trouble, continuity of operation is thus assured.

The current is stepped-up at the station from a generating pressure of 6 600 V to 33 000 V at an outdoor sub-station, arranged in duplicate, and the energy is then transmitted to sub-stations at the various collieries. The overall length of the main transmission line is twenty miles. A secondary transmission line operating at 6 600 V feeds two of the company's collieries and outside consumers in the same district, near the power station.

An unfailing supply of fresh water of a quality suitable for boiler feed without treatment is available. The conditions as to fuel supply, condensing water, fresh water, etc., indicate that this undertaking is one which should grow. That the station has been in operation continuously for the past two years indicates that the supply is reliable.

Power Margin for Sale.

At present there is ample margin of power for sale to outside consumers, particularly as there is a wide area of land in the vicinity eminently suitable for new industrial sites in the rapidly progressing industrial centre, where are already situated the iron and steel smelting works and rolling mills of the Broken Hill Proprietory Co., Ltd., the wire netting works of Lysaght Bros. and Co., Ltd., the wire and nail works of Rylands Bros. (Australia), Ltd., the Railway Wheel and Axle Works of Vickers-Commonwealth Steel Products, Ltd., the Australian Wire Ropes, Ltd., Sulphide Corporation, Ltd., cement works, etc.

The design and construction of the whole of the power station and transmission system was under the supervision of Mr. J. E. Donoghue, consulting engineer.

CANADIAN POWER PROJECTS.

Proposed Developments in British Columbia and Ontario.

THE West Kootenay Power and Light Co., Ltd., has made application to the British Columbia Water Board for a licence permitting them to establish a power plant at the mouth of the Adams River, at the level of the Shuswap Lake. The new power plant would be linked up with the company's main transmission lines from Bonnington Falls via Kelowna, and the power generated would be utilised largely by mines in the Princeton district, including that of the Granby Consolidated Mining and Smelting Co., at Copper Mountain. The new plant would develop some 25 000 or 30 000 H.P., which would assist the company in supplying the rapidly increasing demands on its parent company. In the meantime, the British Columbia Government has been assured that the company has decided definitely to proceed with the harnessing of Pend Oreille River, near the International boundary, south of Nelson, which will be one of the largest hydro-electric power developments yet undertaken in the Province.

The West Kootenay Power and Light Co., Ltd., also contemplates the erection of a dam at Granite, the construction of which is expected to add greatly to the output of its big power plant at Bonnington Falls. Granite is situated at the outlet of the Kootenay River from the lake, and the output of the Bonnington Falls plant has hitherto been reduced to one-half of the maximum of 150 000 H.P. through the lack of a sufficient head of water, when Kootenay Lake is low.

The Ontario Government has approved of the purchase by the Ontario Hydro-Electric Power Commission of the Claybank, Stewartville, Burnstown and High Falls power sites in the Upper Ottawa Valley. These sites are now in the possession of the M. J. O'Brien Co., Ltd., and the purchase price is stated to be $1 800 000. The acquisition of these sites adds approximately 100 000 H.P. to the available water power resources of the Commission.

ELECTRIC BATTERIES IN CANADA.

According to the Dominion Bureau of Statistics at Ottawa, the production of electric batteries in Canada during 1928 amounted in value to $8 189 573, as compared with an output worth $7 722 011 in 1927 and $7 766 798 in 1926. Storage batteries were made in 17 different establishments, and the total production was valued at $4 590 984. The output included 61 357 batteries worth $398 121 for radio filament lighting and plate supply, 467 886 batteries valued at $3 283 913 for the starting and ignition of internal combustion engines, 60 085 units (cells or jars) worth $414 842 for farm lighting, and $494 108 worth for all other purposes. Dry cell batteries for radio purposes, flashlights, etc., made in four plants, numbered 33 585 301 individual cells valued at $3 437 410. Battery parts and supplies were worth $161 179. Imports of batteries into Canada during 1928 totalled $701 289 in value and included 33 278 storage batteries valued at $598 754 and primary electric batteries valued at $102 535. Exports are not shown separately in the trade classification.

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RECENT ELECTRICAL PROGRESS IN INDIA.*

Developments in the Indian States—Outstanding Hydro-Electric Projects—Supply on a Kilowatt-year Basis—Transmission and Distribution Problems.

By A. T. COOPER, M.Inst. C.E., M.I.Mech.E., M.I.E.E., M.Conr.E.

(*Continued from page* 46).

ONE-THIRD of the total area of India, containing a fifth of its population, is ruled over by hundreds of Indian princes having their own internal governments. Many of these rulers have been quick to recognise the advantages of the use of electrical energy, and possess up-to-date installations for its generation and distribution. A few recent developments may be briefly described :—

Hyderabad.—The Nizam's Government early recognised the value of electricity supply in the capital city, and dealt with its initial lighting requirements by means of a small steam-driven installation located in the Mint. The demand, however, rapidly outgrew this plant, and a few years ago a new power station built on a rocky promontory in the Hussain Sagar Lake came into operation. This is equipped with "unit" coal pulverisers, water-tube boilers, and 6 600 V three-phase turbo-alternators. The lake water is circulated for condensing purposes. A general supply is given for public and private lighting in Hyderabad City, and also in the British Cantonment of Secunderabad a few miles away. Although there are several other towns of importance in the Nizam's broad dominion, only one of them (Aurungabad) has yet been equipped with a general system of electrical distribution.

Indore.—Is about to put down a new power station in the heart of the industrial area of the city, in which there are nine cotton mills and sundry other industries. This will generate three-phase energy at 6 600 V, and the initial plant will be oil-engine driven on account of the difficulty in obtaining sufficient water for steam operation. Mr. Palairet, the Minister responsible, estimates that a 10 000 kW plant will be necessary in a few years' time.

Travancore State.—Has just instituted an electric supply undertaking at a cost of over Rs. 4 lakhs for supplying the capital, while four small water power plants are in operation in the tea districts.

Jaipur State.—In 1926 put down an up-to-date oil-engine driven power house and a complete system of underground mains in the City for street lighting and general supply.

Udaipur.—Is about to instal a small steam power house for palace lighting and general supply.

Hydro-electric Schemes.

Mr. J. W. Meares, in a paper read before the Royal Society of Arts in 1922, described the arduous work which had been carried out by him and his colleagues in connection with the location and assessment of the water power resources of India, and the schemes which had at that date been carried out.

Since then three outstanding projects have presented themselves for record :—

The Tata Power Company.—This company's scheme forms the third section of the development of water power in the Western Ghats for transmission to Bombay City and its environs, so courageously undertaken by the firm of Tata and Sons. The first two sections, viz., those of the Tata Hydro-Electric and the Andhra Valley companies were dealt with in the paper presented to the R.S.A. by Mr. Alfred Dickinson in 1918. The triple installation is perhaps almost unique, inasmuch as energy is entirely derived from rainfall averaging 200 inches a year and stored within the actual catchment areas. Electricity supply must, therefore, be sold by the kilowatt-hour as in the case of thermal power stations, whereas undertakings deriving their power from the harnessing of rivers can enter into contracts for supply on the basis of the kilowatt-year, as the flow continues whether transformed into electrical energy or not.

The combined output of the three undertakings, according to the latest available figures, is 280 million units per annum, and the maximum joint load so far recorded on the power houses 120 000 kW—i.e., less than two-thirds the installed plant capacity, while an annual load factor of only 25% is revealed. The Bombay mill troubles must be blamed for the poor load factor, but it is evident that additional outlets for the power supply must be sought before this important combination is loaded up to a favourable economic level.

Madras Presidency.—Estimates have recently been put forward in connection with a 40 000 H.P. development in the Nilgiris called the Pykara-Moyar project, involving the construction of two power stations in series hydraulically, and with heads of 3 250 and 1 000 ft. respectively. It is proposed to transmit at 150 000 V along the Southern India Railway to Madras, a distance of 350 miles. The total outlay, including Rs.130 lakhs for transmission lines, is put at over Rs.4 crores, and it is apparently anticipated that the necessary revenue will be obtained at the comparatively high average bulk supply rate of 0·80 anna per unit sold. The justification for transmitting 350 miles, with all the risks and losses involved thereby, in order to sell electrical energy at a rate higher than that possible with a thermal generating station on the spot appears to be somewhat doubtful.

Millions of Water Horse Power.

Apart from these projects little further appears likely to be done with India's millions of water horse power. Hydro-electric propositions may be divided into two broad categories :—

Those involving transmission in bulk to one or two districts offering large demands, and of which the Tata scheme is an instance, and those involving distribution over wide areas to scattered demands of small individual magnitude, as is proposed in the Punjab.

In the first case the capital outlay per kilowatt capacity rendered available may be from three to five times that of a local thermal power station, and as improvements recently made and foreshadowed in steam boiler and turbine efficiciencies bring the fuel portion of the cost of supply down to low levels, the disparity in capital charges will generally place the thermal station in a favourable position. Moreover, as the cost of the supply of electrical energy varies inversely as the output sold per unit to capital expended, it follows that hydro undertakings are far more sensitive financially to any departure from the ideal conditions of operation, viz., those of continuous output at the maximum capacity for which they have been equipped.

Turning to the second category, that of long distance distribution, the heavy cost of tapping high voltage lines creates a serious financial handicap. For lines of 100 000 V and upwards, the cost in the present state of the art is more or less fixed irrespective of the demand to be fed, and if all proper safeguards are taken is probably in the neighbourhood of Rs.2 to Rs.3 lakhs per tapping, a very heavy initial outlay in respect of supply to a small town or village.

Furthermore, reliability and stability factors enter prominently into the question of long distance transmission and distribution, while the difficulty of effecting an adequate inspection patrol is emphasised under Indian conditions.

Except in specially favourable cases, therefore, it is to be feared that the results of the work of the surveyors of the water power resources of India are likely long to remain of academic interest only.

Industrial Electrical Developments.

The great sub-continent of India, which is larger than Europe without Russia, has diametrically opposite labour characteristics from those with which we are accustomed at home, inasmuch as the lure of the country rather than that of the city is predominant among its population.

Accommodating a fifth of the human race with three-quarters of its inhabitants devoted to the cultivation of the soil, less than 10% of whom are literate, with its hundred languages and thousand dialects, India has been described by a great journalist as an ocean of all-pervading agriculture studded with a few widely scattered industrial islands.

This description may be emphasised by recording that India has only 33 cities with a population of over 100 000, few of which may be characterised as industrial in the Western sense, but that it possesses 700 000 villages—in which cottage industries are carried on during the periods of enforced agricultural idleness imposed by seasonal conditions.

(*To be concluded*).

D

* Extracts from a paper read before the Indian Section of the Royal Society of Arts.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Supply Authorities and Advertising.

[To the Editor.]

Sir,—It was recently pointed out in one of your articles on advertising for electrical contractors that the provision of decorated vans in local processions and carnivals was a cheap and effective form of publicity. While agreeing entirely to this view I would suggest, as a commercial man having close contact with electricity supply undertakings, that many of our supply authorities could with advantage make more use of this kind of publicity.

Part of the Colchester Electricity Department's display at the recent Hospital Carnival.

Chancing to be in Colchester at the time of the Colchester Hospital Carnival I secured the enclosed snapshot of part of a most effective display, which inquiry showed was prepared by the staff of the Corporation Electricity Department under the personal direction of Mr. Bacon, the commercial engineer, and was awarded a silver cup in a competition in which the Mayor of Maidstone acted as judge.

It may be of interest to some supply engineers to have a brief description of the display. It was mounted on a 5-ton lorry, gaily decorated in bright green and yellow. The back half was fitted out with a model of an old Essex mill grinding the corn. This was manned by the electricity department's carpenter dressed as a miller of the period, and sails were made to revolve by a set of accumulators fitted in the base of the mill, connected to a 12 V starting motor (taken from a car for the purpose).

The portion nearest the driver was fitted as a model labour-saving kitchen of 1929, with de luxe all-enamel "Creda" cooker, an "Inventum" water heater fitted over the sink, a "Creda" electric iron on the kitchen table, and a "Hoover" suction cleaner in the corner. Mrs. Petersen, the Credenda Co.'s demonstrator, sat in an easy chair waiting for the food to cook.

A long stick with a "Hoover" bag at the end was used from the car for collecting for the hospital, and 245 coins were counted at the completion of the tour of the town.—I am, etc.,

G. W. L.

Northampton.

"Television and the B.B.C."

[To the Editor.]

Sir,—May I say that I do not agree with your views as given in your issue of July 26th.

I do not believe that there is any public demand for television in its present stage, and, having given many years' attention to the subject, I am of opinion that facilities for public exhibition will have no effect on the progress of the art.—I am, etc.,

A. A. Campbell Swinton.

40, Chester Square,
London, S.W.1.

Battersea Power Station.

[To the Editor.]

Sir,—The London Power Co., Ltd., have noted with regret the renewed attacks that have recently been made in the Press and elsewhere upon the Battersea power station, and this notwithstanding the assurances that have already been given on behalf of the company.

Unfortunately, those from whom these attacks emanate have displayed no desire to ascertain the steps taken by the Power Co. to fulfil their obligations and to meet the objections to the erection of this station.

The Power Co. desire to state in the most emphatic manner that their engineers and chemists have evolved a perfectly practicable and commercial solution of the "sulphur problem" in which they have complete confidence, and that the menace feared will be non-existent so far as the Battersea station is concerned. Letters patent have been applied for in connection with the process.

The method and the results have been inspected by the Government chemists, and a full and complete report is about to be issued by the Power Co. to the Electricity Commissioners.—I am, etc.,

W. F. Fladgate,
Chairman, London Power Co., Ltd.

Horseferry Road,
Westminster, London, S.W.1.

Researches in Circuit Breaking.

[To the Editor.]

Sir,—I have read Mr. Dunton's lengthy contribution in your issue of July 19th, and in so far as he criticises the Electrical Research Association, I would say that his criticism is based on a mis-statement of the case, and there is, therefore, nothing for the Association to answer.—I am, etc.,

E. B. Wedmore.
Director and Secretary,
British Electrical and Allied Industries Research Association.

36 and 38, Kingsway,
London, W.C.2.

[To the Editor.]

Sir,—I am glad that Mr. Dunton has now stated what he considers to be the "wrong idea" in the method of calculation which I described in "World Power" in January, 1925, and which though not a report of the Electrical Research Association, has been adopted by them.

He states that the method depends on the equation

$$H = 2i/X^2$$

It does not! It is a graphical method depending on the equation

$$H = i\int \frac{\delta\theta}{r}$$

But the equation

$$H = \frac{iX}{Z\sqrt{X^2+Z^2}} + \frac{iY}{Z\sqrt{Y^2+Z^2}}$$

given on page 26, is mentioned incidentally as leading to algebraical methods of comparatively limited application. If X and Y are both large it is obvious that

$$H = \frac{2i}{Z}$$

but by accident this was printed as

$$H = \frac{2i}{Z^2}$$

The original draft was correct, but parts of the method were, for convenience, embodied on a tracing, and the Z^2 crept in at this point, and found its way into print when the method was subsequently published; the x^2 and r^2 on page 30 can be traced to the same source.

The method described is applicable to two-dimensional problems only, and as there seems to have been so much misunderstanding, the description will be repeated in an account of a more elaborate method applicable to three-dimensional problems which I hope to publish shortly.—I am, etc.,

W. Fordham Cooper.

16, Ferme Park Mansions,
Ferme Park Road,
London, N.8.

"Postmark Publicity."

[To the Editor.]

Sir,—While I agree with your remarks on postmark publicity, may I suggest that firms making use of it should keep up to date any slogans that are meant to be topical? Just after reading the note on this subject in your July 26th issue I received a letter from a London supply company bearing the message "Summer is Coming. Order your Electric Fans Now."—I am, etc.,

London, S.W.7. Publicist.

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NEWS IN BRIEF.

Communists and Electrical Works — Situations Vacant—The Mayor of Brighton Entertains—An Ontario Claim—Engineering Wages—Transformers for 2 000 000 V.

A PORTABLE type X-ray apparatus is to be installed at the Sculcoates Union.

An "electric cabinet" for the destruction of animals is being used at Derby instead of a lethal chamber.

Luton electricity undertaking showed a gross profit for the past year of £67 000 and a net profit of £26 000.

A commercial assistant is required in the borough of Bromley electricity department.

Horse-racing under electric light was successfully tried out in the United States for seven nights last month.

Electricity is to be installed at the extensions of Bingley Grammar School at a cost of £284.

Tubular heating is to be installed in the committee room at the Poplar Borough Council offices.

Bradford Baths Committee recommends installing an electrically driven hydro-extractor in the laundry at the Windsor Baths.

Yeadon Education Committee is to instal electricity at the Yeadon and Guiseley secondary school at an estimated cost of £350.

A site in Ford's Yard, Brandon Road, Belle Isle, is to be bought by Islington Electricity Committee for the erection of a sub-station.

The Metropolitan Asylums Board is to instal a goods lift at Darenth Training Colony, at a cost of £325, and electric lifts in the North Western Hospital are about to be reconstructed.

Steps are about to be taken by the Birkenhead Electricity Department to introduce an assisted wiring scheme.

An exhibition arranged by Lytham St. Annes Electricity Department was opened last week in Holy Trinity Schools, Kirkham.

Additional premises to the number of 2 326 have been connected to the mains of the Birmingham electricity undertaking during the last three months.

A technical officer is required at the Royal Aircraft Establishment, South Farnborough, for writing descriptive matter and instructional handbooks on wireless and electrical apparatus. Form from Chief Superintendent. (Reference A. 358.)

Messrs. Philips, of Eindhoven, Holland, manufacturers of electrical and wireless equipment, having dismissed a large number of Communist employees, the police guard on the firm's works has been considerably reinforced, as foul play is feared.

Fire broke out in the toolshop at the Streatham Hill works of the Relay Automatic Telephone Co. on Monday evening, when 50 girls made good their escape. The company's brigade checked the fire in 30 seconds and three London brigades answered the district call. See page 151.

The Swansea Branch of the Electrical Association for Women spent an afternoon at St. Madoc, Broughton Bay, Gower, last week, by invitation of Mrs. Burr, chairman. About 50 members attended and after tea Miss Burr presented a playlet entitled "The Lady Interviewer."

The electrical equipment in the White Star Line's 27 000-ton motor vessel, the "Britannic," which is to be launched from Harland and Wolff's Belfast shipyard on August 6th, includes nearly 200 motors ranging from 1 to 170 H.P. In addition to the operation of lifts, water-tight doors, steering gear, winches, pumps and auxiliary machinery, electricity will be used in connection with cooking, ice cream making, potato peeling, printing, etc.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated August 2nd, 1879 :—*

An underground telegraph cable was laid between Hamburg and Bremen, and Oldenburg and Emden.

Dr. C. Herz, European concessionaire for Edison's quadruplex system, was invited by the French and Belgian Governments to place at their disposal apparatus for quadruplexing the line between Paris and Brussels.

* * *

TWENTY-FIVE years ago, it was stated in THE ELECTRICIAN *of August 5th, 1904, that :*

The author of a paper on boiler house problems said that "none of the items which make up the total costs of production, with the exception of coal, are capable of being materially reduced, as the economical limit has been reached."

Although there were signs of an inclination towards the erection of overhead lines up to, say, 10 000 V, it was doubtful whether this figure would frequently be exceeded in this country owing to the short distances over which it was necessary to convey energy.

* * *

FIFTEEN years ago THE ELECTRICIAN *dated July 31st, 1914, reported that :*

The tercentenary of Napier, the inventor of logarithms, was celebrated in Edinburgh.

Mr. R. Birkett, of Southend, was the first municipal electrical engineer to order an electric battery 'bus.

A special committee of the London County Council recommended that Parliamentary powers should be sought to establish a new authority to unify electricity supply in London.

The accounts of the St. Pancras (London) electricity undertaking for the year ended March 31st show a net profit of £37 586.

Fourteen hundred guests were entertained by the Mayor and Mayoress of Brighton (Alderman and Mrs. Galliers) at a garden party at the Royal Pavilion last week.

Swansea Education Committee recommends the overhaul of the electric lighting and heating installation at the training college.

A 2 000 000 C.P. beacon is to be erected at Chicago for the guidance of aircraft. The new light will be called the Lindbergh Beacon.

At a meeting of the Finchley Council last week it was stated that the electricity department required 9 000 tons of coal, but had been able to obtain only 5 000 tons.

Sanction to borrow £675 for the purchase and adaptation of property and a sub-station plant at White Lund, has been received by Morecambe Electricity Committee.

Fulham B.C. has voted £78 15s. for the conversion of the lighting supply in the new part of the town hall building from 100 to 200 V, and for the improvement of lighting in refreshment rooms.

In a recent lecture at Dresden on the development of e.h.t. equipment, Dr. Reiche declared that the firm of Koch and Sterzel had just succeeded in constructing test transformers capable of handling 2 000 000 V.

New showrooms of the York Electricity Department were opened in Clifford Street on July 26th, by Ald. C. W. Shipley, chairman of the Electricity Committee.

The working of the Maidstone electricity undertaking for the year ended March 31st shows a profit of nearly £14 000, of which £4 000 will go to the relief of rates.

It is stated that Ontario, Canada, has a greater density of h.t. hydro-electric power lines than any other country in the world. Amongst the newest of these lines is a 220 000V transmission line, 220 miles in length, from the Gatineau river to Toronto. A second line at the same voltage over the same route is now being erected.

There was an interesting exhibition of electro-medical appliances in the exhibition held in the City Hall, Manchester, last week, in connection with the annual meeting of the British Medical Association. Apart from hospital equipment and utensils, there were on view several specimens of electric aids to good hearing, X-ray outfits, scientific instruments, etc.

The number of telephones in the United States has increased during the past five years by an average of 5·8% per annum, while the population has increased at the average rate of 1·50%. Florida with 103·7% shows the largest rate of increase over the period. California ranks second with an increase rate of 57·9%, and New York State shows an increase of 45·8%. The total number of telephones in the U.S. at the close of 1927 was 18 522 767 or one to about every 6 of population.

At a conference of engineering unions in London last week it was decided that an application be made to the Engineering Employers' Federation for a further conference, to be held in the third week of September, for the purpose of hearing their considered reply to the unions' application for an increase in wages of 8s. per week for time workers, with a corresponding increase in piecework prices. Also a deputation is to urge upon the Foreign Secretary the desirability of closer trade relations with Russia.

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PERSONAL.

MR. Herbert W. Young, president of the Delta-Star Electric Co., of Chicago, who has been on a short trip to this country following attendance at the Paris Conference on Large Electric Systems, sailed for the United States on Wednesday by the "Olympic." Interviewed before leaving by a representative of THE ELECTRICIAN, Mr. Young said that apart from the courteous reception given to Americans by the English electrical manufacturers, and their willingness to show their designs and products in detail, he was impressed with the great personal interest which British executives were showing in their switchgear departments. This was particularly true of the outdoor switching equipment, and he looked forward to its greatly increased use in England. Mr. Young thought that the advisability of using higher insulation values on the switches than were employed on the transmission lines had not in some cases been given quite the consideration that electrical engineers in the States thought was necessary. He felt, however, that the importance of this feature would be demonstrated as more experience was gained in actual operation.

Mr. Herbert W. Young.

"In the States," Mr. Young added, "it is standard practice to over-insulate the switching on outdoor sub-station equipment, so that under over-voltage conditions flash-over will not occur at those points, but will be confined to more easily replaced line insulators. This practice is followed whether or not lightning arrestors are used."

In view of the interest shown by executives Mr. Young thought there was no doubt that English-made high tension outdoor type switchgear would soon reach the high standards established by the self-contained or enclosed type of gear.

"I am returning to America," Mr. Young concluded, "with a very favourable impression of England and its business men, and I feel confident that a steady exchange of ideas between British and United States electrical engineers will be of great benefit to both countries."

Mr. Harry Pollitt has been appointed relief charge engineer at Darlington Corporation's electricity works. Mr. Pollitt has been junior charge engineer at Burnley for some time.

Mr. Richard Vynne Southwell, F.R.S., has been appointed professor of engineering science at Oxford University in succession to Prof. C. F. Jenkin.

Mr. R. H. Paterson, chief assistant electrical engineer to Hammersmith (London) B.C., has been appointed borough electrical engineer, in succession to the late Mr. F. Hill.

Senator Marconi has left Gaeta in his yacht "Elettra" for Spain, Great Britain, and Germany, and it is stated that he intends to make further experiments in long-distance wireless telephony.

The marriage of Mr. Edward Dyson, of the Rugby staff of the British Thomson-Houston Co., Ltd., and Miss Ellen Thomson, was solemnised at Christ Church, Sowerby Bridge, on July 15th.

Mr. A. Nichols Moore, borough electrical engineer, Newport, has been appointed representative of the I.M.E.A. on the British National Committee of the Welfare Conference which meets in Berlin next year.

Morecambe Electricity Committee has decided to increase the salary of Mr. M. J. Mortimer, borough electrical engineer, by £100 for the forthcoming year, and subsequently two additional increases of £50 each.

Mr. M. B. Esson, assistant secretary of the New Zealand Posts and Telegraphs Department, has been appointed as New Zealand's permanent representative on the Imperial Communications Advisory Committee.

The marriage of Mr. Fred Iredale, who has for nine years been on the staff of Halifax Electricity Department, and Miss Annie Sugden was solemnised on July 18th. The bridegroom received from his colleagues a canteen of cutlery.

At the last monthly meeting of the Ayrshire Electricity Board ex-Provost Mathew Smith, the chairman, presented to the board a replica of his portrait in oils which had been gifted to him by Kilmarnock Town Council and other friends.

Mr. F. A. Rogers, who has been with the Marconi's Wireless Telegraph Co., Ltd., at Chelmsford, for seven years, has resigned his position as chief of the estimating department, having accepted an appointment abroad, and he is succeeded by Mr. R. H. Cox.

Sir Courtauld Thomson has been elected chairman of the Imperial Communications Advisory Committee, the body concerned with the policy of the new Imperial and International Communications Company formed by the cable and wireless merger. Sir Campbell Stuart is to be deputy chairman and Sir Norman Leslie, secretary. Sir Campbell at one time represented Canada on the Pacific Cable Board.

Mr. F. A. Merrick has been elected president of the Westinghouse Electric and Manufacturing Co., Ltd. In announcing this fact Mr. A. W. Robertson, chairman, stated that the Board, while accepting the resignation of Mr. E. M. Herr, president since 1911, in order that he might go on an extended vacation, had elected Mr. Herr vice-chairman. Mr. Merrick advances into the position of president from the position of vice-president and general manager.

Among those upon whom the Council of the City and Guilds of London Institute have conferred the distinction of Fellow of the Institute (F.C.G.I.), are Mr. G. J. Gibbs and Mr. C. D. LeMaistre. The Fellowship is conferred by the Council upon those who, having obtained the Associateship of the Institute and spent at least five years in actual practice, produce evidence of having done some original and valuable research work, or of having otherwise contributed to the advancement of the industry in which they are engaged.

Mr. James Hargeaves, aged 20, of Ennismore Street, Burnley, who has obtained a First Honours B.Sc. degree at Manchester University, has carried off prizes for occupying the top place in his class in the electrical engineering course. The Royal Commission for the Exhibition of 1851 has also awarded him an industrial bursary. He will take up an appointment at Ferranti's, Ltd., Hollinwood, on August 5th, and the bursary (the only one offered to his college) is of one year's tenure, to be prolonged a second year provided the Commissioners are satisfied with his work. The salary of Mr. Hargreaves will be supplemented by £175 per annum. The bursary is awarded to enable suitable applicants to tide over the period between leaving college and obtaining remunerative employment.

West Ham Corporation has appointed Mr. J. W. J. Townley, chief electrical engineer of London County Council tramways department, as chief engineer and manager of the West Ham electricity undertaking, in succession to Mr. F. W. Purse, who was recently appointed engineer-in-chief to the London and Home Counties Joint Electricity Authority. Mr. Townley has held appointments on the technical staffs of the Paisley, Manchester, Ashton and Sunderland Corporations electricity supply undertakings and the Trafford Power Company. He went to Barnsley in 1918 as acting borough electrical engineer, and upon the return of Major Barker returned to Sunderland early in 1920 as chief assistant electrical engineer. In 1922 he was appointed deputy city electrical engineer at Bradford and held that position until appointed as electrical engineer to the London County Council Tramways at the end of 1926. See page 151.

Obituary.

MR. BRAILEY DUNLOP, on July 25th, late chief electrician of the s.s. "Berengaria."

MR. GEORGE GRUNDY DEELEY, on July 15th, aged 41 years. He was electrical engineer to the South Lancashire Tramways Co., Ltd., and had just secured an appointment in the electricity department of Hastings Corporation.

MR. A. B. WRAY, on July 20th, aged 43 years, whilst proceeding by boat from Melbourne to Sydney. He was during part of the war period manager of the Luton Corporation Tramways. He had been in Australia for four years.

MR. C. T. BRISCOE, on July 23rd. He was head of the well-known firm of C. T. Briscoe and Son, Ltd., electrical engineers and contractors, Blackburn, and a former chairman of the Blackburn sub-Branch of the Electrical Contractors' Association. See page 151.

MR. GEORGE PRINGLE FAIRLESS, a member of Stockton-on-Tees T.C., on July 8th. Coun. Fairless was chairman of the Engineering and Lighting Equipment Co., Ltd., manufacturing electrical engineers, Sphere Works, St. Albans, managing director of Fairless Engineering Supplies Co., Ltd., and chairman of Stockton Corporation Electricity Committee. He was 43 years of age.

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IN PARLIAMENT.

Replies to Questions of Electrical Interest in the House of Commons.

ABOUT 600 000 miles of wire in underground telephone cables were provided during 1928, at a cost of about £4 300 000.

The observations which are regularly taken of the London telephone service do not indicate deterioration. They show that the average speed of answer from the exchange is six seconds.

The cost to the British Government of working the Transatlantic telephone service from Great Britain for the three months up to May 31st, 1929, so far as can be estimated for such a short period, was about £25 000.

There are now three radio telephone circuits in commercial operation between Great Britain and the United States. The transmitters are concentrated at Rugby. The number of calls over these circuits during the three months ended June 30th last was 3 881.

Television Transmissions.

The Postmaster-General has received representations from the Baird Television Development Co. and from the British Broadcasting Corporation concerning the facilities offered for the use of a broadcasting station for experimental transmissions of television.

It has been decided to establish a public service between London and Berlin for the transmission by telegraphy of pictures, photographs and other similar matter. The apparatus has been ordered. It is hoped that the service will be open within two or three months.

The Minister of Transport has received representations from two important local authorities as to the desirability of initiative legislation requiring certification and stamping of all electric meters, and he is in consultation with the Electricity Commissioners with regard to them.

The Minister of Transport understands that an electricity scheme promoted by a local company makes provision for a supply to Millbrook (Cornwall). The Electricity Commissioners hope to be in a position shortly to make a Special Order in respect of this application.

Up to March 31st, 1929, the Post Office beam services had earned gross receipts amounting to £813 100 at a cost of £538 850, leaving a net surplus of £274 250. Since April 1st, 1928, the services have been worked by the Post Office acting as agent for the Imperial and International Communications Co.

The Post Office and Labour.

The amount of work for certain classes of labour employed by the Post Office engineering department has been diminishing for about the last two years, as a result of the catching up of arrears of main construction work and other causes. Lines are not falling into disrepair through employment of insufficient staff.

In the case of telegrams sent by telephone a telephone fee as for a local call is charged in addition to the charge for the telegram. The proportion of telegrams sent by telephone is steadily growing. The Postmaster-General does not see his way to incur the loss of revenue involved in the waiving of the telephone fee.

The Minister of Transport has no power to impose upon any electricity supply company, whether its shares are held by British or American interests, any stipulation as to the source of electrical machinery. The question of legislation on the subject is a wide one which cannot be considered solely in relation to electricity undertakings.

The Foreign Secretary (Mr. A. Henderson) states that the ratepayers of the International Settlement at Shanghai have approved the proposal of the council to accept an offer of 81 000 000 taels (about £10 000 000) for the municipal electricity undertaking. He has no information as to how much of the goodwill is the result of expenditure borne by the British taxpayer.

Before the consent of the Minister of Transport is given under the Electricity (Supply) Acts to the erection of any electric line above ground the local authorities concerned are entitled to be heard at a local inquiry if they so desire. It is not possible for the Minister to limit his freedom of action by laying down the principle suggested by Mr. Lawther, that priority is given to the views of the inhabitants over commercial interests by transmission cables being placed underground.

LEGAL INTELLIGENCE.

Application for Introlocutory Injunction Granted by Master of the Rolls.

IN the Court of Appeal consisting of the Master of the Rolls and Lords Justices Lawrence and Slesser on July 25th, Sir Duncan Kerley, K.C., on behalf of the Edison Storage Batteries, Ltd., said that with the view to an appeal by that company from the judgment of their lordships dismissing their appeal from the judgment of Mr. Justice Clauson granting an introlocutory injunction restraining the company from carrying on business under that name it had been agreed on terms with the plaintiffs, Edison Accumulators, Ltd., that the operation of the injunction should be suspended for six weeks. The Master of the Rolls assented to the application.

Extension of Patent.

Mr. Justice Luxmoore heard in the Chancery Division on July 25th an application by the British-Thomson Houston Co. for an extension of the period for a patent relating to X-ray tubes. The application was opposed by Messrs. Newton and Wright, electrical engineers, Wigmore Street, W., Messrs. Cuthbert and Andrews, manufacturers of scientific apparatus, Red Lion Street, Holborn, and Messrs. A. G. Dean and Co., electrical, medical and scientific engineers, Leigh Place, Holborn.

Sir Arthur Colefax, K.C., for the applicants, said the opponents were contending that the war helped rather than hindered the applicants in working the patent. The characteristic of the invention was that prior to the war these X-ray tubes which were used in the process of taking photographs depended for their efficiency upon gas, but this invention disposed of the use of gas, the tube being charged exclusively by the heat of the cathode which was one of the electrodes. It was called a Coolidge X-ray tube, and belonged to the General Electric Co., of America, who had communicated the patent to the applicants. The patent expired in June last.

His Lordship granted an extension for one year.

Inadequate Guarding of Wires.

Messrs. J. L. Clarke Chapman, electrical engineers and foundrymen, of Gateshead, were fined £50 and costs at Gateshead recently for a breach of the Home Office electricity regulations. It was stated by Mr. H. R. Rogers, an Inspector of Factories, that the firm had several "live" wires, carrying current to work overhead cranes, which had been covered by asbestos boarding. Owing to the heat of the molten metal carried by the cranes, this had been charred away and the wires were exposed in several places. On March 16th an apprentice foundryman, Wilfred Hughes, was carrying a metal carrier which came into contact with the wires. He received a shock of 200 V and never regained consciousness, dying soon after. Mr. J. H. Taylor, on behalf of the firm, said this was the first example of want of thorough inspection the firm had had in 60 years.

NEW SCREENED GRID VALVE.

A USEFUL addition to the range of valves manufactured by The Mullard Wireless Service Co., Ltd., of Nightingale Works, Nightingale Lane, Balham, London, S.W.12, and 111, Charing Cross Road, London, W.C.2, is the P.M.16. This is a low temperature filament h.f. screened grid valve, for use with a 6 V accumulator; it is stated to be the only 6 V screened grid valve on the market in this country. Although the internal screen avoids retro-active coupling through anode-grid capacity, it is necessary to screen the various circuits as completely as possible in order to avoid any stray electro-magnetic or electrostatic coupling external to the valve. In a well-designed h.f. amplifier circuit of the "tuned-anode" type, the amplification per stage is said to be very much greater than that obtainable by the use of a completely "neutralised" normal three-electrode valve. Two methods for using the valve for h.f. amplification are available. The circuit employing shunt feed to the anode of the h.f. valve is usually preferable. In both cases, the anode-bend system of rectification is advocated, so that the least possible amount of damping shall be introduced into the "tuned-anode" circuit. If a variable high resistance ($\frac{1}{2}$ to 1 megohm maximum) be connected across the tuned anode circuit, external screens may be omitted. Care must be taken that disturbance is not caused by radiation from the aerial.

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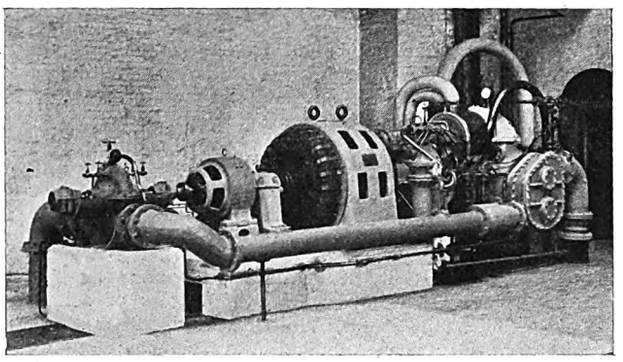
POWER PLANT.

Some Recent Contracts for Large Units and Small Self-contained Sets.

RECENT contracts placed with the Metropolitan-Vickers Electrical Co., Ltd., for turbo-alternator sets show an interesting variety of equipment, ranging from very large units for interlinked main power stations down to sets of



A "Metro-Vick" 625 kW self-contained turbo-alternator set in the Bromley works of the Gas Light and Coke Co., Ltd.

medium and small capacity for industrial power plant installations. The large units include a 50 000 kW set for the Liverpool Corporation, a 32 500 kW set for the Victoria Falls and Transvaal Power Co., and three 12 500 kW sets for the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board. The smaller sets are mainly of the self-contained type.

The 50 000 kW set for Liverpool, though not the largest of the sets which the Metropolitan-Vickers Co. has under construction, is one of the notable units which are being built for power stations in this country. It is to form the initial installation in the new Clarence Dock power station. The first set is to consist of a 51 250 kW turbine driving, at 1 500 r.p.m., a main alternator of 71 500 kVA, and a 1 562 kVA house service alternator, both alternators being excited by a double exciter also directly driven. The rated output of the set is 50 000 kW measured at the h.t. terminals of the step-up transformers. The turbine is normally to operate with steam at 400 lb. pressure and 800 deg. F. total temperature, but it will also be capable of giving full output with steam at 340 lb. pressure and 675 deg. F. The condenser is to be of the central-flow type. The main alternator, which will generate at 7 250 V, and the auxiliary generator will both be ventilated on the Metropolitan-Vickers patent closed-circuit system, with an air-cooler capable of dealing with 120 000 cubic ft. of air per min. serving both machines. In addition to the equipment above mentioned, the contract includes the step-up transformer equipment for the set, consisting of two 37 500 kVA 7 250/33 000 V three-phase core-type units, together with auxiliary switchgear.

The 32 500 kW set for the Victoria Falls and Transvaal Power Co. is for an extension to the Vereeniging power station, which is one of a chain of large steam power stations serving the mines and other industrial activities of the Rand. The set is to run at 3 000 r.p.m. with steam at 200 lb. and 330 deg. C. The alternator will have a capacity of 40 000 kVA, generating at 10 500 V 50 cycles, and will be accompanied by a closed circuit air-cooler equipment. The condenser will again be of the central-flow type. The cooling water will be taken from the Vaal River, on the bank of which the power station is situated. The Vereeniging power station is linked by an 80 000 V line with the company's 132 000 V Witbank transmission system, for which the transformers and switchgear were supplied by the Metropolitan-Vickers Co.

The three 12 500 kW sets for Stalybridge are required in connection with the change of the system from 40 to 50 cycles, the Hartshead station, in which they are to be installed, being one of the selected stations for the "grid" scheme. The sets are to operate at 3 000 r.p.m., generating at 6 300/6 600 V. It is of interest to note that with the two 7 500 kW Metrovick turbo-alternator sets which the new equipment is to replace, this comparatively small station has achieved a remarkably high efficiency and remarkably low running cost. The latest published returns, for the year ending March, 1928, show a total cost per unit, including management and all other expenses, amounting to only 0·43d. per kWh sold. The total power generated during the period mentioned was just over 40 million kWh, the load factor being 31·8%.

Of the small self-contained sets the range of standard sizes is from 200 kW to 4 000 kW, and, within the short period which has elapsed since these sets were put on the market, about 70 sets have been supplied or are now on order. Of these a considerable number are for the British Navy, some are for the navies of Chile and Japan, and the remainder are for various industries in this country and abroad.

The variety of the industrial applications is indicated by the most recent orders, which include two 2 000 kW sets for collieries in the Federated Malay States, a 1 000 kW set for a paper mill in China, a 1 000 kW set for a copper mine in Rhodesia, a 750 kW set and two 280 kW sets respectively for an ironworks and a jute factory in India, and a 2 800 kW set for an ironworks in Belgium. The last mentioned order is noteworthy in that the installation is for what may be called the home continental area, in which the competition of continental manufacturers is very keen.

TRADE PUBLICATIONS.

THE subject of dust removal is dealt with in booklet K.189 by the JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, London, E.C.4.

The HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD., Hersham, Walton-on-Thames, has published a special leaflet with respect to the closing of the works from August 3rd to 12th on account of the annual holidays.

We have received from MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, London, W.C.2, copies of leaflets Nos. 1 094, 1 095 and 1 098 describing direction finders types 11g, D.F.M.3 and D.F.M.4 respectively.

"Noise! the Problem of Industry" is the title given to a new publication by S. G. BROWN, LTD., Avenue Chambers, Vernon Place, London, W.C.1. The issue, which is fully illustrated, deals with electro-megaphones for all uses.

A summary of current information on nickel is contained in Vol. 1, No. 1, of "The Nickel Bulletin," published by the Research and Development Department of the MOND NICKEL CO., LTD., Imperial Chemical House, London, S.W.1.

The PORTER PATENT SAFETY SEALS, LTD., 7/9, Belfast Road, London, N.16, have issued a new publication in the form of a puzzle. The new issue is sealed, and the trade is asked to open it without breaking the seal. It is so good a puzzle that it even beat that practised person—the office boy!

We have received from CONSTRUCTORS, LTD., of Imperial House, Charlotte Street, Birmingham, a copy of a new shelving leaflet which should be of interest to electrical contractors. The booklet deals with steel shelving and similar fittings for both showroom and office use, as well as fittings for storerooms, etc.

The B.E.N. PATENTS, LTD., 92, Tottenham Court Road, London, W.1, have published two new catalogues dealing with air units and mechanical polishers respectively. Each of these catalogues deals in a concise and convincing manner with the merits of the goods described. Both publications are well illustrated and all possible particulars are given.

The ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2, has sent us a copy of publication No. 947, illustrating and describing oil-immersed circuit-breakers, Class OKD.1 for outdoor use on circuits up to 33 000 V. We have also received a copy of an attractive little leaflet which has been issued for friends and prospective customers desiring to visit the Bradford works.

It is interesting to note that 122 separate installations have been completed, or are on order, for high power rectifiers to operate at d.c. pressures exceeding 1 000 V. In practically every instance they are required for railway work, while in several cases they are automatically operated. Particulars of the equipment are the subject of list No. 204, by BRITISH BROWN BOVERI, LTD., of Trafalgar House, Waterloo Place, London, S.W.1.

We have received from the UNITED STRIP AND BAR MILLS, LTD., Sheffield, a handy pocket-size booklet setting out the various sections of steel strip and bar available. Many useful tables are also incorporated. It is of particular interest to learn that United Strip and Bar Mills, Ltd. (which is a branch of the United Steel Companies, Ltd.), have a service department whereby reinforcement bar is supplied in lengths, ready bent, hooked, marked and bundled, and delivered to suit the contract. A department under a ferro-concrete engineer will also get out quantities and advise generally on ferro-concrete construction.

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THE NATIONAL REGISTER.

List of Registered Electrical Contractors Strengthened by Further 24 Names.

AT a meeting of the Executive Committee of the National Register of Electrical Installation Contractors on July 23rd, 31 applications from electrical contractors for registration were considered. Of this number 24 were accepted, 2 were withdrawn, and 5 were declined.

The following are the names and addresses of the successful applicants :—

Neale, A. E., 46, Crowthorn Road, Ashton-under-Lyne.
Mathers, James S., 5A, Craven Road, Woodhouse, Leeds.
Drape and Upton, Ltd., 77, Welbeck Street, Hull.
Jennings, Wm. Arthur, 37, Easy Road, Leeds.
Hirst, George H., Lodge Lane, Beeston Hill, Leeds.
Jones, William, Bromford Lane, Ward End, Birmingham.
Morrish and Robertson, 3, Green Dragon Yard, Leeds.
Galvert, William, 71, Raglan Road, Leeds.
West Park Electrical Co., 570, Thornton Road, Bradford.
Randall's, 21, Mount Street, Cromer.
Roberts, Hugh, 211, Walton Village, Walton, Liverpool.
Taylor, Edwin, 106, Stamford Street, Stalybridge.
Parsons, Albert E., 403, Sheffield Road, Whittington Moor, Chesterfield.
Jones, Oswald, and Co., Mill Street, Maidstone, Kent.
Manning, John, and Co., 23, Coleshill Street, Birmingham.
Lowe, T. and G., 2, Cricklewood Lane, Cricklewood, London, N.W.2.
Western Electricity Supply Co., Ltd., Cainscross, Stroud, Glos.
Randall, William, 75, Spencer Street, Birmingham.
Priest, Thomas R., 2, Market Place, Blackheath, Birmingham.
Hullah, E., and Co., Grey Street, Stockton-on-Tees.
Hallam, Gifford, 168, Hall Street, Stockport.
Scott, Herbert, 19, Oldham Road, Ashton-under-Lyne.
Bustin's, J., Electrical Works, Horse Fair, Banbury.
Leeds Corporation, Electricity Department, 1, Whitehall Road, Leeds.

THE SOCIAL SIDE.

PRITCHETT and Gold won their home cricket match with A.B.C. last Saturday by 103 runs to 31.

St. Helens Cable Co.'s cricket club head the Slough Estate League, having so far played seven matches and won six, the other one being lost.

Nottingham Corporation Tramways cricket team were defeated by Sheffield Tramways by three wickets last week. Nottingham scored 100 and Sheffield 102 for 7 wickets.

On the occasion of their recent annual staff picnic the employees at Warrington Corporation electricity works paid a visit to Helsby, where the party of 60 were the guests of British Insulated Cables, Ltd.

On June 29th the directors and staff of A. H. Hunt, Ltd. enjoyed the annual outing, which again took the form of a charabanc journey to Brighton, where the day was spent. A suitable presentation was made to each of the directors by a member of the staff, who, incidentally, was the young lady with the longest service. In acknowledging the gifts Mr. A. H. Hunt, managing director, remarked how pleased he was

The staff of A. H. Hunt, Ltd., outside the works before starting for Brighton.

to see the continual growth of the staff, and Mr. C. H. Hunt also pointed out that, in addition to the growth from the point of view of numbers, it was very noticeable that the advancing age of the staff had increased, not because the members were a year older, but because it had been found possible to find employment for more senior employees, and the hope was expressed that during the next 12 months further increases in the staff would take place in view of anticipated developments. A start was made for home at 6.30, the journey being interrupted at Handcross for a short sing-song and dance, and the arrival back at the works at approximately 10.30, completed an enjoyable and very successful day.

BUSINESS ITEMS.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, announce that the range of "Phililite" commercial diffusing units has been the subject of considerable price reductions.

The Acton works of S. G. BROWN, LTD., will be closed from to-day (Friday) until August 12th, on account of annual holidays and stocktaking. A small staff will, however, be in attendance for matters of urgency.

THE stand of the Chloride Electrical Storage Co., Ltd., at the International Aero Exhibition, which concluded at Olympia last week. Prominent among the exhibits was the "Keepalite" panel, which was wired in conjunction with the stand circuit. This panel, which operates in connection with batteries, automatically switches on emergency lights when any interruption takes place in the normal source of supply. The automatic action of the panel was demonstrated on the stand and caused considerable comment. Other exhibits included a full range of batteries designed for the starting and lighting of aircraft, and also of low and high tension wireless batteries. *See page 148.*

J. A. CRABTREE AND CO., LTD., Lincoln Works, Walsall, announce that, on and after Wednesday, August 7th, the address of the London office and depot will be 12, Dyott Street, New Oxford Street, W.C.1. Telephone: Temple Bar 2741 (two lines).

We are advised by the ALTON BATTERY CO., LTD., of Alton, Hants, that the trade discount on "Alton" batteries has been increased and the exclusive buying agreement which has been issued by the company has been revised. This document is now termed a Traders' Agreement and signatories receive a cash settlement discount of 5% on their purchases of "Alton" batteries.

EDISON STORAGE BATTERIES, LTD., Victoria House, Southampton Row, London, W.C.1, announce that they are a new company formed by the manufacturers, the Edison Storage Battery Co., of Orange, New Jersey, U.S.A., to carry on the sale and distribution of Edison storage batteries in this country. In order to avoid confusion of the company's name with that of another company, Edison Storage Batteries, Ltd., are taking steps to change their name to "NEW DISTRIBUTORS OF EDISON STORAGE BATTERIES, LTD."

The ENGLISH ELECTRIC CO., LTD. has received an important contract from the London County Council, for 50 double-deck, all-steel tramcars and 100 motor equipments. The cars will each have seating accommodation for 28 passengers in the lower saloon and 46 passengers in the upper saloon. The equipments will each consist of two 57·5 H.P. motors with controllers, circuit breakers, resistances, cabling and trolleys. The cars and equipments will be built at the company's Preston works. The total value of the contract is £160,450.

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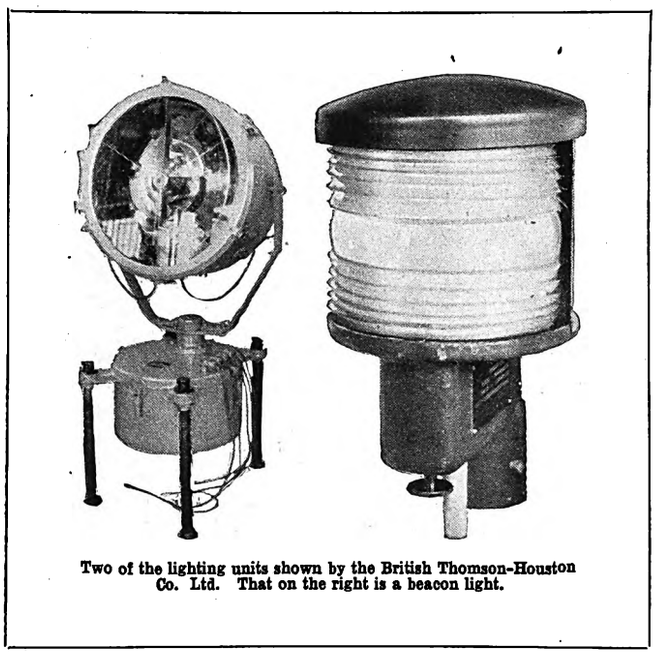
AERO EXHIBITION.

Some of the Electrical Items Which Were Among the Exhibits.

AMONG the electrical exhibits of particular interest at the International Aero Exhibition, which concluded at Olympia, London, last week, was a range of aerodrome lighting equipment shown by the British Thomson-Houston Co., Ltd. The equipment was divided into two groups, that required for the guidance of pilots desiring to land or take off, and general illumination which included the lighting of hangars, forecourts, repair sheds, etc. In the first group the exhibits were a 24 in. revolving beacon and a 180 deg. aerodrome floodlight. The revolving beacon, intended for mounting on the top of a hangar or steel tower to act as a guide to the pilot by indicating from a distance the location of the aerodrome, consists essentially of a cast aluminium barrel 24 in. in diameter containing a high grade silver glass "parabolic" mirror, a frame holding a plate glass front being hinged to the barrel and held in place by clamps. The barrel is supported in a crutch mounted on a vertical shaft carried on ball-bearings. This shaft is furnished with collector rings for supplying current to the lamp, and flashing mechanism which permits code signals to be given, various different flashes being obtained by the use of different cams in this gear. The shaft is rotated through worm-gear by a motor enclosed in a sheet metal casing attached to the base. Various speeds of rotation from one half to 6 r.p.m. are available.



Two of the lighting units shown by the British Thomson-Houston Co. Ltd. That on the right is a beacon light.

Where the beacon is not placed in a readily accessible position, an automatic lamp changer can be provided. In the event of lamp failure the changer automatically places a second lamp in focus so that the operation of the beacon is not interrupted. A beam candle power of approximately 2 000 000 is secured with a 1 000 W lamp.

The 180 deg. aerodrome floodlight is intended to illuminate aerodromes by the distributed method, a number of the units being installed along the boundary in sections controlled by separate switches, thus enabling the landing direction, according to the direction of the wind, to be indicated to the pilot. The unit consists essentially of a 180 deg. Fresnel lens, at the focal point of which the lamp is placed. A spherical mirror of silver glass fixed to the inside of the casing behind the lamp enables light which would otherwise be wasted, to be utilised. The focussing mechanism is provided to permit of the lamp being accurately centred.

In the second group of lighting equipment for ground illumination, the lighting of airplane sheds, hangars, etc., the B.T.-H. fittings included floodlight projectors and gas and watertight lanterns. Other exhibits of the same company included a very comprehensive range of aircraft magnetos, impulse starters, inertia starters, lighting generators, and similar equipment.

A newcomer at the exhibition was the firm of Messrs. Alfred Graham, well known in marine circles as manufacturers of telephones and other apparatus for use on board ship. Matters relating to aircraft equipment are under the control of Capt. D. Sinclair, and at the stand was shown aircraft radio apparatus as well as public speech and band repeater equipment for use on the ground. The equipment shown included medium and short wave aircraft equipment with and without direction finding apparatus and a portable battery-operated transmitter and receiver for lightships, survey work, etc. A special feature of this company's exhibit was the "Graham" light aeroplane equipment.

Direction Finders.

Radio apparatus was also shown by Marconi's Wireless Telegraph Co., Ltd., the latest of this company's transmitters being a Type T A I 4 kW set shown by the Air Ministry. A model of the Type R G 14 direction finding receiver was also shown on the same stand. In addition, on the Marconi stand, the aerodrome ground station transmitter, Type U, with a power of 1·5 kW and a waverange of 600 to 3 000 metres, was shown. Receiving equipments especially suitable for aerodrome working were the Type D F M 4 and R G 19 sets, displayed in conjunction with the transmitter. Another interesting set was the "all purpose" telephone-telegraph apparatus Type A D 6 H for use on civil, military and naval aircraft. It comprises a transmitter of 150 W and a receiver, and is suitable for the transmission and reception of telephone and telegraph messages to and from aerodrome ground stations up to distances of 100 to 300 miles. Where space is restricted and no operator or observer is carried, the set can be mounted in any part of the machine and operated by the pilot through a remote control unit. As in the case of all the Marconi aircraft sets, power is supplied by means of a windmill generator, which may also be used to provide current for lighting the aircraft at night. The power supply may be arranged so that in the event of a forced landing the generator may be operated by batteries or a light petrol engine to enable communication to be established with the nearest ground station. Other exhibits were the long range telegraph-telephone set Type A D 8, the short wave transmitter, Type A D 5, the A D 12 receiver, and a comprehensive range of d.f. apparatus. Of particular interest was a "light aeroplane" set, Type A D 22, which comprises a 75 W transmitter for telephone communication and a receiver, combined in one light case. Telephone transmission is possible over ranges up to 75-100 miles, the receiver being capable of receiving both telephony and telegraphy, either c.w. or interrupted c.w., when required. The set can be mounted in any convenient part of the machine and operated through a remote control unit by means of Bowden wires. (See page 149).

The Chloride Electrical Storage Co., Ltd., was another exhibitor, and on this company's stand was shown the "Keepalite" apparatus, a description of which has already been given in THE ELECTRICIAN. Other exhibits included a complete range of batteries specially designed for use by aircraft and for radio purposes. A picture of the "Exide" stand is given on page 147.

INSTITUTE OF METALS.

British Metallurgists to Visit Germany—First Congress Since 1914.

AN attractive programme has been drawn up in connection with the metallurgical congress to be held by the Institute of Metals in Düsseldorf from September 9th–12th. The gathering is the first of its kind to be held since the war, and takes place by invitation of the Verein Deutscher Ingenieure and the Deutsche Gesellschaft für Metallkunde. At the two business sessions of the Congress 14 technical papers will be presented for discussion. Following the meetings visits will be paid to works in Düsseldorf and neighbourhood, and to the Düsseldorf Foundry Exhibition; there will also be a whole-day excursion to the works of Messrs. Krupp at Essen. On the social side there will be a dinner and dance given by the Lord Mayor of Düsseldorf, also a cabaret evening at the Düsseldorf Artists' Club.

Following the Düsseldorf meeting supplementary visits will be paid on September 13th–15th, the first to Berlin and the second to Holland. The latter will be of a sightseeing character, but in Berlin visits will be paid to works as well as to the Technical High School at Charlottenburg and to the Government Testing Laboratory.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

ROCHFORD GUARDIANS, August 7th.—Underground cables, switchgear instruments, wiring, 25 H.P. motor, starting gear, etc. Specification, etc., from Mr. H. Tomlinson-Lee, 26, Victoria Street, Westminster, S.W.1; deposit £2 2s.

SALFORD CORPORATION, August 10th.—Low tension, paper insulated, lead covered and armoured cables. Forms of tender from the City Electrical Engineer.

LONDON COUNTY COUNCIL, August 12th.—Supply and installation of nine 1 000 kW rotary convertors, with static transformers. Specification, etc., from the General Manager, Tramways Offices, 23, Belvedere Road, London, S.E.1; deposit £1 1s.

UTTOXETER URBAN DISTRICT COUNCIL, August 12th.—Overhead 11 000 V transmission line; e.h.t. and l.t. cables and roadwork and public lighting; and sub-station equipment. Persons desiring to tender must notify Mr. W. C. C Hawtayne, 9, Queen Street Place, London, E.C.4.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., August 13th.—Supply of ironclad unit type switchgear, at the National Physical Laboratory, Teddington. Specifications, etc., from the Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1; deposit £1 1s.

CENTRAL ELECTRICITY BOARD, August 24th.—Supply, delivery, and erection of metering equipment for certain stations in the area of the South-East England Electricity Scheme, 1927. Specification No. S.E.E.—G.M.1, after August 6th, from Mr. Richard H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2. Deposit £2 2s. for first copy, £1 1s. for each subsequent copy.

NEWCASTLE ENDOWED SCHOOLS, August 24th.—Electric light installation in a new wing to be erected at each of two schools, viz.: Newcastle-under-Lyme High School, and Newcastle-under-Lyme Orme Girls' School. Specifications, etc., from Messrs. Cramp and Frith, 1, Dickinson Street, Manchester; deposit £3 3s. in respect of one contract, or £6 6s. in respect of both contracts. Tenders are invited only from firms on the National Register of Electrical Installation Contractors.

COMMITTEE OF VISITORS OF GLOUCESTERSHIRE MENTAL HOSPITALS, August 26th.—Electric wiring of Wotton and Coney Hill Mental Hospitals, on "Stannos" earthed concentric system. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

MANCHESTER CORPORATION, August 30th.—Supply and delivery of one water-tube boiler superheater for Barton power station. Continuous actual evaporation of boiler 130 000 lb. of water per hour. Specification, etc., from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5, on and after July 30th; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled, duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links, one 30 000 kVA busbar coupler equipment with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £3.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

YUGOSLAVIA.—Supply and delivery of two electric lifts for a local company. (Reference A.X. 8 315.)

INDIA STORES DEPARTMENT, SIMLA, August 5th.—For the supply and delivery of one 5 kW oil engine-driven, direct current, three-wire generating set, for the Military Engineering Service, Belgaum, Bombay Presidency. (Reference B.X. 5 517.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 6th.—Supply of 120-ton, four-motor, overhead travelling crane and runway (specification No. S.M. 358). (Reference A.X. 7 810.)

NEW ZEALAND POSTS AND TELEGRAPHS, August 7th.—Enamelled and silk-covered resistance wire (No. P. and T 151/1 497). (Reference B.X. 5 322.)

THE stand of the Marconi's Wireless Telegraph Co., Ltd., at the International Aero Exhibition, which came to a close at Olympia last week. A brief description of some of the exhibits is given on the opposite page.

PORT ELIZABETH MUNICIPALITY, August 8th.—One 250 kVA, 3-phase, self-cooled type, indoor transformer (specification No. 30). (Reference B.X. 5 487.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 8th.—Telegraph material, including g.i. tubular side-arms, insulators, paper sleeves, insulator spindles, etc. (tender No. 161). (Reference A.X. 8 112.)

CHILEAN MINISTRY OF MARINE, August 9th (extension of time).—Supply and erection of two aerial towers for new wireless station at Arica. (Reference A. 8 244.)

ORADEA MORE MUNICIPALITY, BUCAREST, August 9th.—Supply and delivery, 400 single phase supply meters, 150 V, 42 cycles, 3 A; 200 single-phase supply meters, 150 V, 42 cycles, 5 A. (Reference B.X. 5 519.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, August 12th.—Supply and erection at Burrinjuck of auxiliary hydro-electric generating plant. (Reference B.X. 5 365.)

EGYPTIAN MINISTRY OF THE INTERIOR, August 13th.—Supply of electric power plant, with underground and overhead network, for the town of Maghagha, Minieh Province, (Reference B.X. 5 318.)

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., August 13th.—Supply of 70 a.c. motors and starters, with spares, for Perambur works remodelling. Forms of tender (£1, not returnable) from the Company's Office, 25, Buckingham Palace Road, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 13th.—Water turbine driven generating sets and switchgear for Waitaki power development (section 2). (Reference B.X. 5 278.)

PIETERSBURG (TRANSVAAL) MUNICIPALITY, August 13th.—Supply and erection of steam raising plant, engine, alternator and switchgear (contract A). (Reference A.X. 7 983.)

PIETERSBURG (TRANSVAAL) MUNICIPALITY, August 15th.—Supply of h.t. and l.t. cable, lamps and sundries, in connection with extensions of the electricity undertaking. (Reference B.X. 5 312.)

EGYPTIAN MINISTRY OF THE INTERIOR, August 15th.—Supply and erection of additional Diesel engine and alternator at Zagazig power station. (Reference B.X. 5 393.)

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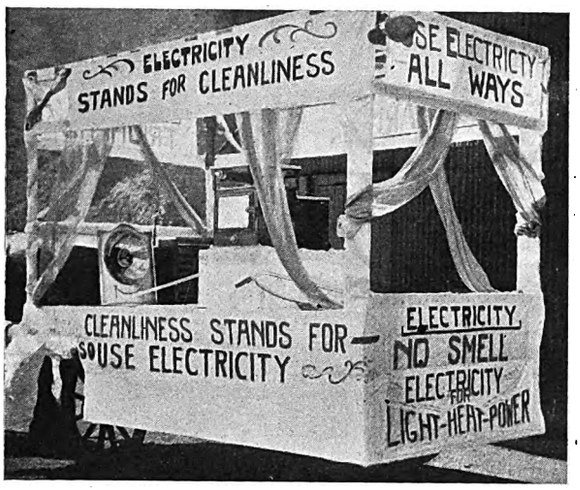
LOURENÇO MARQUES TREASURY DEPARTMENT, August 15th.—Supply and delivery of one electric motor and set of type for gilding books. (Reference B.X. 5 520.)

SOUTH AFRICAN RAILWAYS AND HARBOUR, August 15th.—Electrically-driven plate bending and flattening machine (tender No. 1 498). (Reference A.X. 8 164.)

CHILEAN STATE RAILWAYS, August 16th.—Material for overhead lines, underground cable and cable boxes (Group 41);



ONE of the special efforts to boost electricity in the Abertillery area. The wording on the vehicle read to the effect that though the horse pulling the exhibit served in the war, "electricity will serve you always." Mr. Dawson Thomas, the engineer and manager of the undertaking, points out that electricity has been advanced in this area by the hard work of the engineers attached to his department during the past twelve months, and it is anticipated that much good will result from the "spade-work" which is now being done.

and material for lighting of locomotives and carriages (Group 43). (Reference C. 3 069*.)

CHILEAN STATE RAILWAYS, August 16th.—Telegraph and telephone materials, including copper wire and cable, switches, table telephones (Ericsson type), telephone cords, etc. (Reference C. 3 072*.)

CHILEAN STATE RAILWAYS, August 16th.—Supply of instruments of staff or tablet type, for installation at 36 stations between Alameda and Talca, locking apparatus for switches, batteries and telephone combinations. (Specification C. 3 070*.)

URUGUAY POSTS, TELEGRAPHS AND TELEPHONES, August 17th.—Supply of telegraph wire. (Reference A.X. 8 229.)

AUCKLAND ELECTRIC POWER BOARD, August 19th.—Single-phase transformers. (Reference B.X. 5 324.)

INDIA STORE DEPARTMENT, SIMLA, August 20th.—Supply and delivery of one 80 kW, 2-wire, d.c. generating set for the Military Engineering Services, Razmak. (Reference B.X. 5 522.)

PORT ELIZABETH MUNICIPALITY, August 22nd.—One 10 000 kW turbo generator and condenser, boiler, steam and feed water pipes, etc. (Reference B.X. 5 430.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 22nd.—Extension magneto bells, bell sets, condensers, magneto generators, central battery switchboard tumbler switches, wall and table telephones, etc. (Reference B.X. 5 415.)

GREY ELECTRIC POWER BOARD, August 27th.—Supply and erection of generating plant, for the Arnold river hydro-electric scheme. (Reference B.X. 5 422.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 27th.—Supply of cord type switchboards (schedule C. 448). (Reference B.X. 5 428.)

OUDTSHOORN MUNICIPALITY, SOUTH AFRICA, September 3rd.—Supply and delivery of 35 kW steam-driven generating set together with the supply and delivery only of certain switchgear material. Reference B.X. 5 524.

NEW ZEALAND GOVERNMENT RAILWAYS, September 4th.—Supply of motor generator (specification 287). (Reference B.X. 5 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 7th.—Supply of v.i.r. wire. (No. P. and T. 151/1 573.) (Reference B.X. 5 416.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 10th.—Two-conductor cores (P. and T. 151/1 600). (Reference B.X. 5 462.)

LOURENCO MARQUES PORT AND RAILWAYS, September 11th.—Battery tractors and trailers. (Reference A.X. 8 172.)

BULAWAYO MUNICIPALITY, September 13th.—Supply of h.t. overhead transmission lines, stepdown transformers, pumps with motors, etc. (Reference A.X. 8 181.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, September 16th.—Supply of automatic sub-station at Remuera (two 500 kW machines and switchgear); automatic sub-station at Point Chevalier (two 1 000 kW machines and switchgear); 22 000 V switchgear; 6 600 V switchgear, and supervisory control apparatus. (Reference B.X. 5 506.)

Tenders Accepted.

BODLEIAN LIBRARY, OXFORD.—Hill, Upton and Co., electric light installation.

HULL CORPORATION.—J. C. Coulchan, Ltd., electric light installation at Central Public Library.

GLASGOW CORPORATION.—Kennedy, Stark and Co., electric light installation at Dixon Halls, £421.

KENSINGTON (LONDON) BOROUGH COUNCIL.—Duncan, Watson and Co., rewiring Leighton House, £311 17s.

COLWYN BAY URBAN DISTRICT COUNCIL.—Macintosh Cable Co., Ltd., supply, laying, etc., of e.h.t. and l.t. cables.

SKELTON AND BROTTON URBAN DISTRICT COUNCIL.—Hewling, of Skelton, electric light installation at Hospital.

STOCKTON-ON-TEES CORPORATION.—Brush Electrical Engineering Co., Ltd., two 1 250 kVA three-phase transformers, and l.t. three-phase switchgear, £990.

MYTHOLMROYD URBAN DISTRICT COUNCIL.—J. Harrison and Co., electricians' work in connection with erection of eight houses on Caldene housing site, Ashton Road.

WEYMOUTH CORPORATION.—Hyde and Cowley, supply and fitting of all wiring and electrical work for Maternity and Child Welfare Centre and Public Health Office, £103.

MILNSBRIDGE PERSEVERANCE CO-OPERATIVE SOCIETY.—E. Rayner, electrician's work in connection with erection of four houses on Society's estate at Cowersley, £12.

WEST LANCASHIRE RURAL DISTRICT COUNCIL.—W. T. Henley's Telegraph Works Co., Ltd., works in connection with Aughton electricity scheme, £13 305 (Recommended).

DEPTFORD (LONDON) BOROUGH COUNCIL.—Alpha Manufacturing Co., Ltd., provision of electric cables, etc., in connection with extension of lighting at Laurie Grove baths, £197 (Recommended).

STOKE-ON-TRENT CORPORATION.—Mr. F. Holloway, Stoke, for overhead wiring and services to housing site: Victoria Road, £550; Shelton New Road (A), £9 18s.; Shelton New Road (B), £11; Marlborough Street, £66.

SHEFFIELD EDUCATION COMMITTEE.—Electric wiring and fitting at various council schools: Wilkinson, Bentley and Co., Firshill, Intake and Lowfield council schools, Electric Supply Dept., Carfield, Woodbourn, Woodseats and Woodside council schools.

CALNE CORPORATION.—Morement and Bridges, underground cables for the supply to the new school in Silver Street; also wiring municipal buildings, £85. For latter contract other tenders were: A. R. Fox, £82 15s; Gough Bros., £83 9s. 9d.; Ellis and Ward, £92 14s.

MANCHESTER CORPORATION.—Air-break circuit breakers, Allen West and Co., Ltd.; star delta switch starters, Crompton Parkinson, Ltd., and English Electric Co., Ltd.; alternating current motors, British Thomson-Houston Co., Ltd., Asea Electric Co., and Crompton Parkinson, Ltd.; potential and current transformers, Ferranti, Ltd.; electric kettles, Premier Electric Heaters, Ltd.; time switches, Venner Time Switches, Ltd., and Nathan and Allen, Ltd.; cables, Connollys (Blackley), Ltd., W. T. Henley's Telegraph Works Co., Ltd., Johnson and Phillips, Ltd., Macintosh Cable Co., Ltd., Standard Telephones and Cables, Ltd., Pirelli-General Cable Works, Ltd., W. T. H. Glover and Co., Ltd., Hackbridge Cable Co., Ltd., Callender's Cable and Construction Co., Ltd., Liverpool Electric Cable Co., Ltd., Edison Swan Cables, Ltd., Mersey Cable Works, Ltd., and Ward and Goldstone, Ltd; electricity meters, Ferranti, Ltd., Metropolitan-Vickers Electrical Co., Ltd., Edison Swan Electric Co., Ltd., and Measurement, Ltd.; neutral earthing resistance and switch, Whipp and Bourne, Ltd.; material and labour involved in extension of 33 000 V mains, Callender's Cable and Construction Co., Ltd.; installation of grit arrester at Stuart Street station, E. Green and Son, Ltd.; repairs to motor convertor, Bruce Peebles and Co., Ltd.

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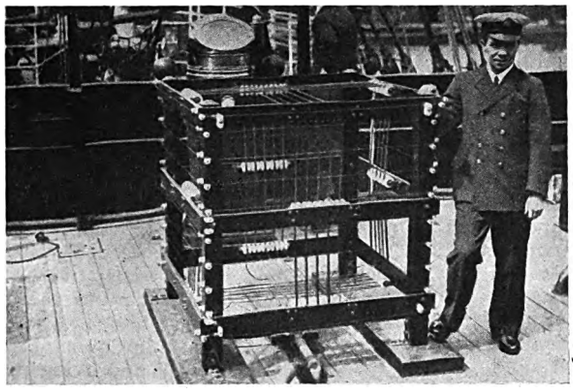
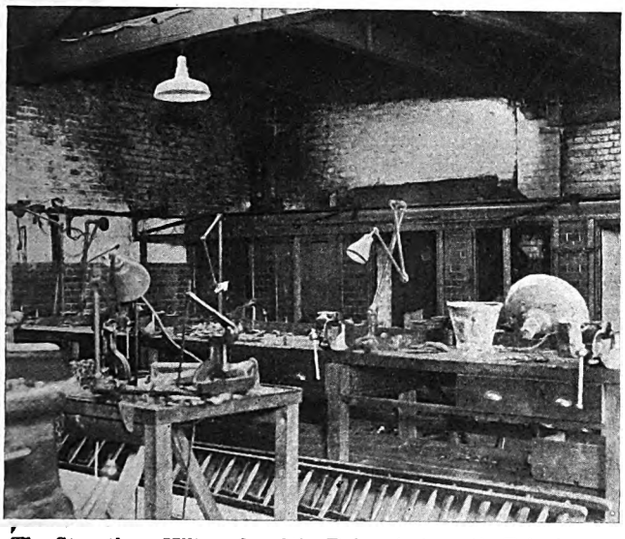
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

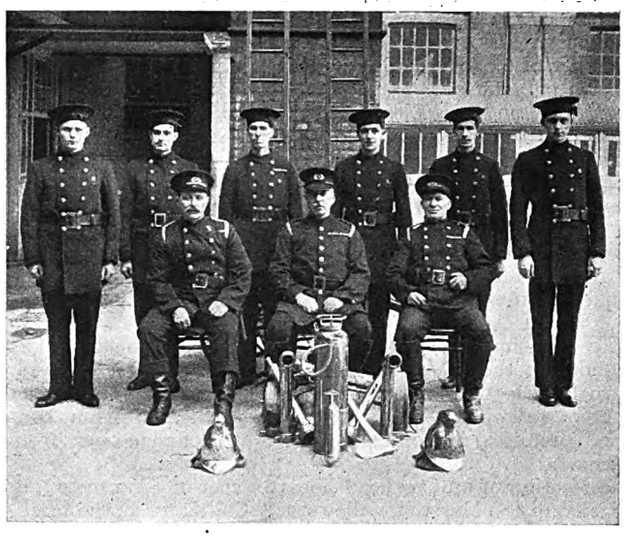
Mr. C. T. Briscoe, head of the firm of electrical contractors which bears his name, whose death is announced on page 144.



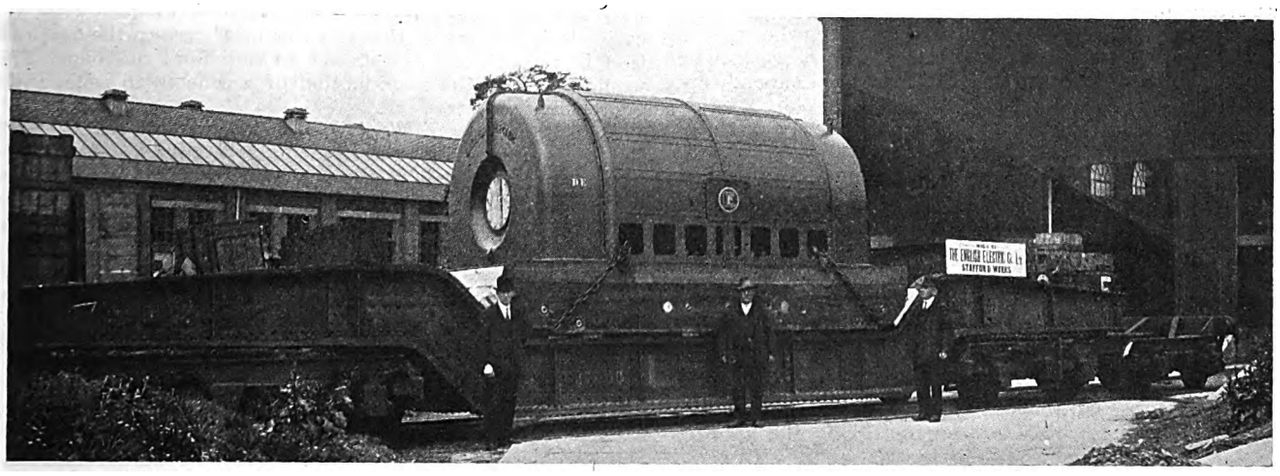
The wireless direction finding "aerial" on board the "Discovery," which leaves the East India Dock, London, next week, on her way to the Antarctic.

Mr. J. W. J. Townley, whose appointment to West Ham Electricity Department as successor to Mr. F. W. Purse, is announced on page 144.





The Streatham Hill works of the Relay Automatic Telephone Co., Ltd., were the scene of a fire on Monday, when the toolshop was badly damaged. The flames, which at times were 40 ft. high, destroyed all belting and would undoubtedly have done more damage but for the smart work of the company's fire brigade in checking the fire within 30 seconds. The shop was full of girls at the time but the absence of panic allowed everyone to make an escape. The damaged shop may be seen in the left-hand picture, while the "Relay" fire brigade is shown on the right.



This illustration shows what on the railway is regarded as an "exceptional load." This stator is 19 ft. 8 in. long, 9 ft. wide at base, and 9 ft. 6 in. high at the centre. It weighs 71 tons, and has an output of 31 250 kVA. Manufactured by the English Electric Company, the machine is here shown leaving the Stafford works loaded on an 80-ton trolley ready for transport by L.M.S. to the Leicester Corporation Central Power Station, where it will be coupled to the 25 000 kW, 3 000 r.p.m., two-cylinder steam turbine which has been built at the company's Rugby works. Special precautions were taken to ensure the safe travelling of the load, the train being limited as to speed, with frequent stops for examination, one of the railway company's inspectors being in charge throughout the journey.

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ELECTRICITY SUPPLY.

Accrington and Unemployment—President Cosgrave and the Shannon Scheme—New Houses at Morden—New Feeder Mains for Sheffield—Overhead Lines and Birkenhead Corporation—The Grampian Electricity Scheme.

WEYMOUTH Electricity Committee is to extend mains at a cost of £1 400.

Sheffield Electricity Committee has obtained sanction to borrow £25 000 for feeder mains.

Warrington T.C. has applied for a Special Order to supply electricity to Warburton, Agden and High Leigh.

Derby Corporation is to apply for powers to supply electricity to Kirk Langley, Radbourne and Mackworth.

Portland Electricity Committee has obtained sanction to borrow £8 186 for mains and services and £1 278 for plant.

Oldham Corporation has obtained sanction to the borrowing of £70 000 for the construction of tie and interconnecting mains.

Ockbrook P.C. has accepted the terms of the Notts and Derbyshire Electric Power Co. for public lighting with 200 c.p. lamps.

Leeds Electricity Committee has accepted a tender amounting to £1 124 for the erection of a sub-station in Ebenezer Street.

Bexhill Electricity Committee is to extend mains, at an estimated cost of £2 754, to supply electricity to houses on the Pebsham estate.

Tynemouth Electricity Committee is to obtain tenders for the supply of 6 000 V cable required for taking current to the Ingleside sub-station.

Poplar (London) Electricity Committee has obtained sanction to borrow £4 773 for cable extensions at West India Docks and Wick Lane sub-stations.

Brighton Electricity Committee has now agreed upon the terms of the assisted wiring scheme and seeks sanction for a loan of £5 000 for its inauguration.

Grange-over-Sands U.D.C. has received sanction to a loan of £5 000 for electricity extensions, which will enable the Council to complete the mains to all parts of the district.

The South African Electricity Supply Commission is to erect a transmission line from the traction sub-station at Claremont to the Cape explosives works at Somerset Strand.

Barnsley Electricity Committee has voted £1 725 in respect of meters to replace 1 150 d.c. meters removed from consumers' premises, in connection with the change-over from d.c. to a.c.

The erection of an overhead line at a cost of £800 to supply electricity to the Marston Valley Brick Co., Ltd., at the brickworks now in course of erection at Lidlington, has been agreed to by Bedford Electricity Committee.

An application is to be made by the West Lancashire Rural District Council to the Electricity Commissioners for a Special Order covering the parishes of Tarleton, Hesketh-with-Becconsall, Rufford, Scarisbrick, Halsall, and North Meols.

Accrington Electricity Committee has decided to push forward with the change-over of its supply from d.c. to a.c. in order to provide work for men at the electricity works who might otherwise be dispensed with. The capital expenditure will amount to £42 000.

Authority for installing electricity services to 43 premises at a cost of £437, extensions of mains for private services at a cost of £875 and extensions of mains for public lighting and conversions of gas lamps at £931 has been granted by Battersea (London) Electricity Committee.

Rotherham Electricity Committee recommends that the price to be charged for the supply of electricity in connection with the working of automatic street signals be £50 per annum per set of four signals, including the supply of current and the maintenance of gear and lamps.

Fulham (London) Establishment Committee recommends the B.C. to authorise an expenditure of £78 15s. for the conversion of the electric lighting in the new part of the Town Hall building from 100 V to 200 V and for improving the lighting in the refreshment rooms, cloak rooms, etc.

Wantage R.D.C. has received an offer from the Wessex Electricity Co. to wire for four points, and supply fittings, etc., to about 78 Council houses, at about £4 per house. The Ministry of Health has offered to make a grant, if the tenants will agree to an increased rent to meet the cost.

On the occasion of the opening of the intake gates to the head race of the Shannon electric power undertaking at Parteen Villa, O'Brien Bridge, last week, President Cosgrave said it was probable that the supply of electric power throughout the Irish Free State would begin in the early part of next winter.

The necessary mains to meet the demand for supplies on the Gayton Park Estate are to be laid by Birkenhead Corporation. The Electricity Committee has decided to make application to the Ministry of Transport for compulsory wayleaves over land in connection with a supply to Burton and Puddington.

Hambledon R.D.C. has approved amended plans submitted by the Aldershot Gas, Water, and District Lighting Co. of a line of cables from Farnborough to Hindhead. The line will be partly overhead and partly underground, and on the amended route the cables will not be visible from the Devil's Punchbowl.

An Order-in-Council has been passed in the Canadian House of Commons approving the plans of the Chats Falls Power Co. for the development of electricity at Chats Falls, about 25 miles west of Ottawa, at an estimated cost of $2 500 000. The power house will be designed for two 15 000 H.P. units operating under a 37-ft. head.

The first section of the Grampian electricity scheme at Rannock is expected to be completed early next year. About 600 men are engaged on the tunnel between Loch Ericht and Loch Rannock, where the generating station is to have an initial capacity of 42 000 H.P., and another power station is to be erected at Loch Tummel.

The new administrative buildings and extensions to the boiler house at the Kilmarnock electricity station were opened recently by Sir Andrew Duncan, chairman of the Central Electricity Board, and Mr. Archibald Page, chief engineer to the Board. The premises include a showroom for apparatus and equipment for hiring out to consumers.

At Messrs. Lever Bros.' new dock at Bromborough, a large modern electricity generating station has been erected in an ideal situation in about the centre of the estate, and electricity can be supplied to meet any requirements of industry. Supplies are being taken by large industrial factories and the power station is being extended to meet further demands.

London County Council Housing Committee reports that it has decided that all the houses on the new St. Helier estate at Morden shall be lighted by electricity, and the necessary wiring for the first section has been arranged for at a cost of £31 500. The County of London Electric Supply Co. and the South Metropolitan Tramways and Lighting Co. are to lay the mains free of charge to the Council.

At a recent meeting of Londonderry Corporation, some members complained of a minimum charge of 7s. 6d. a quarter being made for electricity to poor people, even when no electric light had been consumed during the period. The Electrical Engineer said the minimum was adopted to deal with the early closing of offices, the object being to recoup the Corporation in respect of interest and sinking fund on loans. He would consider the introduction of a scheme to relieve the poorer householders.

A dispute between Woolwich T.C. and Erith U.D.C. as to the interpretation of an agreement for a supply of electricity to a large power user in the Erith District, has been settled by arbitration. The arbitrator, Mr. N. Micklem, K.C. decided that Erith Council should pay to Woolwich Corporation £2 759 2s. 8d. in addition to £12 407 12s. 9d. already paid, and a further sum of £360 14s. 4d., claimed as owing on the true construction of the price clause of the agreement, based on the agreement year ending April 25th, instead of the financial year ending March 21st, and that each party should pay its own costs, and half his fee (£54 15s. 6d.)

London County Council Mental Hospitals Committee is of opinion that steps should be taken to substitute an electric service for the gas lighting and heating now used at the Hanwell Mental Hospital. The cost of lighting, cooking and heating by means of gas produced at the hospital gas works was £3 460 for the year ended March, 1929, and the cost of electricity purchased from the Metropolitan Electric Supply Co., and the purchase of gas for cooking is estimated at £1 780 per annum, exclusive of debt charges. The committee recommends that an estimate of £23 000 expenditure on capital account, in respect of the electric lighting, etc., of the hospital be approved.

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COMPANY NEWS.

Electrical Share Market Inactive—A Manufacturing Rumour—Dividends and Reports—The Young Accumulator Meeting—Einsteins Electro-Chemical Process—Metropolitan Railway Interim Dividend.

OWING to the inactivity of the market this week there have been no appreciable dealings in the electrical share market. Prices remain for the most part steady, quotations being much the same as those published last week.

AMERICAN ELECTRIC POWER Co.—Regular qrtrly. div. on pfd. stk. is announced.

POWER CORPORATION OF CANADA.—Directors declared 5% stk. div., payable Oct. 25.

ENFIELD CABLE WORKS, LTD.—Div. of 10% actual (2s. p. sh.) will be payable on Sept. 21.

CANADIAN MARCONI Co., LTD.—Rept. for year 1928 shows net pft. of $181 590, an incr. of $135 035 over 1927.

CITY OF BUENOS AYRES TRAMWAYS Co. (1904), LTD.—Div. of 1s. 3d. p. sh. for qrtr. ended June 30, 1929, will be payable on Aug. 16.

METROPOLITAN ELECTRIC SUPPLY Co., LTD.—Intm. div. at rate of 6% p. a. for half-year ended June 30, 1929, will be payable on Aug. 13.

IMPERIAL TRAMWAYS Co., LTD.—Intm. div. on ord. shs. for half-year ended June 30, 1929, at rate of 4% p.a., less tax, has been declared.

COMMONWEALTH POWER CORPORATION.—Div. of $1 p. sh. on common stk. and reg. qrtrly. div. of 1½% on 6% pfd. stk. paid on Aug. 1.

ALLIED POWER AND LIGHT CORPORATION.—Regular qrtrly. divs. of $1.25 p. sh. on $5 cum. 1st pfd. stk. and 75 cents p. sh. on $3 cum. pref. stk. will be payable on Aug. 15.

CHARING CROSS ELECTRICITY SUPPLY Co., LTD.—Intm. div. on ord. shs. of West End undertakings for half-year ended June 30, 1929, of 9½d. p. sh., less tax, has been declared.

W. H. DORMAN AND Co., LTD.—Rept. for year ended March 31 shows net pft. of £13 372, compared with £10 281 for 1927-28. Deb. bal. of £59 383 bt. in thus reduced to £46 011.

METROPOLITAN RAILWAY Co.—Intm. div. of 1¼ p.c. (same as last year) on ord. stk. for half-year ended June 30, 1929, and intm. div. of 1½% (same) on surplus lands stk. have been declared.

INTERNATIONAL HYDRO-ELECTRIC SYSTEM.—First qrtrly. div. on class "A" stk. in the form of stk. at rate of $\frac{1}{50}$ sh. for each sh. held or cash at rate of 50 cents for each $\frac{1}{50}$ sh. of stk. div. has been declared.

DUBLIN UNITED TRAMWAYS Co. (1896), LTD.—Div. at rate of 6% p.a. on pref. shs. for half-year to June 30, 1929, has been declared. Directors do not feel justified in declaring an intm. div. on ord. shs.

ASSOCIATED GAS AND ELECTRIC SYSTEM.—Net earngs. for year ended April 30, 1929, $23 818 643, increase $5 677 045. Gross earngs. $52 618 711, increase $11 718 449. Operatg. exes., maintenance, taxes, etc., $28 800 068, agst. $22 758 664. Gross surplus, $7 848 634, agst. $6 257 795.

CITY OF LONDON ELECTRIC LIGHTING Co., LTD.—The following divs. for half-year ended June 30, 1929, have been declared: 7·2d. p. sh. (at rate of 6% p.a.) on 6% 1st pref. shs.; 9·6d. p. sh. (at rate of 8% p.a.) on 2nd pref. shs.; 1s. p. sh. (at rate of 10% p.a.) on ord. shs.; all payable, subject to deductn. of tax, on Sept. 30.

BABCOCK AND WILCOX, LTD.—It is reported that a group including Messrs. Babcock and Wilcox, the Banco de Vizcaya, and the General Electric Co., as well as several Spanish electrical enterprises, will establish a company at Bilbao with a capital of 10 000 000 pesetas, for the manufacture of material used in the electrical industry.

EAST KOOTENAY POWER Co.—Gross revs. for year ended March 31, 1929, $498 755, agst. $422 586. Net earngs. $86 101, agst. $65 580. After provisn. for pfd. divs. blce. applicable to common stk. was $16 101, agst. $4 330, plus previous surplus $16 225. After mtg. all charges, div. earngs. on 30 000 shs. of common stk. are equal to 54 cents p. sh.

MEXICAN LIGHT AND POWER Co., LTD.—Rev. for 1928, $4 729 570, agst. $4 566 838. Deductg. gen. exes., int. on bonds ($2 459 726), and placing $974 086 to sinkg. funds, blce. is $1 164 132, agst. $1 264 321. Two half-yearly divs. in respect of 1928 have been paid on 7% pref. shs. and 4% 2nd pref. shs. Fwd. $1 456 453, agst. $940 321. There was an improvement in the exchange situation during the year.

MEXICO TRAMWAYS Co., LTD.—Earngs. during 1928 show little improvement over previous year, in consequence of jitney and omnibus competitn. and general business depression. Consolidated rev. and expenditure acct. shows credit of $2 071 400, agst. $1 563 679. After mtg. gen. exes. and paying fixed charges, blce. is $995 445, agst. $601 997, which is set aside towards mtg. necessary cap. expenditure for improving and developing system.

AMERICAN AND FOREIGN POWER Co.—Net earngs. of controlled subsidiaries for 1928, $15 594 315, agst. $10 530 526. Blce. available for common stk. after deductg. all charges, $1 528 900, agst. $856 364. Surplus at $8 816 972 showed increase of $4 900 710. Qrtrly. divs. of $1·75 and $1·50 respectively have been declared on $7 and $6 prfd. stks., payable July 1. An increase in investmts. amtg. to over $177 000 000 is reported. Total investmts. at Dec. 31, 1928, $285 565 840, agst. $108 186 628.

NORTH AMERICAN Co.—During year end. March 31, 1929, assets increased from $733 998 905 to $861 416 955. Property and plant increased in valuation from $620 384 338 to $733 331 773. Investments, $45 211 173, decreased from $46 744 829; current and workg. assets $62 581,730, agst. $46 823 661. Provision for reserve stands at $108 581 724, agst. $82 713 156. Capital surplus and undivided pfts. amount to $103 496 216. Current and accrued liabilities are $11 428 163 and $16 353 120, agst. $13 689 601 and $13 278 593.

MIDDLE WEST UTILITIES Co.—The board proposes to offer stckhldrs. rights to subscribe for additnl. common stk. on basis of one new share at $200 for every four shs. of all classes held. The common stk. will be split ten for one, the co. proposg. to retire its funded debt, to call in its Prior Lien bonds and pfd. stks. and to offer hldrs. of the latter rights to purchase about $55 000 000 of new 6% pfd. stk. carrying common stk. purchase warrants. The split-up common will receive stk. divs. at annual rate of 8%. On the readjustment the capital will consist of 550 000 shs. of $6 pfd. and 13 445 000 shs. of common stk.

TELEFONAKTIEBOLAGET L. M. ERICSSON.—This co., which recently published an excellt. annual rpt. of its Mexican branch, now reports favourable results of last year's activities of its affiliated concessn. cos. in Poland and Italy. In Poland telephone subscribers during 1928 increased by about 14% or from 60 635 to 68 917, while in Italy the number of subscribers rose by 10%, or from 21 566 to 23 795. Net pft. of Polish branch increased from 1·05 to 1·59 million kronor (£60 000 to £90 000), and div. was raised from 8% to 10%. Net surplus of Italian affiliatn. rose from 3·07 to 4·08 million lire (£9 000 to £12 000) and div. was 7%, agst. 6½% in previous year.

EAST AFRICAN POWER AND LIGHTING Co.—Pft. for 1928, shs1 129 719, includg. shs30 966 brt. in. After provisn. for pref. div., depreciatn., writing down exes. in connectn. with issues of cap., survey exes., div. of 6½% on ord. shs., etc., carry fwd. is shs33 914. In Nairobi area demand continues to expand. Increase is spread over all classes of consumers with exceptn. of sisal industry, where there was slight reductn. Developmt. of further hydro-electric works to augment supply for Nairobi area has been delayed by prolonged negotiatns. with Government, which are still in progress, and duplicatn. of main transmissn. line supplying Nairobi is nearing completn. Progress in Mombasa has been satisfactory. Considerable extensions to Kilindini Harbour are in hand, and a fourth oil-engine set has been purchased and was put into commissn. in April last.

Company Meetings.

WILLIAM BEARDMORE AND Co., LTD.—At a meeting on Monday, in London, holders of the eight per cent. seven-year notes unanimously adopted an amended scheme of reorganisation, after it had been decided to increase the dividend rate on the new second preference shares. Under the original scheme of 1928 holders of the notes were to have received £107 10s. of five per cent. "B" or second income debenture stock in respect of each £100 of notes held. The

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amended proposals submitted on Monday gave the noteholders £108 of six per cent. second preference shares for each £100 of notes. Following the seconding of the resolution authorising the scheme, it was proposed that the rate of dividend on the second preference shares to be issued to the noteholders and others be increased to 7½%, and this proposal was adopted.

BRITISH POWER AND LIGHT CORPORATION (1929), LTD.—The statutory meeting of this company was held, in London, on Monday. Captain C. E. Benson presiding. The chairman said: You will notice by the statutory report that all the payments due to the corporation in respect of shares subscribed for cash have been made, and also that the shares to be issued in satisfaction of purchase price of shares acquired in the various companies which we control have been issued, and the purchases completed. In the balance-sheet, including the statutory report, the expenditure on preliminary expenses is not shown, but since the date of that report the various sums due have been finally ascertained, and amount to less than the estimate given of £11 000; this is very little more than one-half of 1% on the total authorised capital of your company. The period which has elapsed since the formation of the company has been occupied principally in consolidating the management and operation of the various subsidiary companies. The statutory report was unanimously approved.

YOUNG ACCUMULATOR COMPANY (1929), LTD.—The statutory meeting of this company was held, in London, on Monday. Mr. E. H. F. Reeves (the chairman) said the work of equipping the company's new factory at Malden was well advanced, and they were actually carrying on part of their manufacture there at the present time. It was anticipated that in the course of next month the existing small factory at Fulham would be practically closed down, the whole of the plant and the offices of the company being transferred to the new works. Shareholders would recollect that in the prospectus the sum of £20 000 was mentioned as the estimate for the equipment of the new factory. The directors were glad to be able to state that the total cost would be well below this figure. They claimed that the company's accumulator was the most efficient on the market. They had recently secured a licence for the manufacture and use of the Wilderman Separator. The use of this separator had many important advantages, and still further improved the efficiency of the accumulators.

The management had now got together their sales organisation and were actively engaged in appointing additional agents both in this country and abroad. Since the formation of the company many new accounts had been opened. There was a very large demand for storage batteries of all descriptions, and, owing to the special feature of the company's products, they felt sure that when the factory was in full working order, and the company was running its plant to its utmost capacity, they would obtain a large proportion of this business. The chairman then read a letter from Bentley Motors, Ltd., in the course of which they stated that all the cars entered by them in the Le Mans twenty-four hour race, the Brooklands Double twelve-hour race, and also in the Dublin motor race were fitted with Young accumulators, which stood up to the tests in a satisfactory manner. In conclusion, the chairman said that, after the end of August, the directors would be glad to welcome any shareholder who would care to visit the company's works on the Kingston by-pass road. The appointment of Capt. R. F. H. Norman as a director of the company having been approved, the proceedings terminated.

EINSTEINS ELECTRO-CHEMICAL PROCESS, LTD.—An extraordinary meeting was held in London on Tuesday, for the purpose of passing a resolution to increase the capital of the company by the creation of 520 000 Ordinary shares of 4s. each, which were to be issued as fully paid, for the purpose of acquiring the Pigache process.

Colonel the Master of Sempill, who presided, said: The progress of your factory at Slough is satisfactory, and in connection with this progress I would like to record the directors' satisfaction with the admirable services they have received from the engineering firm of Perrins', Ltd., of Astor House. The directors feel that the services of that firm are responsible in no small measure for the satisfactory progress that has been made. Negotiations are proceeding satisfactorily for the sale of licenses. The Pigache process undoubtedly has considerable possibilities, not only in so far as it applies to the Einstein process, but in a variety of different directions. After questions asked by shareholders had been answered, the resolution was duly carried.

COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BROWNE, Mr. J. D., 34, Inverness Avenue, Westcliff-on-Sea, wireless factor. £16 8s. 8d. June 12th.

BROWNING Thomas Edwin (trading as PREMIER RADIO ELECTRICAL CO.), 184, Railway Approach, Shepherds Bush, wireless dealer. £16 14s. 5d. May 28th.

CENTRAL RADIO CO., Britannia Buildings, Fenwick Street, Liverpool, radio dealers. £23 3s. 9d. June 22nd.

ECONOMIC WIRELESS CO., 46, Barker Street, Oldham, wireless dealers. £13 3s. 8d. June 25th.

MARKS, Bernard, 85, Dartmouth Road, N.W., electrical contractor. £31 18s. 8d. June 17th.

POWELL, Hector B., 6, Chandos Street, Hereford, wireless dealer. £12 16s. May 31st.

SOUTHERN ELECTRICAL CO., 317, Coldharbour Lane, Brixton. £16 3s. 4d. June 7th.

WILMINGTON RADIO CO., 58, Birchwood Road, Wilmington, wireless merchants. £14 os. 11d. May 1st.

Deeds of Arrangement.

GREAVES, John, rear of 11, Moon Street, South Shore, and 69, St. Heliers Road, Blackpool, electrical engineer and contractor. Dated July 18th, filed July 23rd. Trustee, J. Todd, 18, Birley Street, Blackpool, C.A. Secured creditors, £1; liabilities unsecured, £349; assets, less secured claims, £180.

KINCHIN, Magnus, trading as LEWIS ELECTRIC SEDAN CO., 72, Eastbank Street, Southport, electrical engineer. Dated July 23rd, filed July 29th. Trustee, W. G. Lithgow, 429A, Lord Street, Southport, accountant. Liabilities unsecured, £864; assets, less secured claims, £430.

Receivership.

DOREE, LTD. R. A. M. Pater, of 3, Warren Avenue, Bromley, Kent, was appointed receiver on July 12th, under powers contained in debenture dated June 17th, 1929.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

HUGHES (ALFRED H.) AND CO., LTD., Old Whittington, electricians. Registered July 17th, £1 000 debenture, to A. H. Spalton, 25, Wellington Street, Sheffield, electrical factor; general charge.

MEXICAN HYDRO-ELECTRIC DEVELOPMENT SYNDICATE, LTD., London, E.C. Registered July 20th, £250 debentures, part of £6 000 and 100% premium; general charge. *£4 450. December 31st, 1928.

Satisfactions.

LOOE ELECTRICITY CO., LTD., London, S.W.—Satisfaction registered July 12th, all moneys, etc., registered February 25th, 1927.

RADIO SERVICE (LONDON), LTD. Satisfaction registered July 16th, £1 500, registered August 29th, 1927.

SIMMONDS AND STOKES, LTD., London, W.C., electricians. Satisfaction registered July 17th, £3 000, balance of amount registered April 17th, 1924.

VIOZONE, LTD., London, W.C., electrical engineers.—Satisfaction registered July 11th, £148 4s. 5d., registered May 13th, 1929.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

STEVAL, LTD., 133, Oxford Street, London, W., wireless dealers, etc. A meeting of creditors was held on July 25th at the offices of Gray, Stainforth and Co., 31, Lombard Street, E.C., when it was reported by the solicitor to the company that there had been a meeting about three weeks previously when some of the principal creditors attended. Accounts were submitted to them, and it was decided ultimately to invite all the creditors to a meeting in order

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that the position could be fully discussed. The accountant said that the figures he had presented at the previous meeting were from a balance sheet dated June 11th last. At that time, there was cash at the bank and in hand amounting to £108, debtors on hire purchase agreements totalled £16 971, but against that figure there were secured creditors for something like £12 000, other debtors totalled £239 and bills payable amounted to £79. The stock was valued at £1 573 and fixtures and fittings, etc., at £249. Against that the unsecured creditors amounted to £4 796 and there were preferential creditors totalling £323. On the face value of those figures, there was a surplus, so far as the creditors were concerned, but the accountant pointed out that the creditors would have to remember that as regarded the hire purchase accounts, in some instances, the payments were spread over a period of four years, and, in the majority of cases, they ran from 12 to 15 months. In addition to that there would be the cost of collection, which would come to quite a substantial figure if the creditors collected the debts themselves.

Answering Mr. E. Judd, of Corfield's Traders Association, who represented the Ever-Ready Co., the accountant said that the Ever-Ready Co., who were large creditors on the estate, were not invited to the first meeting of the creditors, because at that time the amount was not due to be paid, and the accountant had no idea that the Ever-Ready Co. were creditors. Answering further questions put by Mr. Judd, the accountant stated that the company was registered in February, 1928, with a capital of £1 000 and at the present time there were calls in arrear amounting to £133. The trading for the three months to April 30th, 1928, shows sales £1 746, and purchases £1 123. For the next nine months down to January 31st, 1929, the sales were £11 410, and the purchases £5 012, while for the last three months the sales were between £10 000 and £12 000. There were two directors of the company and they each drew £8 a week.

A circular had been previously sent out to all the creditors by Penman, Johnson and Ewins, solicitors, of Watford, which stated that the affairs of the company had recently been considered by an informal committee of some of the largest creditors, and it was unanimously agreed that a forced liquidation would not benefit anyone, as the favourable realisation of the hire purchase instalments would require the existence of an organisation for service in collection, whilst the liquidator would probably be unable to make any distribution amongst the creditors until the result of the collection became known, which would not be for at least 18 months. Shortly after the committee met, the company ceased trading, and Mr. F. S. Wilks was appointed receiver for the debenture holders. The chief creditors had also suggested that a gentleman who was contingently liable under guarantees to certain of the finance houses, should consider offering an immediate cash composition to the other creditors to avoid a delay which would be involved by any other arrangement. In the circular it was stated that the gentleman in question was prepared to purchase all the unsecured trade debts owing by the company for a sum equal to 6s. 8d. in the £, on the amount of such debts. That offer was subject to acceptance by first post on Saturday, July 27th, and it gave the guarantor the right to withdraw that offer if acceptances up to 95% of the total value of the unsecured debts (other than those having a preferential claim) were not received by that date. That provisional offer had already been accepted by Messrs. Bullmores, Ltd., the Dorian Wireless Co., Ltd., the Halcyon Wireless Co., Ltd., and the St. John Manufacturing Co., whose debts together exceeded £2 500, and those creditors recommended the acceptance of the 6s. 8d. to the general body of creditors.

At the meeting held on July 25th the creditors present were of opinion that sufficient time had not been given for them to agree to the acceptance. They also suggested that the percentage should be reduced.

London Gazette, etc.

Companies Winding-up Voluntarily.

CHIRK ELECTRICITY SUPPLY CO., LTD. By Special Resolutions, July 1st, confirmed July 17th. To sell the undertaking to the Electricity Distribution of North Wales and District, Ltd.; and W. G. Lloyd, of 8, West View, Rhosywaen, Chirk, appointed as liquidator, for the purposes of such winding-up.

COMMUNITY RADIO, LTD. By special resolution, June 24th, confirmed July 10th. That a liquidator be appointed, and that the liquidator enter into an agreement for sale of the going concern to Community Radio (1928), Ltd. on terms to be agreed.

J. R. JENNENS, LTD. By reason of its liabilities, July 18th. J. W. Blackham, 147, Corporation Street, Birmingham, Incorporated Accountant, appointed as liquidator.

SOUTHEND RADIO AND GRAMOPHONE CO., LTD. By reason of its liabilities, July 12th. T. L. Summers, 64, Victoria Street, London, S.W.1, appointed as liquidator.

Bankruptcy Information.

MARSH, Basil, 17, Victoria Road, Brighton, Sussex, electrician. Receiving order, July 20th. Debtor's petition. First meeting, August 7th, 12.30 p.m., Official Receiver's Offices, 12A, Marlborough Place, Brighton. Public examination, August 21st, 11 a.m., Court House, Church Street, Brighton.

Notice of Intended Dividend.

LAURENS, William Hamilton, 492, Prescot Road, Old Swan, Liverpool, radio engineer. Last day for receiving proofs, August 14th. Trustee, J. Allcorn, Government Buildings, Victoria Street, Liverpool.

Bankruptcy Proceedings.

BAINES, Gerald Talbot, 66, High Street, Gorleston, Suffolk, electrical engineer. The first meeting of creditors was held on July 27th at the Official Receiver's Office, 9, Queen Street Chambers, Norwich, when a statement of affairs was filed showing liabilities of £350 against assets of £55, thus leaving a deficiency of £295. The debtor stated that he commenced trading on his own account in July, 1925, and carried on for one year. For the next two years he did no work owing to an accident which he sustained to his leg. He recommenced trading again in March, 1928, with £40 capital he had borrowed. He had only kept a memorandum book containing customers' accounts for work done. The matter remained in the hands of the Official Receiver as trustee of the estate.

TEMPEST, Colonel, 4, Manns Court, Bradford, Yorkshire, electrician. The first meeting of creditors of this debtor was held on July 26th at the Official Receiver's Office, 12, Duke Street, Bradford, when the debtor attributed his failure to loss through bad debts, loss of contracts, and decline in trade owing to the depression in the textile industry, his contracts being formerly obtained mainly with manufacturers. He returned a statement of affairs showing ranking liabilities of £1 382, and there was a deficiency of £985.

WARNES, Elizabeth Ann, 10, Crescent Gate, Wilmslow Road, Rusholme, Manchester, electrical and radio engineer. The receiving order was made on June 10th, and according to the statement of affairs there are liabilities ranking at £1 158, against assets estimated at £524. From that has to be deducted preferential claims of £60, leaving net assets of £464, or a deficiency of £694. The debtor attributed her failure to competition, bad trade, and losses in connection with an agency. It would seem that in 1925 the debtor became entitled to the whole of her late husband's estate, valued at £3 667, and in the following year she financed her eldest son in the manufacture of wireless coils, but early in 1927 she paid his creditors 10s. in the £, involving a total loss of £1 000 in this business. In January, 1927, she leased a shop at Crescent Gate for seven years at £150 a year, and opened an electrical and radio engineering business which was entirely managed by her eldest son and his brother, who had experience in wireless work. She contributed £500 as commencing capital, but periodically since then she has realised all her shares and property to provide further capital, and also borrowed £300 from relations. The business, according to a rough account prepared to June, 1928, showed a loss of £600. She advanced £200 to a firm of patent electrical plug makers in order to obtain a sole selling agency but the plugs were never marketed owing to an alleged infringement. The dwelling house at Manchester was left to her by her husband and was sold in 1925 for £1 200, and another was purchased for £1 300, but was sold nine months ago for £1 450, which amount was used in repayment of the mortgage £750 and in the business. The debtor has kept a cash book and purchase and sales ledgers, and states she became aware of her position in January, 1929. The following are creditors: Brandes, Ltd., Sidcup, £44; Cossor, A. C., Ltd., London, £60; Downes and Davies, Liverpool, £27; Electrical Components, Ltd., Birmingham, £40; Hirst, Ibbotson and Taylor, Ltd., Manchester, £83; Mullard Wireless Service Co., Ltd., London, £53; Macintosh Cable Co., Ltd., London, £48; Philips Lamps, Ltd., London, £43; Sharratt Electrical Co., Ltd., Manchester, £30; White, J. C., and Co., Ltd., Manchester, £72.

WILMINGTON, Granville, 75, Railway Street, Nelson, Lancs, electrical and radio engineer. The public examination of this debtor was held last week at the County Court House, Bankhouse Street, Burnley, when a statement of affairs was produced showing ranking liabilities of £613 against assets estimated to produce £301. thus leaving a deficiency of £312. It appeared that the debtor commenced trading in 1923 at a stall in the Market Hall, Nelson. He had a capital of £50 borrowed from his mother. He carried on business until June, 1925, when he disposed of the stock and fittings and discharged all his liabilities with the exception of the £50 owing to his mother. In April, 1928, he borrowed a further £50 from his mother and recommenced trading at a lock-up shop, 75, Railway Street, Nelson. He had been successful for the first four weeks, but owing to a cotton dispute in the district from May to September of last year, his turnover was seriously affected. He stated that he became aware of his position in January of this year, and attributed his failure to the fire in his shop in December, 1928, when stock and fittings of the value of £120 were destroyed. While he received £120 from the insurance company, he had suffered a further loss through being unable to share in the ensuing Christmas and New Year trade. The examination was adjourned with a view to closing.

READ, Roland Arthur, electrical engineer, 9, The Pavement, Middle Lane, Crouch End, London, N. Under a receiving order recently made against the estate of this debtor the statutory first meeting of his creditors was held on Monday at Bankruptcy Buildings, Carey Street, W.C. Mr. F. Vyvyan (Official Receiver) presided. The debtor had stated in preliminary examination that he started business in September, 1926, with £50 borrowed capital, dealing in wireless goods and carrying out electrical installations. The immediate cause of his failure was the issue of a writ by the landlord in respect of a former residence, and owing to pressure by wholesalers the debtor filed his petition. He estimated his liabilities at £800 and valued his assets at about £350. In addition to the stock there were a number of accumulators belonging to customers left for charging and other goods on sale or return.

The estate was left in the hands of the Official Receiver.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

312 209 W. E. Beatty (Bell Telephone Laboratories, Inc.). Cable telegraphy. (21/2/28.)
285 824 I.G. Farbenindustrie Akt.-Ges. Electrolytic production of metals, and apparatus therefor. (21/2/27.)
312 384 W. H. Sayers and Electramonic Co., Ltd. Controlling means for sound-reproducing apparatus. (22/2/28.)
312 217 J. A. Kuyser and Associated Electrical Industries, Ltd. Dynamo-electric machines. (22/2/28.)
312 395 Electro Bleach and By-Products, Ltd., J. Hollins and D. Jepson. Electrodeposition of metals. (25/2/28.)
312 396 J. R. P. Lunn. Alternating-current voltage regulators. (27/2/28.)
312 398 E. L. Stubbings. Electric insulators. (27/2/28.)
293 294 Associated Telephone and Telegraph Co. Telephone systems. (2/7/27.)
312 416 General Electric Co., Ltd., and H. J. Coates. Protection of electric systems. (6/3/28.)
312 417 S. Z. de Ferranti and Ferranti, Ltd. Electrical transformers. (6/3/28.)
312 418 S. Z. de Ferranti and Ferranti, Ltd. Electrical circuit-breakers. (6/3/28.)
287 098 E. Harsanyi. Production of electric radiating-elements, particularly electron-emitting elements for electric discharge devices. (14/3/27.)
289 042 Compagnie Lorraine de Charbons Pour L'Electricite. Manufacture of arc-lamp electrodes. (21/4/27.)
312 430 W. Henderson and Telford, Grier, and Mackay, Ltd. Electric connection-boxes for cargo clusters, portable lamps, and such like. (21/3/28.)
312 432 I. H. Parsons and A. E. J. Ball. Electrical step-by-step mechanisms. (22/3/28.)
312 436 W. Wadsworth and Sons, Ltd., and A. A. G. Jensen. Electromagnets. (24/3/28.)
312 442 A. Shaw, S. H. Long, and Siemens Bros. and Co., Ltd. Wireless telegraph and telephone receiving apparatus. (29/3/28.)
312 443 Dunlop Rubber Co., Ltd., and E. W. Madge. Deodorising of articles produced by the electrophoresis of latex mixings. (29/3/28.)
312 444 Gramophone Co., Ltd., A. Whitaker, and W. H. Eccles. Piezo-electric devices. (29/3/28.)
318 448 T. Freer-Ash. Electrical transformer tanks. (4/4/28.)
312 450 C. T. Nicol. System of tuning wireless receiving sets and multi-contact switch therefor. (5/4/28.)
312 456 Edison Swan Electric Co., Ltd., and F. Shergold. Electric switches. (17/4/28.)
312 461 T. W. John. Electric wall-plugs. (24/4/28.)
299 761 Felten and Guilleaume Carlswerk Akt.-Ges. Electric submarine cables. (31/10/27.)
312 479 H. Baron (Compagnie Lorraine de Charbons pour l'Electricite). Electric couplings. (12/5/28.)
312 494 W. T. Henley's Telegraph Works Co., Ltd., and P. Dunsheath. Joints of electric cables. (25/5/28.)
312 495 British Insulated Cables, Ltd., and W. Holttum. Joints of electric cables. (25/5/28.)
312 507 Kelvin, Bottomley and Baird, Ltd., and F. A. King. High-frequency electrodes. (11/6/28.)
312 508 General Electric Co., Ltd., and E. M. Eden. Apparatus for controlling mechanism by means of light. (12/6/28.)
292 916 C. Lorenz Akt.-Ges. Wireless communication and remote control systems. (25/6/27.)
312 514 U. F. L. Steindorff. Portable electric lamps. (22/6/28.)
312 522 Eversheds and Vignoles, Ltd., and C. Midworth. Index-locking devices for electrical measuring instruments. (26/6/28.)
294 112 International General Electric Co., Inc. Cooling of dynamo-electric machines. (16/7/27.)
294 147 British Thomson-Houston Co., Ltd. Apparatus for the inter-conversion of mechanical and electrical oscillations such as loud-speakers. (18/7/27.)
299 032 Steatit-Magnesia Akt.-Ges. Electric insulators. (20/10/27.)
294 180 G. Somajni. Electric motor control systems. (19/7/27.)
294 615 Associated Electrical Industries, Ltd. Protective apparatus for electrical distribution systems. (27/7/27.)
312 544 J. Baxter. Electrically illuminated manœuvre-indicators for use on road vehicles. (31/7/28.)
295 037 British Thomson-Houston Co., Ltd. Electric switches. (4/8/27.)
296 303 International General Electric Co., Inc. Electrical determination of irregularities in the structure of massive metal bodies. (27/8/27.)
312 560 J. L. Baird and Television, Ltd. Television apparatus. (30/11/27.)
299 778 G. Fischer. Current-collectors for electric vehicles. (31/10/27.)
300 121 Siemens and Halske Akt.-Ges. Telephone systems. (5/11/27.)
301 745 British Thomson-Houston Co., Ltd. Electric discharge devices. (2/12/27.)
302 181 Marconi's Wireless Telegraph Co., Ltd. Radio and the like signalling systems. (9/12/27.)
302 602 A. Koulikoff and C. Chilowsky. Method and apparatus for the measurement of distances by means of electromagnetic waves. (15/12/27.)
303 178 L. Thurm. Television and like receiving apparatus. (30/12/27.)
303 180 Standard Telephones and Cables, Ltd. Filter circuit arrangements comprising piezo crystals. (29/12/27.)
306 837 West Manufacturing Co. Test-sets for locating faults in electric transmission lines. (5/7/27.)
312 259 G. V. Lomonossoff and P. Kapitza. Electromagnets. (20/12/27.)
312 403 Electro Bleach and By-Products, Ltd., J. Hollins, and D. Jepson. Electrodeposition of metals. (25/2/28.)
295 368 Allmanna Svenska Elektriska Aktiebolaget. Electric rotary converters. (12/8/27.)
285 478 Siemens-Schuckertwerke Akt.-Ges. Coupling of two alternating-current mains of different frequencies. (18/2/27.)
312 658 J. H. Buchanan and Associated Electrical Industries, Ltd. Magnetic cores for electromagnetic devices. (24/2/28.)
312 591 W. D. Verschoyle. Electric lamps for the production of ultra-violet rays. (25/2/28.)
312 616 English Electric Co., Ltd. and J. C. Wilson. Excitation of dynamo-electric machines. (27/2/28.)

Applications for Patents.

May 8th.

14 436 Electrical Research Products, Inc. Submarine signalling conductors (6/6/28, U.S.)
14 300 D. A. F. Evennett. Electrical reproducers for gramophone records.
14 388 E. Fries Hackebridge Electric Construction Co., Ltd. Transformers.
14 342 A. Graham and Co., Ltd., W. J. Rickets and W. Stott. Telephone exchange systems.
14 431 P. B. Healey Telephone Manufacturing Co., Ltd. Telephone receivers.
14 437, 14 438, 14 439 J. H. Hewitt. Apparatus for electrically transmitting pictures, etc.
14 409 International General Electric Co., Inc. Electric oil switches. (8/5/28, Germany.)
14 407 L. Mellersh-Jackson (Siemens and Halske A.G.). Measurement of flow of liquid by electric generators.
14 440 L. L. de Kramolin. Radio receiving apparatus. (8/5/28, Germany.)
14 411 Dr. P. Meyer A.G. Mercury switches. (8/5/28, Germany.)
14 305 A. Moore. Electric lamps.
14 426, 14 427 L. M. Myers and Universal and General Radio Co., Ltd. Television receivers.
14 428 L. M. Myers and Universal and General Radio Co., Ltd. Radio apparatus.
14 415 S. de Ploeg and Soc. Anon. Electrochimique Phœbus. Manufacture of dry batteries.
14 381 Siemens Schuckertwerke A.G. High tension switches. (23/5/28, Germany.)
14 382 Siemens-Schuckertwerke A.G. Switchgear. (25/5/28; Germany.)
14 321 Spezial-Werkzeugfabrik Feuerbach Ges. Electromagnetic signalling device for vehicles. (8/6/28, Germany.)

May 9th.

14 540 C. O. R. Andrews and J. D. Frye. Incandescent cathode X-ray tubes.
14 549 Associated Electrical Industries, Ltd. Automatic synchronising apparatus. (29/5/28, U.S.)
14 564 P. Baxter and A. H. Gausden. Electrical pick-up devices.
14 456 British Thomson-Houston Co., Ltd. Stabilisation of tuned radio frequency amplifiers. (9/5/28, U.S.)
14 457 British Thomson-Houston Co., Ltd. Dynamo electric machine windings. (9/5/28, U.S.)
14 513 British Thomson-Houston Co., Ltd. Systems of electrical distribution. (9/5/28, U.S.)
14 514 British Thomson-Houston Co., Ltd. (General Electric Co. of New York). Photo-electric devices.
14 572 J. N. Dean, H. J. Garnett and W. S. Smith. Manufacture of electric cables.
14 537 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Feeding discharge tube cathodes with alternating current.
14 497 D. Dunnett. Ignition timing apparatus for engines.
14 506 S. G. Brown. Gyroscopes.
14 556 Etablissements E. Belin. Picture telegraph, etc., systems. (9/5/28, France.)
14 491 F. W. Mather. Television apparatus.
14 531 N. V. Philips' Gloeilampenfabrieken. Thermionic valves, etc. (15/12/28, Holland.)
14 542 Telefonaktiebolaget L. M. Ericsson. Circuit arrangements for telephone systems. (12/5/28, Sweden.)
14 560 Telefonaktiebolaget L. M. Ericsson. Impulse circuits. (12/5/28, Sweden.)
14 539 J. Villiger. Automatic telephone installations.

May 10th.

14 587 J. Achard. Electrical induction apparatus for resistance welding. (26/11/28, France.)
14 576 H. Ashdown. Electromagnetic loud speaker.
14 712, 14 713 J. L. Baird and Television, Ltd. Television apparatus, etc. (11/7/28.)
14 590 W. L. Barber and Midland Electric Manufacturing Co., Ltd. Starting switches for motors.

METAL AND CHEMICAL PRICES.

Tuesday, July 30th.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£75 10 0	—	—
Electro Wirebars .. .. ,,	£84 15 0	5s. od.	—
H.C. Wires, basis .. .. per lb.	11 11/16d.	1/16d.	—
Sheet .. .. ,,	11 1/16d.	—	—
Phosphor Bronse—			
Wire (Telephone), basis .. per lb.	1s. 2 11/16d.	1/16d.	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	8 1/4d.	—	1/4d.
Sheet ,, ... ,,	10 1/4d.	—	—
Wire ,, ... ,,	11 1/4d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. ,,	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£24 5 0	—	—
Foreign or Colonial .. .. ,,	£23 0 0	5s. od.	—
Tin—			
Ingot .. .. per ton	£215 0 0	—	—
Wire, basis .. .. .. per lb.	2s. 10d.	—	—
Aluminium Ingots .. .. .. per ton	£95 0 0	—	—
Spelter .. .. ,,	£25 5 0	—	2s. 6d.
Mercury .. .. per bottle	£22 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2 1/2d.
Sodium Bichromate—Per lb. 3 1/2d.
Rubber—Para fine, 11 1/2d.; plantation, 1st latex, 11 1/2d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

The market was quiet last week, and, according to James Forster and Co., the highest prices paid were on Monday at £22 16s. 3d. for July and £22 17s. 6d. for October, and lowest on Wednesday at £22 10s. and £22 12s. 6d. respectively. The American price remains unchanged at 6.75 cents.

Closing prices on July 25th were £22 12s. 6d. for July and August, £22 13s. 9d. for September, and £22 15s. for October, 1s. 3d. per ton lower on the week.

COMING EVENTS.

Saturday, August 3rd—Monday, August 12th.

Institution of Electrical Engineers (Students' Section).—Summer tour, Paris and Northern France.

Tuesday, August 6th.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting 5 *p.m.*

Wednesday, August 7th.

Electrical Contractors' Association (Bath Sub-Branch).—Ordinary meeting.
Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting. 2.30 *p.m.*

Thursday, August 8th.

Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting.
Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.
Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting. Corridor Chambers. 2.30 *p.m.*

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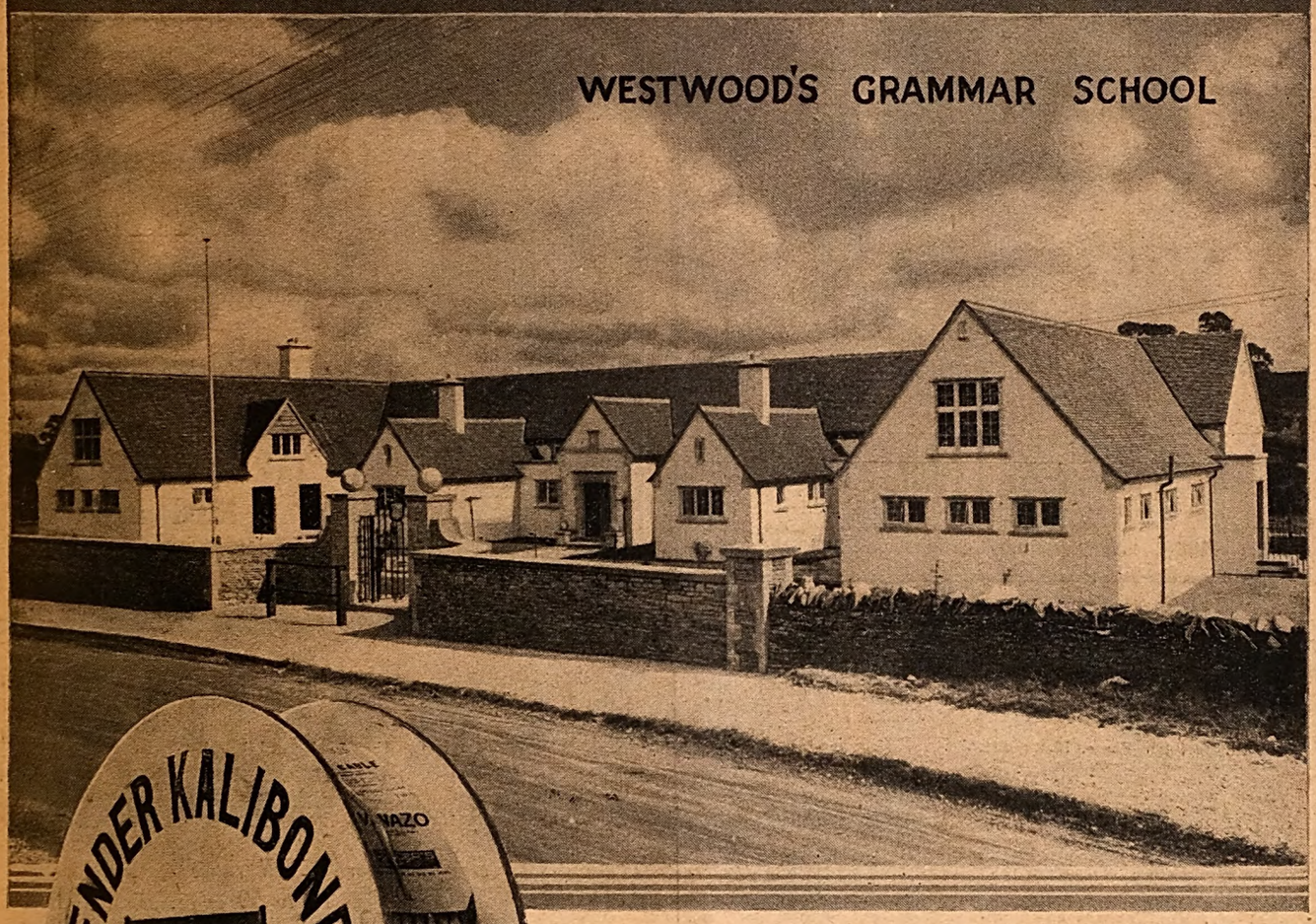
THE ELECTRICIAN

Vol. CIII.—No. 2671. Friday, August 9, 1929. [Registered at the General Post Office.] Sixpence

Wired with "Kalibond"



WESTWOOD'S GRAMMAR SCHOOL,
NORTHLEACH, GLOUCESTERSHIRE,

wired throughout with **"Kalibond"** to the specification of

Mr. H. S. PHILLIPS, F.R.I.B.A.,
County Education Architect, Gloucester.

Always specify "Kalibond" for Electric Lighting and domestic Power and ensure safe and easy wiring with a sound, permanent installation.

The CALLENDER "KALIBOND" WIRING SYSTEM

Patent Nos. 215671, 225114, 226120, 236786, 272730, 276172

CALLENDER'S CABLE & CONSTRUCTION Co., Ltd.
HAMILTON HOUSE, VICTORIA EMBANKMENT, E.C.

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ZENITH

(REGISTERED TRADE MARK)

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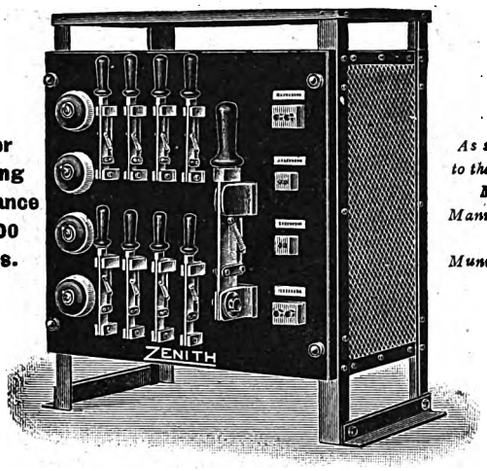

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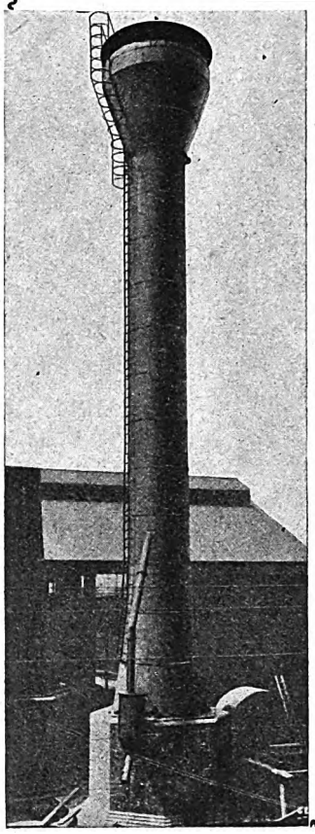

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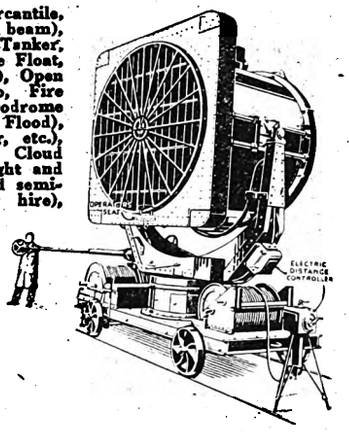

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Current Topics.

Electric Vehicle Possibilities.

OUR belief that there is a big future for electric battery road vehicles has often been expressed in these columns, and of its truth there can be no question if only the electrical industry will take the matter up in a vigorous way and "push" electric battery traction for the applications to which it is—in its present phase of development—best suited. Although but a small proportion of the industry is directly interested in the development of this form of road transport it is possible for all to help it along. As providers of a useful off-peak load for power stations electric vehicles naturally deserve encouragement from station engineers, but other sections of the industry can help too. All electricity undertakings, without exception, should use commercial electric vehicles for transport purposes and supply engineers should themselves ride about their supply areas, if no farther, in an electrically-propelled car; than which there is no better advertisement for the cleanliness, and silent, odourless and unobtrusive power of electricity. Just as all electrical men who take a pride in their industry live in properly electrified homes, all who are in a position to run a car should think long and earnestly before purchasing a petrol-driven machine. Coming from the electrical industry itself a push of this kind would give a great impetus to a development the extent of which we can hardly visualise to-day. It is no exaggeration to say that where electricity and some other means are available for performing a certain job of work, electricity, if properly applied, will always do it better than the alternative. Why, then, do we tacitly acknowledge the superiority of the fuel-wasting and odoriferous petrol engine. The performance of storage batteries, and the service of charging stations are doubtless susceptible of improvement, but such improvements will only follow a definite determination to put the electrically-propelled vehicle in its proper place in the transport world. The extent of the field is enormous, but it is humiliating to find, according to a return issued by the Ministry of Transport that out of a total of 2 059 346 motor vehicles licensed at May 31st last only 1 405 were electrically-propelled, and that out of a total of 14 603 mechanically-propelled goods vehicles registered for the first time during the period March—May, 1929, only 11 were electrically propelled. These figures are at once a reproach and a challenge.

Electric Baths at Taunton.

CONGRATULATIONS are due to Mr. A. J. HOWARD, borough electrical engineer of Taunton, for securing a full electrical service in the new swimming and slipper baths which were opened on August 1st. In addition to the lighting installation, electricity is used for power purposes, and electric motors find application in the filtration plant and elsewhere. Heating is not actually by electricity, but steam from the power station is very usefully employed in this direction and no gas or coal is used anywhere in the establishment. As if this were not enough to mark the new baths as an Electricity Department job, four E.P.E.A. members of the generating staff won the team race shield at the opening gala.

A Curious Policy.

READERS will recollect that we have recently published several letters containing complaints about the service of a London electricity supply company. The ground for complaint was very unusual, for in this case the company's prices have recently been reduced to a reasonable level to consumers electing to be charged on an "all-in" basis. The introduction of the two-part tariff suggested to some consumers that it might now be economical for them to use electricity in their homes for heating and cooking. Curiously enough, according to the complainants, inquiries about cookers and fires brought from the supply company a warning that a certain very low figure of maximum demand must not be exceeded. In one case the figure quoted was 3 kW, which definitely excludes the use of a normal-sized cooker or electric fires. The complaints which have come to our notice are made by men who are engaged in the electrical industry, but there must be a large number of non-electrical people on this company's mains who are similarly placed and who represent a big potential domestic load, for the development of which the new two-part tariff was presumably introduced. Feeling that the company should have an opportunity to state its case and deal with these remarkable criticisms, we wrote to the supply company suggesting that they might care to reply to the points raised by correspondents in our columns. Judging by the silence which they have maintained up to the present, the company do not wish to reply, though it seems obvious that some sort of statement is eminently

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desirable, as their policy of seeking domestic load by the offer of a two-part tariff and then declining to give the service when demanded is one that is not likely to be easily understood by consumers.

"Light's Golden Jubilee."

MANY British electrical engineers, probably viewing the matter in the light of corresponding celebrations in this country, seem to have greatly underestimated the extent of the "Light's Golden Jubilee" celebrations in which the National Electric Light Association of America is "telling the world" that Mr. EDISON invented the incandescent electric lamp. It is all very well for us to adopt a complacent attitude and assure ourselves and each other that, despite the propaganda of the N.E.L.A., we know that SWAN is the real hero of the piece. In these columns we have more than once endeavoured to indicate the widespread nature of the American propaganda, and how such countries as South Africa and Japan have been prevailed upon to co-operate. A further idea of the magnitude of the effort may be gained from the statement that a new 2 cent postage stamp has been issued by the U.S. Post Office Department "to commemorate the fiftieth anniversary of the perfection by THOMAS ALVA EDISON of the incandescent lamp," and that the first issue of 180 000 000 stamps was sold so quickly that a second issue of 110 000 000 stamps has been authorised.

Sulphur Compounds in Flue Gases.

SINCE the London Power Co. announced the discovery of a perfectly practicable and commercial solution of the "sulphur problem" we have been reading an article in "The Chemical Age," in which Mr. J. ARTHUR REAVELL, President of the Institution of Chemical Engineers, puts forward a plan which he believes will quite easily remove 90 to 95 per cent. of the sulphur compounds from the flue gases. Briefly, the method advocated is to saturate the gases entering the flue by means of a rotary atomiser with warm water from the condenser discharge, the atomiser being rotated independently of the water, and the water discharged on to this rotating disc or roller from the outside. Mr. REAVELL suggests that the subsequent washing for sulphur removal should take place in a chamber so arranged that the water should present as large a surface as possible to the gases, with the maximum possible time of contact between water and gases. It is pointed out that by this method a certain amount of entrained water is carried out of the chimney unless eliminators are provided to remove the surplus water.

Electricity in Factories.

AMONG the many conversions which the application of electricity has brought about must be added that of converting workshops into factories, for according to the Chief Inspector of Factories the installation of power-driven machinery into even the smallest workshop raises its dignity to that of a factory. Bearing this in mind, it is interesting to note that, in spite of the necessarily increased number of factories, the total number of fatal accidents due to electrical causes during 1928 was only 26. This figure, based on facts given by the Senior Electrical Inspector, whose contribution to the Annual Report of the Chief Inspector is dealt with elsewhere in this issue, is largely made up of accidents involving voltages below 500, and its smallness is in a great measure due to regulations and inspection, together with the improved methods of manufacture of accessories, portable tools, etc. That this is so is shown by the fact that the total number of reportable accidents during 1928 was actually less than fifteen years ago, notwithstanding the increased application of electricity to industry. The fatality rates per 1 000 accidents in the various industries record "electrical generating stations" as being responsible for 19, a decrease of 10 when compared with 1927, the lower figure being due in some degree to the fact that h.t. switchboards are now adequately protected against contact, and fitted with protective devices against mistakes by their attendants. Whilst opinions differ as to the advisability of interlocking, which, as Mr. SCOTT RAM points out, in cases of temporary disconnection or repair has itself been the cause of some accidents, there is little doubt that some of the serious accidents which have occurred would have been prevented by its adoption. The Home Office Industrial Museum, which was opened a year ago in connection with accidents in factories, has proved of considerable interest, nearly 8 000 persons having examined the exhibits during the year. Though the museum was intended for use as a demonstration centre against accidents, use has also been made of it to ascertain the best type of electrical equipment and methods of lighting for laboratories and lecture rooms, while the secretary of a golf club inspected the lighting exhibit before embarking on a new colour scheme for the club house!

Rate Aid Again.

THERE are very few municipal electrical engineers who are unaware of the injustice of transferring large sums from the profits of their electricity undertakings to the relief of the general rates, but too many of those who are afflicted with Electricity Committees and Town Councils to whom this policy appeals keep this knowledge to themselves. A vigorous statement of the case against rate relief is included by Mr. F. W. PURSE in his last annual report as engineer and manager of the West Ham Electricity Department. While there is nothing particularly new in Mr. PURSE'S argument, it is worthy of emulation as a concise and effective pronouncement. He points out that "apart from the moral obligation of repaying the amount formerly advanced out of the rates, there is no reason whatever why any contribution should be made in aid of rates. One is well aware of the old cry of the loans being raised on the security of the rates; but the fact is always overlooked that the consumers of electricity are making a handsome present to the ratepayers in the shape of the assets of the undertaking, which could be disposed of at any time and a handsome profit realised. It is therefore difficult to appreciate why the rates should be subsidised to benefit such ratepayers as the railway companies and gas companies, who take all the benefit of the Department and do not assist it in return. If all the ratepayers were consumers of the Department, there might be something to be said for 'rate aid,' but otherwise it is a very vicious doctrine and a hindrance to progress and development." If every municipal electrical engineer concerned would include a paragraph of this kind in every annual report we would soon see the end of indiscriminate rate relief.

The E.T.B.I. Competition.

KNOWLEDGE of the game of judging distances, in which so many electrical engineers acquired proficiency fifteen or so years ago is proving useful in the "cable-laying" competition which has been organised in aid of the funds of the Electrical Trades Benevolent Institution. This interesting contest, of which details have previously been given in our pages, is tempting a gratifyingly large number of entrants, and we understand that though barely a month has elapsed since the scheme was launched only a hundred books of tickets at present remain unsold. As it appears probable that no further tickets will be printed when the present stock is disposed of, intending competitors are advised to make immediate application for their ticket requirements. By entering this contest electrical men secure an interesting spare-time occupation, with the chance of winning one of a number of handsome prizes, and lastly, but by no means of least importance, they assist the Institution in its increasingly difficult task of devoting their ridiculously small funds to the assistance of all deserving and necessitous persons who are or have been engaged in the electrical industry.

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CONCRETE POLE DESIGNS AND COSTS—II.

An Examination of the Differences in Cost of Wood and Concrete Lines—The Most Economical Construction—Disadvantages of Steel—Detailed Examples of Costs.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

(*Continued from page* 103.)

APART from the fact that wood is a better insulator than reinforced concrete, the latter construction is far superior in every way, and therefore should justify a higher price than wood construction. Furthermore, the chief questions at issue have nothing to do with the better insulating properties of any one material over the other.

The two chief questions are :

(*a*) Can the concrete construction compete favourably in initial first cost of line for the general sizes (or weights) of distribution lines, i.e., lines averaging slightly above the minimum equivalent of three or four 0·025 sq. in. copper conductors ?

(*b*) What percentage higher price will justify a reinforced concrete pole line of the equivalent strength of wood ?

The initial equivalent design strength favours wood at the start, but rarely favours the common wood-pole foundation at the start because it is usually set in a back-fill. On the other hand, for equal initial strength, concrete construction is favoured throughout its long life because it increases in strength with age, and is weakest when new. Also, for equal strength of wood or steel, if concrete construction cost is favourable in the lighter weights, it is assuredly still more favourable in the heavier construction such as main power transmission lines. Certainly, engineers must first assure themselves of (*a*) and (*b*)—the endeavour of this article is to help satisfy the mind on these two most outstanding points.

The appreciable difference in cost between the wood pole line and the concrete pole line is due to the difference in total weight and cost of the transported materials *plus* the total cost of casting and curing, etc., of the concrete pole. For the wood pole we simply have the cost of the timber delivered to the nearest railway siding or station *plus* the cost of haulage, handling, erection, and foundation. For the reinforced concrete pole of the general kind (not the kind proposed by the writer and discussed herein with costs) there is the cost of casting, curing, storing, and handling at the pole works, *plus* the cost of railway transport, *plus* the cost of hauling, handling, erection, and the costs for concrete foundation. The writer's proposal is to transport and haul only the necessary steel and cement and sand to the pole site and cast the pole right in its final position on a finished and undisturbed reinforced concrete foundation—in this way, the concrete pole *line* can favourably compete in first cost with the wood pole *line*, and also provide a superior and usually a more reliable line.

Quality of Material.

The so-called " first class " timber of to-day is not what it used to be, and what there is of the first grade is difficult to find and uncertain in quality because of the depleted forests, etc. The resulting tendency is well marked on the decreased life of the relatively poorer quality timber. Moreover, inferior or defective maintenance, or a reduction in maintenance costs, bring about decreased life and increased failures. A study of the relative best conditions and properties of the soil, wood, and the most suitable kind of foundation, are also left so haphazard that the period of life is further reduced or/and maintenance costs can be increased beyond the estimated values allowed herein for wood and steel.

The most efficient and economical line construction is not necessarily wood or steel or concrete—something beyond a mention of the particular material must be included in the design and construction. For instance, neglecting the smaller or the heavier-weight construction, there are several kinds of wood poles and frames, several types of steel poles, and several processes for concrete poles. The first cost for wood and steel respectively varies within fairly narrow commercial limits for a given set of conditions ; on the other hand, the casting of a reinforced concrete pole will vary all the way from an expensive machine-made one-piece long-distance-transported heavy-type, to a very much less costly and equally strong (or stronger) cheaper-made but heavier-type pole, entirely relieved from transport and handling and their consequent costs and risks. The writer is mainly concerned with the design that eliminates any possibility of bird troubles ; a type that offers the most reliable line ; a line that satisfies reasonable initial total first cost ; longest life ; minimum cost of maintenance ; and minimum service interruptions as judged from all points of view. All these should favour the reinforced concrete pole line proposed by the writer.

The three main grades of overhead lines we need consider are :—

(1) Those lines where the annual interest on the total capital expenditure is equal to, or is greater than, the total depreciation annuities *plus* operating expenses. Taken as a general rule, these conditions are typical of the wood pole line.

(2) Those lines where the annual capital interest is appreciably higher than the equivalent wood pole line, and the total depreciation annuities *plus* operating expenses are appreciably less than the equivalent wood pole line. These conditions will usually conform to, and are quite typical of, steel pole lines.

(3) Those lines where the interest on the total capital investment is no greater than the steel pole line and may equal the wood pole line, but is much greater than the total depreciation annuities *plus* operating expenses. These conditions will, in practically all cases, conform to the reinforced concrete pole lines of the construction proposed by the writer herein, and referred to in THE ELECTRICIAN of April 5th, June 28th, and July 26th.

Wood, Steel or Concrete ?

In making a choice of wood, steel or concrete, it is vital to keep well in mind that the type and construction must under no account be neglected, and that the factor where the greatest economy can always be made (apart from the advantages derived from the writer's proposed construction) is in the sum total costs of depreciation annuities and operating expenses.

It is becoming more generally realised that the climatic and atmospheric conditions of this country are highly rust-forming—that the steel pole line is quite as costly as the wood pole line—that it is not so safe and is a less protective line than the wood pole line. In other words, the wood pole line is more efficient and more economical than many types of steel pole lines now in common use. In order to understand their meaning it is necessary to add that practice has taught engineers to think of efficiency in terms of delivering power at the lowest cost, which include such relative cost items as the initial cost, depreciation annuities for the materials, cost of maintenance, and cost due to service interruptions caused by inefficient design and construction, replacing of poles, bird troubles, etc. The summary of initial costs, interests, etc., given herein, shows that the steel pole is not so efficient nor so economical as the wood pole line, because the *annual total cost for upkeep of the steel pole line is higher for the transmission of the same amount of power.*

The reinforced concrete pole will either retain the 100% original supporting strength, or, with age, maintain a strength still greater. As most crippling loads causing failure are momentary jerking loads, the reinforced concrete pole of equal design strength of the wood or steel pole line, respectively, is stronger, due first to the greater flexibility or/and less number of poles (compared with wood) for a given length of line affected, and, in the second place, it has the advantage of the superior foundation, either when new or old. Painting and renewing or resetting poles are processes entirely eliminated from concrete construction. Landowners and tenants are freed from excessive traffic and consequent troubles during its entire longer lifetime. Wayleave costs and annoyances are reduced to a minimum. The insulator problem is simplified. Thus, from the constructional and maintenance viewpoints, the concrete pole has many advantages.

Now let us take a detailed example of a very small sized primary distribution line consisting of wood, steel, and concrete, respectively. The following results will also closely resemble the equivalently weighted communication-circuit line or a 230/400 V 4-wire secondary line, but will still further favour the concrete construction as compared with wood construction.

Example.—One three-phase, 3-wire, 0·025 sq. in. copper conductor line for 11 000 V.

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COST OF STRUCTURAL STEEL LINE.

	£ s. d.
2·5 tons steel for poles and arms, including transport, etc.	80 13 0
15 cu. yds. concrete for foundations	48 0 0
1 000 lb. copper conductor	48 12 0
32 insulators, including double-insulators for roads	6 3 0
32 galvanised insulator-pins	4 4 0
400 lb. galvanised earth-wire	2 16 0
Earth plates with connections	3 2 0
Haulage of materials, not poles	4 0 0
Steel erection, stringing, etc., for spans of 660 ft.	40 0 0
	237 10 0
Plus 15%	35 12 6
Cost per mile	£273 2 6

COST OF WOOD POLE LINE.

	£ s. d.
1 000 lb. copper conductor	£48 10 0
440 lb. galvanised earth wire	3 3 0
90 insulators, including double insulators for roads	17 10 0
90 galvanised insulator-pins	7 2 0
Poles, arms, braces, bolts (including transport, etc.)	64 0 0
Foundation baulks in place	9 3 0
Wood pole for strut at angle, complete with bolts, etc.	2 0 0
Galvanised earth plates and connections	3 13 0
Haulage of materials, not poles	7 17 0
Stringing, etc., for spans of 240 ft.	14 2 0
	177 0 0
Plus 15%	26 11 0
Cost per mile	£203 11 0

COST OF REINFORCED CONCRETE POLE LINE.

	£ s. d.
1 000 lb. copper conductor	£48 12 0
440 lb. galvanised earth wire	3 3 0
36 insulators, including double insulators for roads	7 2 0
36 galvanised insulator-pins	2 16 0
Earth plates and connections	3 3 0
Haulage of materials, not poles	4 0 0
Stringing of conductors, etc., for spans of 570 ft.	9 14 0
	78 10 0
Plus 15%	11 15 6
Poles and cross-arms complete in place	128 0 0
Cost per mile	£218 5 6

Annual Expenses (Steel Pole Line):	(A) £ s. d.	(B) £ s. d.	(C) £ s. d.
Annual capital interest at 5%	13 14 0	13 14 0	13 14 0
Depreciation annuities for Poles,			
at 2·0% of £181	3 12 0	—	—
at 1·5% of £181	—	2 14 0	—
at 1·25% of £181	—	—	2 5 0
Depreciation annuities for remainder of line,			
at 4·0% of £93 12s.	3 15 0	—	—
at 3·5% of £93 12s.	—	3 6 0	—
at 3·0% of £93 12s.	—	—	2 16 0
Operating expenses	3 0 0	3 0 0	3 0 0
Total annual expenses	24 1 0	22 14 0	21 15 0
Annual Expenses (Wood Pole Line):			
Annual capital interest at 5%	10 4 0	10 4 0	10 4 0
Depreciation annuities for Poles,			
at 7·0% of 24×£3	5 0 0	—	—
at 6·0% of 24×£3	—	4 6 0	—
at 5·0% of 24×£3	—	—	3 12 0
Depreciation annuities for remainder of line,			
at 4·5% of £148	6 13 0	—	—
at 3·5% of £148	—	5 4 0	—
at 3·0% of £148	—	—	4 9 0
Operating expenses	4 10 0	4 10 0	4 10 0
Total annual expenses	26 7 0	24 4 0	22 15 0
Annual Expenses (Concrete Pole Line):			
Annual capital interest at 5%	10 19 0	10 19 0	10 19 0
Depreciation annuities for Poles,			
at 0·8% of £128	1 0 0	—	—
at 0·4% of £128	—	0 10 0	—
at 0·2% of £128	—	—	0 5 0
Depreciation annuities for remainder of line,			
at 3·75% of £91	3 7 0	—	—
at 3·3% of £91	—	3 0 0	—
at 3·0% of £91	—	—	2 14 0
Operating expenses, *nil*, or	0 10 0	0 10 0	0 10 0
Total annual expenses	15 16 0	14 19 0	14 8 0

NOTE.—In the cases of wood and steel, *the operating expenses* nclude costs for painting, replacing, and other annual expenses. To these costs there are the expenses accrued from relative interruptions to service, which vary for each case independent of the type of construction.

Taking a very good average life for the steel pole at 35 years, then, for this period we have the following costs for the respective wood, steel and concrete pole lines. In view of the fact that the average life of the reinforced concrete pole is longer than 35 years, we obtain a further advantage.

The relative gross total costs of the steel and wood respectively will alter with the varying conditions of first costs, total annual expenses, and life period. For instance, it is seen that the wood pole line is the highest for the 35-year total upkeep cost—as a matter of fact, for a 35-year period and equal factor of safety it is almost certain that other first costs for wood poles would have to be included here.

For a better comparison we may apply the 25-year period, and/or the lower depreciation annuities, etc., which are included to answer a wider scope for practical usefulness.

Relative Grand Total Costs per Mile of Line.

	(Steel) £ s. d.	(Wood) £ s. d.	(Concrete) £ s. d.
Cost of Construction	273 2 6	203 11 0	218 5 6
Upkeep cost for 10 years for			
(A)	513 12 6	467 1 0	376 5 6
(B)	500 2 6	445 11 0	367 15 6
(C)	490 12 6	431 1 0	362 5 6
Upkeep cost for 17½ years for			
(A)	693 17 6	664 13 6	494 15 6
(B)	670 7 6	627 1 0	479 18 0
(C)	653 15 0	601 13 6	470 5 6
Upkeep cost for 25 years for			
(A)	874 7 6	862 6 0	613 5 6
(B)	840 12 6	808 11 0	592 0 6
(C)	816 17 6	772 6 0	578 5 6
Upkeep cost for 35 years for			
(A)	1 114 17 6	1 125 16 0	771 5 6
(B)	1 067 12 6	1 050 11 0	741 10 6
(C)	1 034 7 6	999 16 0	722 5 6

That is to say, during the 35 years the wood pole line will have cost £354 10s. 6d. more than the reinforced concrete pole line, which means that, in the long run, it is about as cheap to build and operate two concrete pole lines as it is for one wood pole line, or one steel pole line; this is decidedly so when we account for the expenditures for new wood poles, etc., within the 35-year period, the added cost of service interruptions thus accrued along with loss of revenue due to cutting off the energy supply, including extraordinary labour expenses required to cope with these irregularities, etc.

By using wood poles instead of reinforced concrete poles there is a little saving in the *initial* first cost, but the electricity supply undertaking must pay £10 11s. more per mile each year for maintaining the wood pole line, excluding greater wayleave and other costs that can be added thereto. Thus, to save a little in first cost, the supply company owning the wood pole line is operating it as if it were borrowing money at the rate of interest amounting to (£10 11s./£15 15s.) × 100 = 66% *per annum*.

A Considerable Annual Saving.

The *annual* saving by installing the concrete pole line is equal to more than £1 000 per 90 miles of line, or at least £35 000 for the highest life period and the same length of line.

Furthermore, the installation of the concrete pole line represents one of the most beneficial and *the* most permanent manner of supplying cheaper electricity to the general public. In other words, an aggregate total of 900 miles of line capable of transmitting no more than, say, 300 kW means that the electricity supply undertaking can deliver power over the concrete pole line at a cost £3 3s. cheaper per kW than over the wood pole line.

We therefore have very good reasons for asking: Why borrow money at 66% interest per annum? Why build a less reliable line that costs £3 3s. *more* per kW delivered the same distance? Why not save the interest on the borrowed money, and at the same time obtain a better line and also give cheaper electricity supply for equal or less gross total costs?

The light-weight (3-wire, 0·025 sq. in. copper conductor) construction given here is decidedly the most favourable condition for the wood pole, but even then adverse results are shown. It is therefore evident that the wood pole line will be less able to compete with the heavier types of construction—this also applies to telegraph and telephone-circuit lines with the larger number of circuits. For 33 000 V and 132 000 V lines the reinforced concrete pole line (of the construction proposed herein) is superior in practically every way to steel or wood of any type or kind.

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COMMERCIAL PROPERTIES OF BAKELISED ASBESTOS.

Properties of a New Material—Comparative Tests on British and Continental Samples—Points for the Raw Material Inspection Department.

By "H. T. U. R."

THE synthetic resins have now been known for a considerable number of years, and their commercial applications have developed to a very great extent, especially in the electrical industries, where stability of insulation is of primary importance. By no means the least popular form of the material is the sheet, where resin-soaked paper or cloth is pressed and cured into a compact board with highly finished surfaces. Lately a newer type has been launched on the market having asbestos as base. It is with this latter material that the present article deals.

When treating first with an entirely new material there immediately arises the question of what physical limitations we should expect and permit. While fundamentally similar to the paper and textile base sheet materials, the asbestos obviously changes the nature of the product. It might reasonably be expected that bakelised asbestos would be more resistant to heat than the paper material, and such proves to be the case in actual fact.

The usual tests applied to phenolic sheets are as follows :—(1) Loss in weight due to prolonged heating; (2) Gain in weight during boiling in water; (3) Some form of insulation test after prolonged humidifying; (4) Strength and flexibility tests varying according to the thickness of the samples under consideration.

Chemical tests carried out on samples of bakelised asbestos gave results as follows :—

	Continental Manufacture.	English Manufacture.
Ash value (asbestos base) ..	59·2%	57·1%
Litmus reaction	Faintly alkaline	Neutral
Matter soluble in water	6·6%	1·7%
Matter soluble in spirit	1·3%	4·9%

Experimental heat tests were carried out, and, heated at 280 deg. F. for 1½ hours; the Continental material gave 1·6% loss, and the English 0·85% loss. A further two hours gave an additional loss of 0·5% on the Continental, and 0·03% on the English.

Raising the temperature to 350 deg. F. for an additional four hours gave no more appreciable loss, but gave rise to embrittlement in the Continental sample, and to embrittlement and slight blistering in the English.

Effect on Metals.

In electrical work at raised temperatures it is important to know the possible chemical effect of the materials on metals with which they are likely to be in contact, such as springs, switch parts, etc. To make conditions as stringent as possible the parts were heated up to 270 deg. F. in contact with a series of metals, nickel silver, brass, copper, phosphor bronze, monel metal and steel, and then, while still remaining in contact, were humidified by 72 hours in a water-saturated atmosphere at room temperature. In all cases the metals were slightly coloured, but there was no trace of real corrosion.

The practical insulation tests applied to insulating sheets, while much in dispute at the present time, are yet still carried out by the big concerns of this country and America. It was, I believe, in the latter country where the Megger test at screw centres ranging from 1 in. to 1½ in. first originated.

At 1⅜ in. centres the Continental material averaged 86 MΩ, while the English averaged 700 MΩ. To get these figures a series of twenty tests was carried out on material ⅛ in. thick.

Tests for the loss in weight due to heating are usually carried out by taking a 1 in. square of the sheet, carefully weighing, and then heating at approximately 280 deg. F. for half an hour. Such tests are standard for the paper and textile base materials. Applied to the samples in question both averaged 1%.

For the gain when boiled in water the same samples were used. Two hours is the usual time for the test. They averaged 0·9% and 0·75% respectively.

Glancing now at the results of the chemical tests, it appears that the Continental material is somewhat better cured, which fact may be deduced from the lower spirit extract. However, due to its higher water soluble matter, it may be supposed that the asbestos base is not so good.

In many instances bakelised asbestos sheet will be required to work in contact with resistance wires, and thus its heat resistivity is important. The tests shown above indicate that it may safely be used up to some 300 deg. F.

So far as the present writer is aware, there is no official specification for bakelised asbestos sheet, and therefore it may be of interest to give a few facts culled from extensive tests and experience with commercial deliveries which indicate what may be obtained, and at the same time what is necessary for insuring a good class material well able to withstand the strenuous service conditions to which it may on occasion be subjected.

Asbestos.—Content should fall between 45 and 65%. Determined by the usual incineration method.

Alkalinity.—Nearly all commercial material is somewhat alkaline, and, if a neutral sheet be insisted upon, very little can be passed into the factory. It is best, therefore, to specify that a roughened and moistened surface shall just colour red litmus paper. It is a crude test, perhaps, but one which experience shows is quite good enough for the usual run of work.

Spirit-soluble matter.—A five-hour repeated extract should give a figure not exceeding 6%. A higher figure than this means that the sheet has not been fully cured. Sometimes, of course, half-cured sheets are required for moulding and other work, when this test bears no weight.

Acetone test.—Often stated to be of use, but very doubtful in practice.

Tarnishing.—Raised to 250 deg. F. in contact with polished copper, and after three hours removed to saturated atmosphere and allowed to remain there at atmospheric temperature for 12 hours, there should be no observable corrosion. Actually this test need not be applied, since the writer knows only one case where results condemned the sample.

Heat Loss.—Carried out as described above, loss for sheets up to ⅛ in. thick should have a maximum of 2%.

Gain in Water.—As tested as above should not be greater than 2% for sheets up to ⅛ in. thick.

Destructive Heat.—Twelve hours at 330 deg. F. should not harm the material, nor render it very much more brittle.

Electrical Tests.—So long as the surface is good and the sheets conform to the tests just mentioned, it is the experience of the writer that electrical tests are redundant. The percentage gain in water seems to control the electrical insulation, which naturally has to be carried out after humidifying.

In conclusion, the writer wishes to point out that while the results of the experimental work given in the foregoing article are accurate to the usual laboratory degree, they are intended for use by the Raw Material Inspection Department, and must not be considered in an academical light. If, however, the limitations be met by material, then there should be no trouble experienced in service, which, after all, is the great thing.

ALUMINIUM STANDARDS.

Five New Specifications Issued by the B.E.S.A.

FIVE new specifications relating to aluminium have recently been issued by the British Engineering Standards Association. Two, numbered 359 and 360, are for 98% aluminium notched bars and ingots and rolling slabs and billets and 99% aluminium notched bars and ingots respectively. These deal with the chemical composition of the bars, etc., and the provision of samples for analysis. The other three specifications are for 7% copper, 12% copper, and zinc-copper aluminium alloy castings, and are numbered 361, 362 and 363 respectively. The chemical compositions are specified, together with requirements relating to chemical testing, dimensions, margins of manufacture, and freedom from defects. Mechanical tests are laid down, and provision is made for the supply of test samples.

Copies of these specifications may be obtained, price 2s. 2d. each post free, from the Publications Department, British Engineering Standards Association, 28, Victoria Street, London, S.W.1.

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LIMITS OF THE ECONOMICAL TRANSMISSION OF ELECTRICAL POWER.*

A Comparison of the Relative Cost of Carrying Coal and Conveying Energy Electrically Between Two Given Points—Hydro-Electric *v.* Steam Stations.

By Prof. E. W. MARCHANT, D.Sc, M.I.E.E.

THE transmission of electrical energy nowadays is primarily an economic problem. There is no great technical difficulty in transmitting energy over distances of several hundred miles, though there has been a good deal of discussion in the past as to the best method to use. At the present time, however, apart from a few installations in France and Switzerland, nearly all power transmission is carried out by three-phase high tension currents. In America distances of 300 miles and over have been covered, and pressures up to 350 000 V have been employed. (Here again it is the economic question which determines the pressure to be employed.) There is no overwhelming technical difficulty in using pressures up to 1 000 000 V.

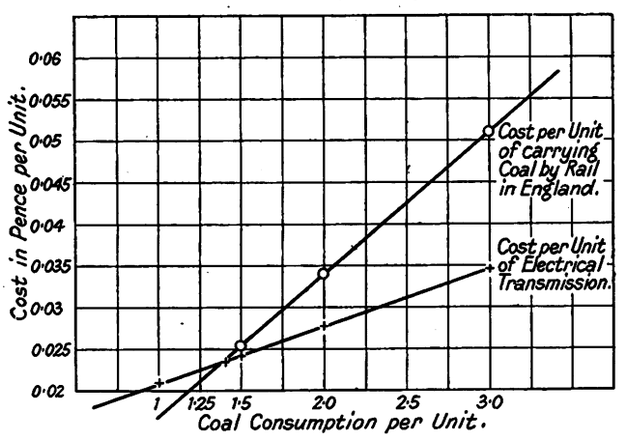

Fig. 1.—Comparison between cost of carrying coal, and cost of electrical transmission per unit for varying coal consumption per unit.

Experiments have been made on overhead transmission lines which more closely resemble bridges than the transmission lines to which we are accustomed, which are designed for operation at a pressure of 1 000 000 V. The most economical pressure to use on a transmission line is, of course, governed by the cost of the line and the cost of the waste energy according to the well-known Kelvin's Law.

Comparison of Costs.

When central stations are operated by steam boilers driving turbo-generators it has often been suggested that the most economical arrangement would be one in which the power station was located at the coal mine, and the energy conveyed electrically to the place where it was to be used. It may be of interest to discuss one case in order to determine the conditions under which such an arrangement can be used economically, though it must be remembered that in settling the site of a modern super station there are many factors, such as the supply of water, which have to be taken into account besides the proximity of a coal mine.

As an illustration, the case of a town such as Liverpool may be considered. Liverpool has adequate railway facilities and a good supply of coal within 20 or 30 miles. It would be possible, as far as purely technical considerations are concerned, to erect a large super-station at Wigan, about 20 miles away, where there are coal mines giving an ample supply of excellent fuel, instead of in Liverpool, and to convey the electrical energy generated in this station by high tension overhead lines to Liverpool. The relative costs of these two methods of providing a supply are given below.

Let us assume that a station of 100 000 kW can be erected in either of the two places, and that there is no great difference between the cost of erecting this station at Wigan and in Liverpool, and that the two stations have the same thermal efficiency.

If the station is located in Liverpool, the only extra charge involved as compared with a station at Wigan, is the cost of conveying coal from Wigan to Liverpool. This amounts to 3s. 2d. per ton.

For a station of this size a thermal efficiency of 20% may be assumed as a working figure. Hence $5 \times 3\,430 = 17\,150$ B.Th.U. must be used per unit, or, taking coal with a calorific value of 11 500 B.Th.U. per lb., the consumption of coal per unit generated is very nearly 1·5 lb. The extra coal cost in Liverpool, therefore, as compared with Wigan is 0·0254d. per unit.

To convey the energy electrically would involve the installation of transformers at Wigan and Liverpool, and the erection of an overhead transmission line capable of transmitting 100 000 kW. It has been assumed that the line operates at a pressure of 132 000 V, as figures for costs of transformers and overhead lines are available for a line of this description.*

$$\text{Pressure in kV} = 5{\cdot}5\left(L + \frac{\text{kW}}{100}\right)^{\frac{1}{2}} \text{ which gives 176 kV.}$$

A later formula given by Evans and Sells gives 150 kV.

Capital Costs.

The cost of transformers used in the English grid scheme is approximately 8s. per kW, and the two sets would therefore cost £80 000. The cost of the switchgear for controlling the output to a duplicate high tension transmission line is approximately £70 000. The three-phase overhead transmission line is required to carry a maximum load of 100 000 kW at, say, 0·9 power factor and 132 000 V. Such a line would consist of a standard double circuit six-wire line, with each of the six conductors of aluminium steel of equivalent conductivity to 0.175 sq. in. copper. The conductors are carried on wide base lattice towers with 900 ft. normal spacing. Such a transmission line erected over fairly level country will cost approximately £3 000 per mile, and will involve a further capital expenditure of £60 000. The usual loan period guaranteed for this class of work is 25 years, which involves a charge for depreciation and sinking fund of 2·56%. Allowing interest at 5%, this gives a standing charge for capital expended of 7·56%, say 7·6%.

The standing charge on this installation, therefore, amounts to £16 000 per annum. Assuming a load factor of 31% the number of units transmitted per annum is 270 million and the additional cost per unit due to standing charges is 0·0142d.

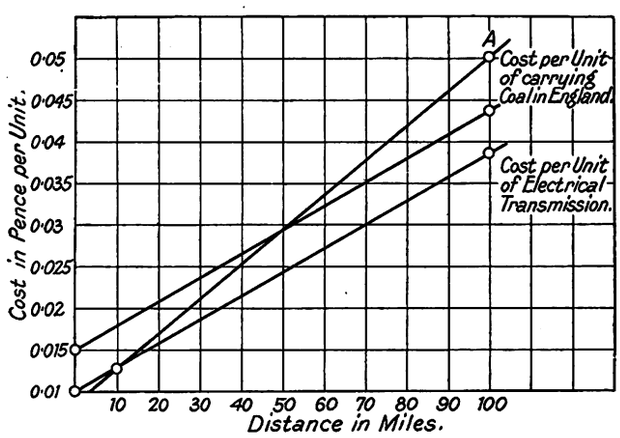

Fig. 2.—Comparison between cost of carrying coal and cost of electrical transmission per unit over varying distances. Coal consumption 1·0 lb. per unit.

per unit. In addition to the standing charge, the cost of energy wasted in the transformers and transmission line has to be estimated.

According to figures for which I am indebted to Mr. A. G. Ellis of the Metropolitan Vickers Electrical Co., the no-load loss for 100 000 kW of transformers of this rating may be taken at 330 kW; the average copper loss over a year with a 31% load factor is 140 kW. The ratio of iron loss to copper loss may vary within fairly wide limits; it has been taken at 1:2:5 at

* Paper read before Section G of the British Association, South Africa, on August 1st.

* The pressure is rather less than that estimated from the empirical formula given by W. P. Dobson for Overhead Transmission Lines in America.

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full load. The total loss in the two sets of transformers is therefore 940 kW.

The energy lost in the transmission line may next be estimated. The resistance per mile of conductor is 0·26 Ω and for the double line 0·13 Ω per mile, giving a resistance per mile for 20 miles of 2·6 Ω. The R.M.S. current with a load factor of 31% (assuming form factor 1·33) works out to 2·00 A, giving an average power loss per phase over a year of 104 kW, or a total power loss for the three double lines of 312 kW. The approximate average power loss, therefore, in the transformers and line, amounts to 1 252 kW, and the units wasted per annum equal $11{\cdot}0 \times 10^6$ units, or approximately 4% of the units transmitted.

The works cost of generating electrical energy (i.e., charges for coal and oil) in a station of this size in Liverpool, according to published tables, is about 0·25d. per unit, and the wasted energy in the transformers and line involves therefore an additional cost of approximately 4% of 0·25d.; the actual figure is 0·01014d. (see Table 1). The total extra cost per unit, therefore, of conveying energy electrically between these two places amounts to 0·0243d. per unit as compared with the additional charge of 0·0254d. for carrying coal. When electric power transmission is carried out on the scale suggested, and under the conditions assumed, there is a difference of only 0·0011d. per unit between the cost of carrying coal and of conveying the energy electrically. It should be remembered, however, that this estimate is based on the assumption of equality of cost of erection and operation of the power stations in the two places, and that in coming to a decision as to the most economical location for the power station it will be necessary to estimate station costs very carefully.

TABLE 1.—COST PER UNIT IN PENCE FOR ELECTRICAL TRANSMISSION OVER 20 MILES AT 31% LOAD FACTOR.

STANDING CHARGE ON CAPITAL				
Transformers and switchgear	$0{\cdot}01015 \times \frac{15}{8}$			
Transmission Line	0·00405			
Total Standing Charge				0·0142
COST OF WASTE ENERGY				
Transformer Iron Loss				0·00535
Transformer Copper Loss				0·00226
Line Copper Loss				0·00253
Total cost of Waste Energy				0·01014
Total Cost per unit				0·02434

Relative Economies.

It is interesting to estimate the effect of variations in efficiency of plant and quality of fuel. If the coal consumption per unit, which has been assumed to be 1·5 lb. were reduced to, say, 1 lb., the cost of coal transport would be reduced in direct proportion to the fuel consumption per unit, but the cost of electrical transmission would only be affected by the reduction in the cost of the waste energy. Fig. 1 shows the relation between the cost of carrying coal and fuel consumption per unit, and cost of conveying electrical energy and fuel consumption per unit, for a range of fuel consumptions from 1 to 3 lb. of coal.

The cost of transport varies directly with the fuel consumed, and falls from 0·051d. per unit with 3 lb. of coal per unit to 0·017d. with 1 lb. of coal per unit. The capital charges involved in electrical transmission are not affected by an improvement in the thermal efficiency of the central station, but the cost of the waste energy is reduced. The cost of the coal and oil used in generating electrical energy in a station of this size is about 0·25d. per unit with a coal consumption of 1·5 lb. per unit. The cost of waste energy, therefore, at other fuel consumptions may be estimated roughly by allowing for the reduced fuel consumption.

On this assumption the cost of generating the unit falls from 0·25d. at 1·5 lb. of coal per unit to 0·167d. at 1·0 lb. of coal per unit, and rises to 0·50d. at 3 lb. of coal per unit. The cost of transmitting the energy electrically has been estimated for different fuel consumptions, and is shown in Fig. 1.

These figures are subject to slight modification, since it may be expected that the lower fuel consumption per unit will be obtained with a better quality of fuel and a more expensive plant, but the result is of interest, since it shows that the case for electrical transmission is less strong when the generating plants in the central station are efficient than when they are less efficient. At this distance there will be equality of cost between the two methods when the consumption of fuel per unit is about 1 lb. of coal.

It is evident that the relative advantages of transporting coal and conveying energy electrically will vary with the distance between the coal mine and the centre of the distributing network. It is impossible to give general figures for different distances, as local conditions vary so much. I have obtained figures, however, from one of the English railways for the cost of hauling coal over distances of 20 miles and 100 miles respectively. The costs, as supplied to me by Mr. Wharton of the L.M.S. Railway, are 3s. 2d. and 9s. 6d. per ton respectively. The cost of transport of coal is made up of two parts, one depending on the cost of hauling the coal along the track, and the other on the cost of handling at the terminals. It may be assumed that the cost of hauling along the track is proportional to the distance covered, and that the cost of handling at the terminals is the same for the two hauls.

Cost of Hauling Coal.

We can represent the cost of hauling coal, therefore, as equal to $A+BL$, where L is the distance in miles over which the coal is transported, and A and B are constants. The values obtained from the above figures are $A=1{\cdot}6$s. and $B=0{\cdot}079$s. respectively, or $A=19{\cdot}2$d. and $B=0{\cdot}95$d. This gives a cost of handling coal at each terminal of 9·6d. per ton, and a cost of hauling coal per ton mile of 0·95d. These values, of course, will be very different in different countries.

Assuming that the station uses 1 lb. of coal per unit, one ton of coal will produce 2 240 units, and, therefore, the cost per unit of handling coal is equal to $0{\cdot}0085+0{\cdot}00032L$ d. The curve A in Fig. 2 shows the way in which the cost of coal per unit delivered varies with the distance from the source of supply.

If energy is conveyed electrically, the cost of transmission may also be divided into two parts, one of which depends on the distance, while the other does not. The fixed part of the electrical transmission charge is that involved in the installation of transformers and switchgear at the two terminals, and the loss of energy in them during the process of transformation.

The variable part is that due to the cost of transmission along the line, and will be proportional to the distance It is made up of the capital charge involved in the erection of the transmission line and the cost of the energy wasted in it. Taking the figures given above for the cost of transformers of 100 000 kW capacity, and taking the capital charge at 7·6 per cent. on £150 000 (the cost of the transformers and switchgear) the annual charge amounts to £11 400 per mile. The cost of the transmission line is £3 000 per mile, and the annual charge at 7·6% amounts to £228 per mile. The annual charge therefore for erection of transformers and transmission line is $£11\,400+228L$. Assuming a works cost of, say, 0·17d. per unit the annual charge for energy lost per kW is 1 440d., or £6 approximately. The loss in the transformers is £5 650 per annum.

The losses in the line amount to 15·6 kW per mile, and therefore involve an annual charge of $15{\cdot}6 \times 6$ or £94 per mile of line. The annual charge for the losses, therefore, is $£5\,650+94L$ per annum, and the total annual charge amounts to $£17\,050+322L$.

Since the number of units transmitted is 270 million, the total annual charge in pence per unit works out to $0{\cdot}0151+0{\cdot}00286L$ d. This quantity is shown in Fig. 2, and it will be noticed that the lines cross at a point corresponding with transmission over about 50 miles.

With a consumption of 1·5 lb. per unit the cost of transport of fuel is increased 50%, and amounts to 0·0128—0·006d. per unit. The cost of transformers and switchgear and transmission line is the same, and the annual capital charge, therefore, remains unaffected and equals $£11\,400+228L$. The cost of generating one unit will be more.

Taking the figures given above, the works cost is equal to 0·25d. per unit (as against 0·17d.) and the cost of the energy lost in the transformers and the transmission line is $£8\,500+140L$ per annum.

The total annual charge for electrical transmission, therefore, is increased to $£14\,570+368L$ d. Curves are drawn in Fig. 3, and it will be seen that with the conditions assumed the electrical method of transmission is more economical when the distance covered exceeds 15 miles.

Influence of Load Factor.

The figures given above are all calculated on the basis of a 31% load factor, the approximate value to-day in a large town like Liverpool. It is of interest to consider the effect of varying load factor. As a standard for comparison, the case worked out in the first section may be taken. If the load factor is increased to, say, 50% the number of units trans-

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mitted will be increased in the ratio of 50 : 31 and will amount to 435×10^6 per annum.

TABLE II.—COST PER UNIT IN PENCE FOR ELECTRICAL TRANSMISSION OVER 20 MILES AT 50% LOAD FACTOR.

STANDING CHARGE ON CAPITAL.		
Transformers	0·0063	
Transmission Line	0·00252	
Total standing charge		0·0088
COST OF WASTE ENERGY.		
Transformer Iron Loss ..	0·00332	
Transformer Copper Loss ..	0·00274	
Line Copper Loss	0·00306	
Total cost of waste energy		0·00912
Total cost per unit		0·01792

The amount of coal needed in the power station will be increased roughly in proportion to the energy generated.

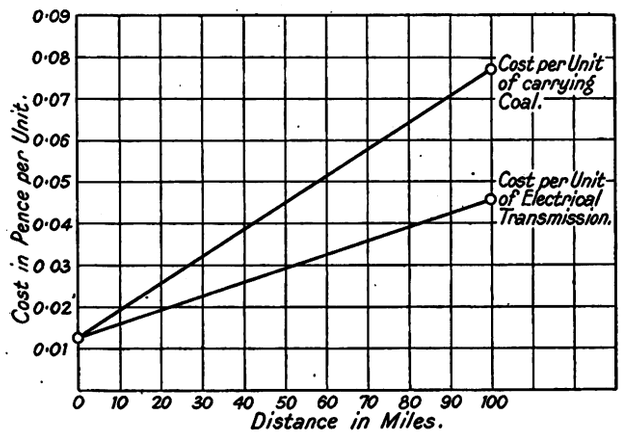

Fig. 3.—Comparison between cost of carrying coal and cost of electrical transmission per unit over varying distances. Coal consumption 1·5 lbs. per unit.

There may be a slight reduction in the fuel consumed per unit generated, but if the generators in the station are operated always near their most economical load, the difference will be small. The cost of transport of coal per unit generated will therefore not be affected to any appreciable extent.

As regards the electrical method of transmission, the capital costs of the transformers and line will remain unaltered, and the charge per unit generated will therefore be reduced in the ratio of 31 : 50 and will amount to 0·0088d.

The iron loss in the transformer will remain unaltered, but the copper loss in the transformers and line will be increased.

Estimating Copper Losses.

In estimating the copper losses at 50% load factor the "Form Factor" may be taken at 1·17 instead of 1·35, and the R.M.S. current flowing through the transformer and line may be taken at 280 A. The copper loss in the line and transformer will therefore be increased in the ratio of $(280)^2 = (280)^2$ or 1·96. The copper loss in the transformers will therefore be increased to 274 kW, and in the line to nearly 620 kW. The total average power loss involved in the transmission is increased to 1 830 kW and the units lost per annum $= 16 \times 10^6$ Taking a works cost of 0·25d. per unit, the additional cost due to losses is approximately $\frac{1\,600}{435} = 3{\cdot}7\%$ of 0·25d. or 0·00825d. per unit.

The total cost per unit, therefore, for electrical transmission amounts to 0·01792d. per unit, a lower figure than at the lower load factor (0·0243 at 31% L.F.). This result shows that the case for electrical transmission is stronger with an improved load factor, though the actual reduction in the cost of transmission per unit depends on the ratio of capital to running charges. The ratio of capital charges to cost of waste energy in this case, according to Kelvin's Law, is nearly correct, the capital charges amounting to 97% of the cost of the waste energy.

In this case it is interesting to note that although the capital charges are reduced in the ratio of 31 : 50 or 0·62 the cost of the energy losses in the transformers and line are only reduced in the ratio 3·7 : 4·05 or 0·915. Where capital charges are relatively high, an improved load factor will make a substantial reduction in the cost of electrical transmission, whereas with a cheap line and cheap and relatively inefficient transformers there is not much gain from an improved load factor.

A case which has often to be considered is that of the relative cost of obtaining electrical energy from a water power plant and from a steam plant. The position of the water power plant is, of course, fixed, but the position of the steam plant may be varied within considerable limits.

Economical Siting.

As a rule it will be found economical to place the steam plant as near as possible to the electrical centre of gravity of the load which it has to supply, since the difference in cost of transport of fuel to different sites within a radius of a mile or two, as compared with the increase in cost of electrical distribution, involved by displacing the central station from the electrical centre of gravity, is usually negligible. One can assume, therefore, for purposes of comparison that the steam station can be placed close to the centre of gravity of the load, thus reducing the cost of the distributing network to a minimum. With a water power station an overhead transmission line has to be constructed from the power station to the electrical centre of gravity.

Taking the figures given in published tables, the total works cost of generating electrical energy in a steam station such as Barton, Manchester, is 0·6d. per unit and the capital charge for interest and sinking fund 0·41d. per unit. With a 31% load factor, and assuming the interest and sinking fund charges to be 7·6% of the capital expenditure, this corresponds with a capital expenditure per kilowatt of maximum demand of very nearly £61. This figure is, of course, more than double the figure for capital expenditure on the basis of the total plant connected to the various power stations, the actual maximum connections to the mains in Manchester being 351 000 kW, as against 154 000 kW of maximum demand.

With a hydro-electric station, capital has to be expended both at the source of power and in constructing the line. In addition, transformers have to be used to step-up the electrical pressure for transmission, and to step-down at the distributing centre. Apart altogether from the technical difficulties involved in the regulation of pressure along a line of this description, it may be of interest to make a comparison between the cost of generating electrical energy from coal and of obtaining it from a hydro-electric station about 600 miles away, which is approximately the distance of the Victoria Falls from the Rand.

The running charges in a hydro-electric station are, of course, extremely small, and may, as a first approximation, be taken at about 0·1d. per unit for maintenance and labour. It is assumed that the plant capacity installed in the hydro-electric station is the same as that installed in the steam station, the extra losses with the hydro-electric scheme being supplied without requiring additional plant. In addition, the energy wasted in transmission must be allowed for, but since the works cost of a unit is so small, the money value of the energy wasted in the transmission line is relatively small, and if the transmission line is assumed to have an efficiency of 90%, is only equivalent to an increase in works cost to 0·01d. per unit.

Capital Charges.

The total generating cost in a steam station of about 100 000 kW capacity may be taken to be 1d. per unit. (The figure for Barton (Manchester) for January, 1929, is 1·01d. per unit) which leaves available 0·9d. per unit to cover the capital charges on a hydro-electric station. Capitalising this on the basis already assumed, the maximum permissible expenditure with a 31% load factor is £133 per kW of maximum demand. For a 600 mile line the total cost (assuming the cost to be £3 000 per mile) will amount to £1 800 000, to which must be added the cost of transformers and switchgear, which will bring the total to roughly £1 950 000.

The maximum load is 100 000 kW, and this corresponds with a capital expenditure of £19·5 per kW, which leaves available for necessary engineering works at the hydro-electric power house a total of approximately £113·5 per kW. This figure will have to be reduced by at least 30% to allow for spare plant at the power house, and therefore a capital expenditure of £80 per kW of plant installed may be taken as the maximum permissible. This figure corresponds fairly closely with that given by the Electricity Commissioners for the maximum capital expenditure which is permissible on the development of a small hydro-electric plant in England.

No attempt has been made in this paper to deal with the question of regulation on such a long line. When the late

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Prof. Ayrton delivered a lecture at the last meeting of the British Association in South Africa he advocated the use of the Thury series system in order to get rid of the difficulties due to charging current and inductive drop, and to reduce the cost of the line. Since that time great developments have been made in long distance transmission with alternating currents, and such lines are now in operation over distances up to 350 miles. There is no insuperable difficulty in designing an overhead transmission line which will operate over this distance.

Another scheme was put forward by Steinmetz some years ago which he called "quarter-wave transmission," in which the transmission is from constant current at the transmitting end to constant pressure at the receiving end. This scheme has never been used on a large scale, although one sees it in practice with very high frequency in an ordinary wireless transmitting aerial, which is a quarter-wave transmission working at no load.

It is interesting to note that the length of a quarter-wave transmission line working at 60 cycles, and made of wire of 0·706 in. dia., is very nearly 700 miles, and therefore it should be practicable, by using suitable "loading," to instal quarter transmission on a 600 mile line, and to maintain constant pressure at the receiving end by controlling the generators at the sending end for constant current.

It is not beyond the bounds of possibility that if the cost of fuel in South Africa increases, and if the load factor of the Rand is improved, the exploitation of the Victoria Falls for the supply of power to the gold mines on the Rand may be economically feasible.

RECENT ELECTRICAL PROGRESS IN INDIA.*

Electrified Industries—Railway Electrification—Compulsory Electric Headlights for Steam Locomotives?—The Radio Position.

By A. T. COOPER, M.Inst. C.E., M.I.Mech.E., M.I.E.E., M.Cons.E.

(*Concluded from page* 141).

OUTSIDE the chief centres of population, which have already been dealt with, there are a few instances in which local conditions with regard to raw material have led to the establishment of isolated cases of mechanised industry, the outstanding example of which is the Tata Iron and Steel Co. Situated at Jamshedpur, about 150 miles to the west of Calcutta, and built upon a site on which 20 years ago stood the village of Sakchi in the primeval jungle, the works of this important company are electrically self-contained, and own two steam power stations, having capacities of 11 750 and 25 000 kW respectively. An 18 000 kW set is shortly to be installed in the larger station, and the smaller will then be shut down, leaving a single station of 38 000 kW capacity.

Power is transmitted overhead at 3 000 V 3-phase, 50 cycles, and is used for many purposes in the manufacture and refining of steel. The annual demand is 150 million units a year, about the same as that of the city of Calcutta. Over 100,000 H.P. of motors are installed, the largest being 6 500 H.P. About one-third of this horse power consists of direct current motors, for speed control reasons, the conversion from alternating current being carried out by fly-wheel motor-generators in the case of supply to the large reversing mills, and by ordinary motor generators for the smaller motor circuits.

COLLIERY ELECTRIFICATION.—The application of electricity to coal mining in India is slowly gaining ground, as is shown in the following official statistics of electric motors installed:—

	1924.	1925.	1926.	1927.
H.P. on surface	13 564	15 501	16 192	16 440
H.P. below ground	29 938	36 835	38 356	43 099
Total H.P.	43 502	52 336	54 548	59 539

The use of electrically driven coal cutters has not been developed to any great extent, the number in use having only increased from 109 in 1924 to 124 in 1927, about equal numbers of the American chain and the British bar type being employed.

Although many Indian coal mines have their own power plants, colliery supply undertakings have been formed in certain areas.

ELECTRIC TRACTION.—Electric tramways have been in operation in the principal cities of India for many years, but the application of electric traction to railways has been somewhat backward, for although the electrification of the suburban sections of the two railways running out of Bombay city was investigated as far back as 1912, it was not until 1922 that sanction was given to the first electrification scheme, that of the suburban section of the G.I.P. Railway over which the first electric trains were run in February, 1925. In September of that year the Indian Railway Board sanctioned the electrification of the main line routes on that railway out as far as Igatpuri and Poona, thus making, with the suburban section, a total of about 300 miles of electrified track.

In 1923 sanction was given in connection with the suburban section of the B.B. and C.I. Railway out as far as Borivli, but owing mainly to the coal strike in this country it was not until January of last year that the electrified service came into operation.

With regard to other Indian Railways, the electrification of the suburban section of the South Indian between Madras Beach and Tambaram has been sanctioned, and propositions in respect of certain main line sections of that railway have been put forward, but so far no decision has been arrived at.

With regard to the Calcutta suburban lines, electrification has been considered, but in view of the heavy expenditure involved the matter has been referred back for further investigation.

Auxiliary Railway Uses.

For many years progressive use of electricity has been made by the railways of India for train lighting, workshop driving, welding, pumping, crane and capstan operation and so forth, and perhaps the only recent application which, in view of its interesting nature, calls for record, is the general application of electric headlights to steam locomotives. About 85% of the steam locomotives have so far been fitted, and the Railway Board are considering the advisability of making such headlights compulsory.

The generator for the supply of electrical energy must, of necessity, be located on the locomotive itself, and it takes the form of a 32 V 500 W steam turbine-driven set which is bracketed off the side of the boiler. There are several types, with both alternating and direct current generators, but the British product introduced a couple of years ago is a turbo-alternator of outstanding simplicity.

A single wheel steam turbine drives an inductor type of alternator, having a toothed rotor without windings of any sort and a stator consisting of permanent magnets with laminated pole-tips carrying only two small fixed coils embedded therein. There is consequently no commutator or collector. The permanent magnets require remagnetising at infrequent intervals, but electro-magnets are provided for this purpose as part of the standard equipment.

Only 250 W, i.e., half the output of the turbo-alternator, is taken by the actual headlight, the other half being applied for lighting the cab, gauges, lubricators and tender, while a portable lamp can be plugged in for inspection purposes.

BROADCASTING.—Concluding with this latest example electrical application, wireless broadcasting came into operation in 1927 through the medium of stations in Calcutta 7CA (370·4 metres) and Bombay 7BY (357·1 metres) operated by the Indian Broadcasting Co., a subsidiary of the Indian Radio Telegraph Co. These stations, although of the same transmitting power as 2LO, viz., 3 kW, have been found under Indian climatic conditions to possess much greater transmitting ranges, and regular reception is reported from the North-West provinces, from Ceylon, and even from the Malay States 1 800 miles away.

So far broadcasting has not captured the imagination of the Indian public to a degree sufficient to make it a financial success, but the company are of the opinion that if they are patient and keep a good service going they will eventually obtain the necessary number of licence holders, which is at present less than 10 000. Should financial success be ultimately achieved, additional transmitting stations will no doubt be installed at such centres as Delhi and Madras.

* Extracts from a paper read before the Indian Section of the Royal Society of Arts.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Southern Railway Electrification Schemes."

[To the Editor.]

Sir,—The suggestion of Mr. J. G. B. Sams in your issue of July 26th that the traffic to Charing Cross should be diverted to Victoria and St. Paul's is entirely wrong, and would be a worse blunder than the proposal to move Charing Cross Station to the south side of the river.

From the standpoint of facilitation of traffic, instead of removing the most convenient terminus in London to an inconvenient position the object should be, if practicable, to bring the terminal stations nearer to the localities which people desire to reach. For instance, consider the enormous improvement in traffic facilities that would occur if it were possible to place Waterloo Station in Trafalgar Square!

The value of the proposed Charing Cross road bridge will be largely discounted by the great number of vehicles necessary to carry over the river the passengers who are now brought by train.—I am, etc.,

H. C. Silver.

Wallington,
August 2nd.

Reviving the Electric Vehicle.

[To the Editor.]

Sir,—It sometimes happens that knotty problems are solved when somebody has the courage to make an attempt at their solution. It should not be difficult for supply authorities to hire or hire-purchase to the hotels and café-garages in their areas suitable plant for charging electric vehicle batteries. The traveller would willingly stop for lunch or tea while his or her car was replenished with silent, safe, smokeless, smellless fuel for the next lap. It ought to be possible to supply current for a demand of this nature at such a price as might show a saving on the old running costs sufficient to pay for the meal. Liquid refreshments for the battery would be supplied from the disused petrol pump.

An automatic slot machine charger for unattended stations is not impossible.—I am, etc.,

"Lectrobus."

Chapel-en-le-Frith.
July 30th.

BOOK REVIEW.

Practical Geometry and Engineering Graphics. By W. Abbott. (London: Blackie and Son.) Pp. 304. 10s. net.

This text-book for engineering students is designed to provide a course in practical geometry for those who have already received some instruction in elementary plane geometry, graph plotting, and the use of vectors. In view of the difficulties in the way of a logical treatment of the subject, the author has departed from the usual procedure, and has grouped plane geometry in Part I and solid or descriptive geometry in Part II, with the intention that the two parts should be read concurrently.

Systematic use is made of auxiliary projections in the solution of problems, and though this method has not been much used, the author rightly holds that with its aid many standard problems become merely exercises involving a knowledge of a few fundamental constructions.

The book is well planned, the subject matter on each page being self-contained, and arranged so that the text and corresponding diagrams are always adjacent to each other, while cross reference is facilitated by the use of a consistent notation throughout.

Most of the 600 examples are original, and types having little but their difficulty to recommend them have been excluded. Answers are given to a large number of the examples and, in the geometry portion, many of the answers are designed to serve simply as checks upon the accuracy of the constructions involved. C. H.

Books Received.

"Journal of the Institution of Electrical Engineers." Vol. 67, No. 389 (May). (London: E. and F. N. Spon.) 10s. 6d. net.

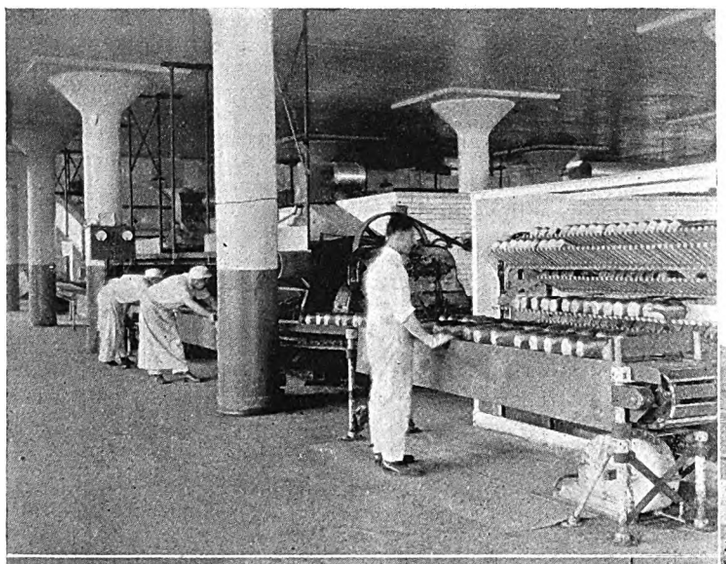
"Radio Receiving Tubes." By J. A. Moyer and John F. Wostrel. (London: McGraw-Hill Publishing Co.) Pp. vii+297. 12s. 6d. net.

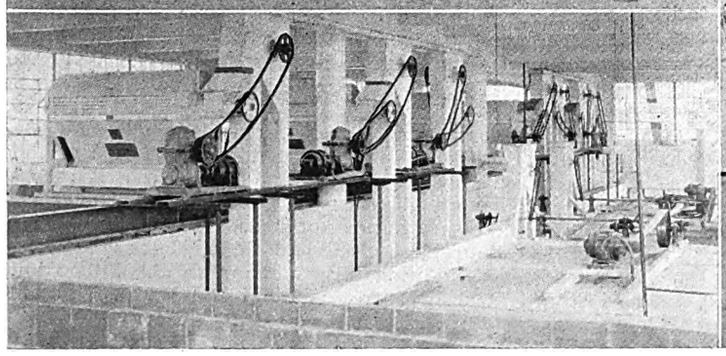
The "Economic Effects of Monopoly on British Power Stations." By A. H. Swain. (Leicester: The Insurance Press.) Pp. ix+147. 10s. net..

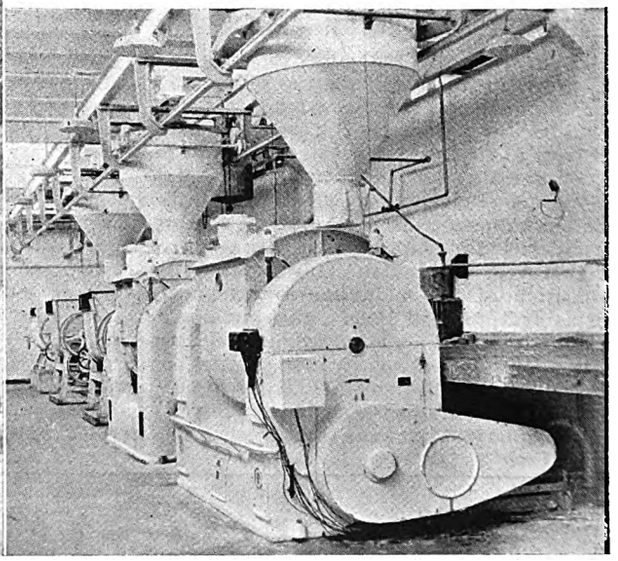
"Science Abstracts." Secs. A and B. Vol. 32, Part 6, No. 378. (June.) Issued by the Institution of Electrical Engineers. (London E. and F. N. Spon.) Single numbers, 3s.; annual subscription for both sections, 50s.

ELECTRICITY IN THE BAKERY.

Some of the extensive applications of electricity in bakeries are illustrated in the accompanying pictures. To the left is a large Baker Perkins oven with control switch unit mounted on one of the roof-supporting columns, and below it are depicted the electrically driven reels where flour receives purification or cleaning before entering the mixers, which are shown in the remaining illustration.







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THE FACTORIES REPORT.

Fewer Electrical Accidents than 15 Years Ago in Spite of Increased Application of Power Drive—Seven Fatalities on H.T. Systems—Fatal Accidents for Year Number 26—Outdoor Sub-Station Designs Compared.

IN the annual report of H.M. Inspector of Factories and Workshops for the year 1928 (Cmd. 3360: H.M. Stationery Office, 2s. 6d. net) it is pointed out by Mr. G. Scott Ram, the senior electrical inspector, that the number of reportable accidents notified during the year was 427, including 26 fatal cases, as against 372 with 27 fatal in 1927. In addition 34 others were notified, including 6 fatal cases, which on investigation proved to be non-reportable. The increase of 55 accidents, or 15%, is of no special significance, seeing that the number has been exceeded in several previous years, and is actually less than it was 15 years ago, in spite of the enormously increased use of electricity during that period..

Thirty-four accidents, including 7 fatal cases, occurred on h.t. systems. Twenty-three of them, including all the fatal cases, occurred in stations of public supply or traction undertakings. In one of them a junior switchboard attendant in a power house on his own initiative opened a switch cell which he must have known to be live, presumably in order to trace certain connections in reference to some work which had to be done the next morning, when the conductors would be made dead. He apparently touched a live conductor, 11 000 V, with his knee whilst his head was resting on an earthed angle iron support. A very similar fatality occurred to an electrical fitter, aged 23, at a rotary sub-station. He was in the employ of a firm of electrical manufacturers who had a contract for the extension of a 6 600 V switchboard. Two new panels had been added, and he wished to see into the adjacent live panel in order to decide what would be necessary for him to prepare in order to connect up the new panels later on. He was not in charge of the job, the head erector being away, but he was regarded as competent. At his request the sub-station engineer opened the door of the panel. He had to stand on a block of wood in order to see what he wanted and whether he slipped, or in peering in got too close to the live conductors, is not known.

Both of these accidents show the necessity for constant supervision by the station staff over contractors' workmen if there are live conductors in any way accessible to them.

Accidents at 33 000 V.

Among other instances mentioned by Mr. Scott Ram may be included two fatalities which occurred at outdoor sub-stations on 33 000 V systems, in both cases to contractors' workmen. In one case a set of the outdoor circuit breakers was being overhauled, having been made dead for the purpose. On either side some 10 feet away the adjacent circuit breakers were in use and live. One of the men who had been engaged on the work in the morning on returning after the dinner interval inadvertently climbed up the adjacent live circuit breaker. In the other case, work had been carried out on a part of the switchgear during the day, a certificate to the effect that part of the gear had been made dead for working on having been previously handed to the men by the engineer of the undertaking. During the night that part of the switchgear had been put in use. The next day a similar certificate was handed to the men, but the parts made dead were not entirely the same, and hence the accident. The men undoubtedly relied on the conditions being the same as on the previous day, but on the other hand they could have seen that this was not the case had they looked, as the isolating switches concerned were adjacent to the work and easily within view.

Two other fatal high-tension accidents were investigated, but were found to be non-reportable. Both occurred to men when painting poles carrying live overhead lines (10 000 and 3 000 V).

Of the non-fatal high-tension accidents at switchboards, several were due to mistakes on the part of authorised persons in thinking that certain switches were dead when they were not, or in opening the wrong doors. Three accidents were due to the explosion of oil switches.

Six high-tension accidents occurred in the testing departments of electrical manufacturing works, fortunately without loss of life. Two were due to mistakes in the "all clear" signals, one to unauthorised entry into the danger zone, and one to an inexcusable and dangerous practice of permitting workers to remain within the danger zone whilst the tests were in progress.

Of the low pressure and medium pressure accidents 40 (two fatal) occurred to men working at live switchboards. In many of the cases there was no need to have carried on the work whilst the boards were live, and in others no precautions were taken as by the use of screens, insulated tools, etc. The injuries were mostly from short circuits causing burns, in some cases very severe.

Other Cases.

Twenty-five accidents (one fatal) occurred to men working on or near live conductors other than at switchboards. The fatal case was due to the use of conductors protected by braiding only. Fifty-two occurred at motor control panels and other switches. Twenty-two occurred in the renewing of fuses, mostly due to faulty construction, necessitating the exposure of live metal. Sixteen accidents occurred at motors, two of them being fatal. One of these was due to the earth wire having been broken and the motor frame becoming live, and the other to the attendant after having switched on the stator of a three-phase motor attempting to adjust the bushes on the slip rings, the motor being at rest.

Thirty-seven accidents from shock, including three fatal cases, occurred in the handling of portable apparatus, and were mostly due to non-earthing; 16 concerned electric drills and other tools, and 11 handlamps. Of the fatal cases one was with a portable drill, the earthing wire in the flexible having become broken. Two were due to the use of ordinary brass lampholders, unearthed, as portable lamps. Fatalities from this cause occur every year, and will probably continue to do so on account of the ease with which such a portable lamp can be improvised by anyone having a very slight electrical knowledge. Flexible conductors and connectors for portable apparatus accounted for 54 accidents, including one fatal. Twelve were due to the use of "adaptors" or other unsuitable types of connector plugs; 26 to the use of inferior type or damaged flexible conductors. The fatal case was due to carelessness or ignorance on the part of a firm of engineers in sending out a gang of men to do some work, involving the drilling of a number of small holes, by means of electric drills not provided with properly constructed connectors.

Thirty-seven accidents, 5 fatal, occurred at cranes or hoists. Eight, including 4 of the fatal cases, were due to absence of or faulty earthing. Twenty accidents, one fatal, occurred to people coming into contact with live trolley wires of cranes on other travelling machines.

Thirty-one accidents, two fatal, were due to inadequately protected conductors. One of the fatal cases occurred in a building under construction, where the conditions made it difficult to provide proper protection. The other was in a boiler house, where some old wiring, although no longer required, had not been disconnected. Ten cases of eye flash from arc welding were reported.

Amongst the miscellaneous accidents were two fatal cases. In one, during some structural alterations to a factory, a girder was being lowered by means of a steel rope and a winch, when it swung against some power wires, cutting through the insulation. The man working the winch was killed.

Mistakes in Wiring.

In previous reports fatal accidents due to tumbler switches being connected in the neutral conductor instead of the phase wire have been described, a mistake frequently made by the careless wireman. One accident due to this cause is worth recording. An electrician was engaged in overhauling electric radiators in the offices of a large works. A bowl fire connected and earthed by 3-core cable and a 3-pin plug was controlled by a single-pole tumbler switch. He wanted to remove the heating element, and took hold of it for that purpose. The switch being in the wrong wire, he received a shock, and was unable to let go. He called out to a girl near by to turn off the switch. As the switch was already "off," the effect of turning it was to put it "on," with the result that the element heated up, and he was still unable to let go. Another girl fortunately pulled out the plug, and he escaped with severe burns to his hand. This accident occurred at a factory where the electrical work is very well done. It was subsequently found that out of a large number this was the only switch

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connected in the wrong wire. The provision of double-pole instead of single-pole switches is the only sure way of guarding against accidents through such mistakes in wiring.

Of the four non-reportable low-tension fatal accidents investigated (not included in the table), one was at a factory premises which had not been working for two years. The supply was still connected up to the service fuse box, the fuses having been taken out. Some youths were stealing cable,

FATAL ACCIDENTS IN 1928.
Table showing Pressure and System.

Fatalities.	Voltage of System.	Probable Voltage of Shock.	System.
2	33 000	19 000	3-phase
1	11 000	6 400	3-phase
3	6 600	3 800	3-phase
1	2 000	2 000	1-phase
1*	470	470	2-phase
1	450	260	3-phase
6†	440	250	3-phase
3	400	230	3-phase
1	380	220	3-phase
1	365	210	3-phase
4	230	230	1-phase
1	210	210	1-phase
1	200	200	1-phase
26			

*Shock and fall.
† Two cases shock and fall.

and having removed three pieces connected to the dead side of the fuse box, proceeded to deal with those on the supply side, one of them being killed.

Eleven prosecutions were taken during the year. Convictions with fines ranging from £1 to £30 were obtained in nine cases, whilst two were dismissed. One case was noteworthy in that it was taken against an employee, a sub-station attendant, the "authorised person" in charge, for permitting a contractor's workman to carry out some work in a 20 000 V switchboard cubicle whilst some of the conductors were live and unprotected.

Mr. Swann compares types of outdoor sub-stations in his area. In some the designers do not appear to have realised the requirements of the Regulations as regards safety in operation in such necessary work as in the renewal of fuses. In others which deal with a duplicate supply and are arranged with hospital bars or other by-pass to allow of an oil switch or other apparatus being worked upon without shutting down more than a small portion of the station, and where the type of switchgear does not lend itself to segregation by means of screens or divisions, the alternative of adequate spacing has been overlooked. As a rule there is no difficulty in obtaining the necessary elbow room in these outdoor or similar sub-stations.

In some cases, precautions which are taken as a matter of course in indoor sub-stations are omitted altogether in the outdoor type, involving much greater danger, when it is realised that an attendant may have to carry on his work at night in semi-darkness or in a gale of wind and rain. It is, of course, necessary and desirable that the cost of such sub-stations should be kept as low as possible, but the collecting together of apparatus in an haphazard manner is not the way to achieve the required result. A little thought beforehand from the point of view of the man who later on has to work the station would often secure safety without in any way adding to the cost. In this connection Mr. Brown (Midland Area) points out that a great deal of the apparatus put on the market demonstrates a complete lack of practical operating experience on the part of the designers. Operations which may appear to be quite practicable and easy when performed mentally on a drawing board, or actually on the workshop floor, are probably very different propositions when executed at night in a gale when standing on a ladder or on climbing irons on a snow-covered pole. The majority of troubles on outdoor equipment are experienced in bad weather, which point should be borne in mind by those designing such apparatus. In a great many instances the arrangement of isolators and fuses is unsatisfactory, there being insufficient clearance between the fuse and the live contacts of the isolating switches to permit of an operator renewing the fuses with safety.

When a sub-station is of sufficient capacity to require the use of oil-filled switchgear, it seems doubtful if the use of a completely outdoor sub-station is the best arrangement. Mr. Brown refers to one large undertaking which experienced so much trouble last winter with this type of sub-station that it is superseding it with sub-stations having switchgear within buildings whilst retaining the outdoor transformer equipment.

Mr. Preston (Western Area) refers to a similar development in his area, tending to supersede the popular arrangement of kiosk sub-stations in which the transformer and switchgear of indoor type are within a sheet metal enclosure, but arranged to be operated from outside, there being no space for the entry of an attendant. Preference is now being shown for brick buildings to accommodate the switchgear and having space for operation from within where the attendant is sheltered from the weather, the transformers being of outdoor type placed outside the building. Amongst other matters he also refers to the use of electricity in building operations and to the risk in the use of a.c. at standard voltages for temporary working of lighting and use for drills and other electrically-driven portable tools.

Mr. McColgan (Northern Division), after describing several new stations and new extensions in his area, refers to the large amount of power generated on factory premises such as steel works and paper mills, the capacity of some being greater than many public supply undertakings. One under construction will be of 100 000 kVA capacity. In this connection Mr. Swann recently reported on a paper mill plant turning out two hundred million units a year. Mr. McColgan mentions one large town where they have completed the scrapping of a number of very unsatisfactory underground sub-stations, having replaced them by above-ground stations of modern design. He also refers, however, to the difficulties experienced in certain crowded cities in finding overground sites for sub-stations, even large ones having to be placed underground, calling for special treatment as regards ventilation, drainage and means of escape in case of fire or switch explosion or other trouble.

Mr. Swann, in particular, has had much special work during the year in reference to electrical plant for use in inflammable surroundings, e.g., for cellulose enamel processes, petrol washes in certain trades, dry cleaning, rubber spreading, in certain processes in artificial silk manufacture. In the early part of the year he was much taken up with the details of electrical plant under the Regulations for Celluloid Film Printing. New designs of high-frequency steel furnaces have required attention, whilst there has been considerable activity in equipping new electrically-operated coke ovens requiring special consideration.

THE WEST HAM UNDERTAKING.

Expectations of a Record Year—Views on the Doctrine of Rate Aid.

"THE net result of a profit of £18 161, after meeting all charges, must be considered a magnificent one, taking into account the substantial reductions made in the charges for supply," states the West Ham Electricity Department in the report for the year ended March 31st. "The average reduction last year," it continues, "amounted to no less than 0·12d. per unit, and represents no less a sum than £45 393 on the total units sold, so that had no reduction been made the profit would have been a total of £63 554, an unnecessarily high figure in view of the strong financial position of the department.

"Even the good results obtained would have been better but for a slump in trade during the first six months in the year. A welcome recovery took place in the latter part of the year, and this is being steadily maintained, and the figures up to date point to another record being set up during the current year."

Figures are given to show that the total benefit to the rates had been increased from £35 139 to £48 344. "One is well aware," adds the report, "of the old cry of loans being raised on the security of rates; but the fact is always overlooked that the consumers of electricity are making a handsome present to the ratepayers in the shape of the assets of the undertaking, which could be disposed of at any time and a handsome profit realised.

"It is therefore difficult to appreciate why the rates should be subsidised to benefit such ratepayers as the railway companies and gas companies, who take all the benefit of the department and do not assist it in return. If all the ratepayers were consumers of the department there might be something to be said for 'rate aid,' but otherwise it is a very vicious doctrine and a hindrance to progress and development."

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NEWS IN BRIEF.

An Electric Chair for Policemen—Electrical Wages—Early Television—The Shining Light of Liberty—The London B.I.F.—Brentford's Electrical Hospital.

TESTING the genuiness of sapphires is the latest use to which the Coolidge tube has been put.

A site for the erection of a sub-station has been secured in Avonmore Road by Fulham B.C.

The tenth annual report of the Women's Engineering Society records an increasing membership.

The Commissioners of H.M. Works, etc., invite tenders for alterations and additions to the Post Office and Telephone Exchange at West Bromwich.

Messrs. Lever Brothers are introducing electric light into their houses at Port Sunlight in place of gas.

Sixty employees of the Darlington Rise Carr Rolling Mills were last week rendered idle when a black cat trod on a live cable and shut down the works.

Members of the Skircoat Ward group of the Halifax Labour Party, numbering between 60 and 70, paid a visit on July 27th to the Halifax electricity works.

An "electric vibratory chair" is the latest addition to the police gymnasium of Pittsburg. It has been designed for the purpose of keeping the city's police staff and firemen fit.

According to the President of the Winnipeg Electric Railway Co., power from the Seven Sisters Falls plant of the North-western Power Co., Ltd., a subsidiary of the concern named, will be available by the end of 1930.

An announcement has been made at Toronto of the completion of the new storage dam being constructed by the Ontario Hydro-Electric Power Commission at Ear Falls, on the English River, in the north-western portion of the Province. Progress is also reported on the construction of the power house, where 3 500 H.P. is to be developed for transmission to mining districts in the Red Woman and Narrow Lake fields in the Patricia district.

Street lighting by electricity is to be adopted at Littleover.

Salt Lake City is discarding tramcars in favour of trolley buses.

The question of substituting electric lighting for gas at Newark Institution has been deferred.

The French Postmaster-General has brought forward a Bill which will authorise the necessary credits for the provision of a radio-telephone system between France and Indo-China. It is proposed to erect a station at Pontoise. It is hoped to commence the service in November.

The Canadian Hydro-Electric Corporation, Ltd. is about to erect at Hawkesbury, Ontario, a new transformer station costing approximately $200 000.

The Mayor of Bridport, Ald. A. Spiller, on July 26th, laid the foundation stone of the power station which is to be erected in connection with the electricity scheme.

Brentford Board of Guardians has placed a contract, amounting to £36 284, for the erection of an electrical and X-ray department and wards at the West Middlesex Hospital, Isleworth.

The August issue of the "Siemens Magazine" contains, among other articles, one giving a brief description of the window in Westminster Abbey erected to the memory of Sir William Siemens.

Westminster City Council has decided to ask the Minister of Health to receive a deputation from the Council, the borough councils of Chelsea, Kensington and Fulham, and the Dean and Chapter of Westminster, respecting the erection of Battersea power station.

Over six months before the opening of the next British Industries Fair, only 5% of the total exhibition space in the enlarged Olympia, where the London section of the Fair is to be held from February 17th to 28th, remains unlet. In some trade sections there is no room left at all.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of August 9th, 1879, recorded that:*

Naval officers undergoing torpedo inspection were required "to familiarise themselves with the practical application of electricity to the art of war."

A leading article dealt with a surprising claim by an American to have invented what we now call television. The inventor, it appeared, had as part of his apparatus, a small mirror, over which a curtain was hung. He announced his intention to establish contact with a colleague in another part of the town. The cloth being removed, the observer saw in the mirror the features of an unknown person, and it was explained that the features were those of the distant colleague. The latter was then told to transmit a representation of the room in which he was working, and immediately the picture in the glass gave place to one of a room the furnishings of which were clearly distinguishable. The question which headed our article: "Is it a Hoax?" suggests the reception which was accorded to the story.

* * *

TWENTY-FIVE years ago, according to THE ELECTRICIAN *dated August 12th, 1904:*

Experiments were being made at Lecce, Italy, in assisting the germination of seedlings by the aid of electricity.

W. T. Glover and Co. introduced an ingenious method for transmitting designs and sketches by telephone by means of special squared charts.

* * *

FIFTEEN years ago it was stated in THE ELECTRICIAN *for August 7th, 1914, that:*

The I.E.E. was asked to open a register of members willing to take temporary Government service in connection with the War.

It was deemed expedient that the Government should have control of the transmission of messages by wireless telegraphy. Instructions were also issued for the closing of all experimental wireless telegraph stations in this country.

The bank rate rose to 6%. It is interesting to note that it was increased from 3 to 4% on July 30th.

The accounts of York Corporation electricity department for the year show a net profit of £28 928, of which £3 450 is to be devoted to rate relief. The net profit the previous year was £30 000.

The New England Power Association, controlled by the International Hydro-Electric System, a division of the International Paper and Power Co., produced 137 688 000 kWh of electric energy in June, an increase of 25% over the output of the association in June, 1928, and 61% over that of June, 1927.

The statue of Liberty in New York harbour has been fitted with a 1 500 W lamp in place of the previous 1 000 W, and the 500 W lamps have been changed for lamps of 750 W. So bright is the illumination that it has been necessary to advise shipping and aircraft in order to avoid errors in local navigation.

As a result of the deliberations of the Telephone Committee at the Amsterdam Conference of the International Chamber of Commerce, the "person to person" call will become operative in European international telephony between England and seventeen other countries on October 1st. Switzerland has refused to be a party to the arrangement and two other countries have yet to decide.

A hitch has evidently arisen in the negotiations for the transfer of the undertaking of the Gayton Park Electricity Co., Ltd., to Birkenhead Corporation. It was reported to the Birkenhead T.C. last week that the proposed transfer price was £500, but the decision would have to be further reconsidered.

At a conference of London rating authorities it was decided that modifications in special cases, not exceeding 7½% of the capital value of rateable machinery be taken as the maximum percentage for gross value and that the maximum deduction of one-third should not be allowed as a matter of course, but the amount should vary between one-third and the normal scale, according to the proportion of machinery included in the assessment.

The National Federated Electrical Association points out that at the meeting of the London Disputes Committee held on May 7th last it was agreed that the second part of the "note" under clauses 6 and 7 of the London agreement be cancelled. In the circumstances, therefore, time-and-a-half will not be payable for hours worked on the Tuesday after August Bank Holiday, or, of course, on any other of the five days mentioned in the note.

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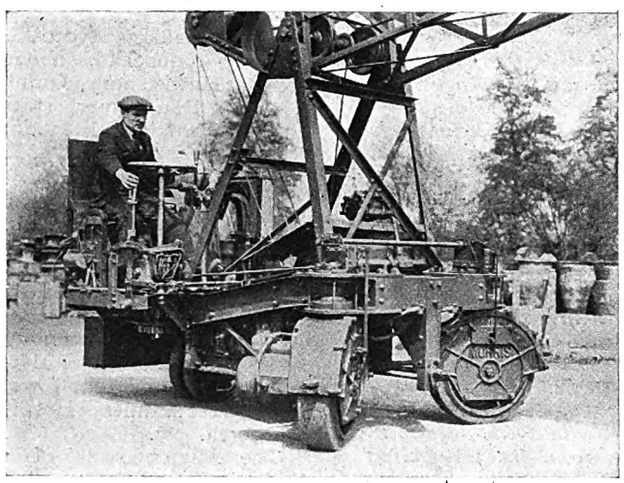
MANUFACTURERS' EQUIPMENT.

Electric Furnace Equipment—Warning Signals for Works and Factories—Portable Jib Cranes—Electric Scaling Apparatus—Isolating Vibration.

A LARGE section of the new Magnet Works at Birmingham has been assigned to the manufacture of industrial heating apparatus. Among the various types of electric ovens and furnaces produced by THE GENERAL ELECTRIC CO., LTD., the "Magnet" muffle furnace may be mentioned. This 8 kW furnace has a chamber 18 in. long, 12 in. wide, and 10 in. high. Its shell is of steel plate reinforced with angles and bolted together with a cast iron front; the legs are of



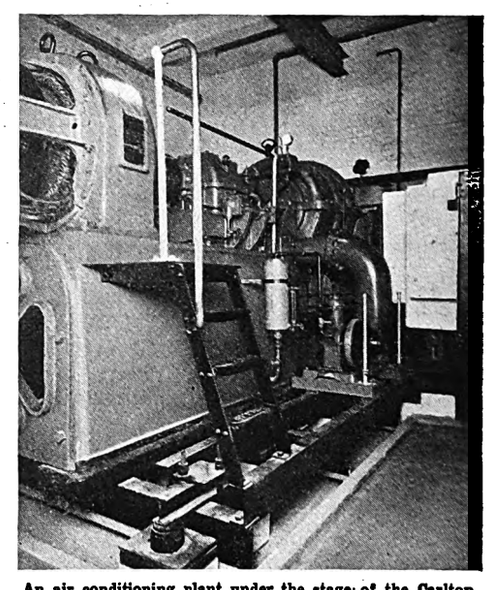
Showing how the front wheels of the "Morris Versatile" crane can be swung into a variety of positions.

angle steel. The door is operated by balanced mechanism controlled by a hand lever at the side, giving easy operation and ensuring that the door is firmly pressed against the furnace front. The muffle is of refractory fireclay and is wound with nickel chrome wire, the arrangement giving an even temperature throughout the length of the muffle. The backing is constructed of insulating bricks, added to which are special magnesia-asbestos slabs. Aluminium paint is used to paint the whole structure; this gives an attractive appearance and also reduces the heat radiation loss. Automatic temperature control equipment, which enables the furnace to maintain any desired temperature to within narrow limits, is supplied as standard. This equipment is mounted on a slate panel board and consists of a "Cambridge" regulator working from a pyrometer in the furnace, together with a sensitive relay instrument transformer, time switch, pilot lamps, push button switch, and switch and fuses for the mains. The time switch can be arranged to be inoperative on any selected day. The mains switchboard has ironclad main switches and fuses; below these is mounted a contactor in steel case, operating from the automatic temperature control relay. A terminal box of sheet steel with perforated metal cover is located at the back of the furnace; a gold excess-temperature fuse is fitted, and is wired into the relay circuit of the main control. This protects both the resistor wire and the furnace charge, if the automatic temperature control fails to operate.

The use of "Klaxon" industrial warning signals is increasing rapidly, according to KLAXON, LTD., of Birmingham, and 36, Blandford Street, London, W.1. It is pointed out that by variation in the duration of the sound, the Klaxon installed in a factory can convey any desired message or warning, while it calls for none of the watchfulness necessary when coloured lights are relied upon for signalling. As a time signal for starting and stopping work, it is claimed to be one of the most effective agents obtainable at a reasonable cost. For calling workers to the office a code signal may be arranged, and when any particular person is wanted the code is sent out, operating all "Attention Klaxons" in the works, so that wherever the wanted man may be he cannot miss the call. It is suggested that in a busy factory even telephone bells should be "Klaxonised." The "Klaxet" is specially designed for telephone use, and is operated by a relay across the bell terminals, which cuts in the signal on a local battery. Installed as an alarm signal at power and similar stations, the "Klaxon" is able to give immediate and unmistakable notice of a breakdown either within the station or at some point on the line. The industrial "Klaxon" motor can be adapted to any reasonable voltage, d.c. or a.c.

The "Morris" versatile crane, manufactured by HERBERT MORRIS, LTD., of Loughborough, is a portable jib crane, stated to provide unique versatility of movement. In addition to manœuvring in the usual way, the new "Morris" crane will perform the following operations: (*a*) change a forward or backward movement into another at right angles to it; (*b*) make any angular change of travelling direction throughout the 360 deg.; (*c*) revolve on its own centre, on a circle whose diameter equals the crane's wheel base. As all wheels, including those which take the drive, are steerable, the crane can be made to rotate round the load, round its centre or round its rear wheel. The 2¼ ton crane will lift a load of 2¼ tons at 5 ft. 6 in. at a speed of 35 ft. per min. It can lift a load of 14 cwt. at a distance of 16 ft. from the front wheel. A 1-ton load can be raised at 40 ft. per min. The travelling speed is about 350 ft. per min. The "Morris" crane is suggested for many purposes, including loading railway wagons, erecting poles, acting as an auxiliary to an overhead crane and shifting scrap steel with an electro-magnet.

ANGELO BROS. (ENGLAND), LTD., 45, St. Mary Axe, London, E.C.3, market a full range of shellacs suitable for all requirements. "Angelobro" shellacs include the following garnet lacs: "A.C.," containing 10% resin; "C. Pure," which is stated to be the most widely used garnet to-day, to contain 1½% resin and 1½% shellac wax, and to have remarkable strength; and "C.5," "C.10," "I.G.," and "Kala," which contain respectively 5, 10, 15, and 20 per cent. resin, and are for use when cheapness is essential. Among orange shellacs is "C.V.T.N.," a new type of shellac, differing from "T.N." in the nature of the wax, which is present in an almost colloidal condition. A typical analysis of "C.V.T.N." is: Insoluble matter, 0·25%; shellac wax, 3·75%; resin, nil; orpiment, nil. The physical and chemical constants of shellac are as follows:—Softening point, 68 deg. C.; melting point, 78 deg. C.; specific gravity, 1·14 to 1·18; specific heat, 0·45; saponification value, 193 average; acid, 63 average; ester, 129 average; iodine (Wijs), 18 average.



An air conditioning plant under the stage of the Carlton Theatre, London, isolated by Christie and Grey supports.

The ELECTRICAL EQUIPMENT AND CARBON CO., of 107-111, New Oxford Street, London, W.C.1, announce the "Devoorde" patent electric scaling equipments for all types of boilers, and tubes and surfaces in general. The "Devoorde" apparatus consists essentially of the motor, the flexible shaft, and the tool heads. The motors are fitted in a hexagonal box—which also contains all electrical fittings—of such a size that it will pass through all standard manholes. In some cases the motor is mounted on a trolley; in others, it can be arranged for vertical running, in which event it is suspended by means of a bracket and eye bolt from any convenient girder or beam. The flexible shaft varies in diameter from ⅜ in. to 1⅛ in., according to the nature of the work. It is pointed out that the "Devoorde" tools do not mill or grind, but have a vibrating, and yet elastic, action, so that they cannot damage the surface that is being treated. Rotary brushes, for instance, have been brought to the point

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where it is possible to remove a gummed label from tin boxes without any attack on the metal. The machine is made in various models, designed for surface cleaning, rust removing, tube cleaning, etc.

HENRY WIGGIN AND CO., LTD., of Wiggin Street, Birmingham, and Imperial Chemical House, Millbank, London, S.W.1, manufacture the three standard resistance alloys, "Brightray," "Glowray," and "Ferry," in the form of sheet, wire and ribbon. "Brightray" is a nickel-chromium alloy. Owing to its relative freedom from impurities, it is capable of withstanding temperatures up to 1 100 deg. C. "Brightray" is usually supplied in an oxidised condition, the film of oxide protecting the material at high temperatures from collapse by overload. Each coil is said to be carefully tested for overload prior to despatch. "Glowray" is a nickel-chromium-iron alloy containing these substances in the proportion of 65%, 15%, and 20%. It is similar to "Brightray," but is designed for temperatures up to 850 deg.C. only. It is suitable for laundry irons, kettles and toasters, whereas "Brightray" is used for furnaces, fires and cookers. "Ferry," which is known on the continent as "Constanton," is an alloy of copper and nickel with a practically zero temperature co-efficient. It is used for motor starters, instrument shunts, field regulator resistances and cinematograph resistances. The principal physical properties of these alloys are given below :—

	"BRIGHTRAY" 80/20 Nickel-Chromium	"GLOWRAY" Nickel-Chromium-Iron.	"FERRY" Copper-Nickel.
Composition			
Specific Resistance. Microhms per cm^3	103	106	48
Specific Gravity	8·35	8·27	8·92
Temperature Co-efficient 20 deg. to 200 deg. C. per 1 deg. C.	·000097	·000202	·000022
Co-efficient of Expansion 20 deg. to 100 deg. C. per 1 deg. C.	·0000125	·0000125	·0000137
Tensile Strength in tons per sq. in. ..	59	47	39
Specific Heat	0·106	0·112	0·098
Resistance Compared with Copper ..	60·05	61·8	28
Melting Point °C.	1375	1400	1250

Factory designers and those owning buildings where noise proves objectionable to near-by residents will be glad to be reminded of the services of W. CHRISTIE AND GREY, LTD., 4, Lloyd's Avenue, London, E.C.3. This firm specialises in the isolation of vibration and resulting noise, and has many ingenious methods for application to already completed factories, power stations and individual machines as well as for incorporation in new structures. When a machine is operating, two sets of vibrations can be distinguished by instruments; the primary air vibrations, communicated directly by the machine, and the secondary air vibrations, due to the vibration of the machine's foundation. When the secondary vibrations are eliminated, noise caused by the machine is confined to the room in which it is working. This elimination can be effected by either using a specially designed foundation or isolating the machine from its foundation. A combination of these ways of treatment is frequently employed, vibrations being absorbed partly by elasticity of the devices supporting the machine and partly by the specially large mass of the main block. Messrs. Christie and Grey particularly consider the effects of unbalanced forces and correct distribution of the masses. When spring-isolated foundations are chosen, each installation has to be dealt with independently, owing to variations in local conditions; even when engine characteristics are identical, a slight change in the subsoil may alter entirely the measures to be taken. With spring isolation applied to power plants the compression of each spring is made adjustable, so that the periodicity of the foundation system can be controlled in all directions, thus avoiding all resonance between the engine and its foundation block.

Foundations may also be isolated by "Coresil" patent foundation plates, which are made up to a maximum size of 18 sq. ft. each, and are in most cases 2½ in. thick. These plates are made of specially treated cork, cut into strips and arranged in iron frames. The "Coresil" plates are laid side by side and end to end upon a lower slab of concrete, and the main concrete block is built on thin sheet felt laid over the plates.

For isolating machines from their supports self-contained units known as "anti-vibrators" are often used; the internal design of these is varied to suit particular installations. The two principal types manufactured are the "Pedestal" type and the "Bridge" type. An example of the application of anti-vibrators is found in a ferro-concrete building where two motor generators on the first floor transmitted aggravating noise throughout the building: the trouble was stopped by fitting eight anti-vibrators under each machine.

The accompanying illustration shows an air conditioning plant under the stage of the Carlton Theatre, London.

PERSONAL.

FELIXSTOWE B.C. has appointed Mr. A. J. Waring as borough electrical engineer.

The marriage of Mr. Robert St. George Terry and Miss Winifred Marie Tulett was solemnised at New Malden, on July 20th.

At the Royal London Yacht Club's regatta at Cowes on Monday, Mr. J. S. Highfield's "Dorina" was the winner of the handicap for yachts over 40 tons but not exceeding 110 tons.

Sir Hugo Hirst's colt Diolite, which won the Molcombe Stakes at Goodwood last Friday, is being freely spoken of in racing circles as a possible winner of next year's Derby.

Blackpool T.C. has agreed to increase the salary of the resident engineer in the Tramways Department, Mr. F. W. Field, to £700 per annum.

Mr. Brinley John has gained the Glamorgan Open County Electrical Engineering Scholarship tenable for three years at the Cardiff University. He is at present in charge of the electrical plant at Bedwas colliery.

An increase of salary from £1 250 to £1 600 for Mr. Charles Furness, electrical engineer and tramways manager, Blackpool, with increases to officials in the same department has been considered by the Corporation Purposes Committee. The advance to Mr. Furness was carried by a small majority.

Liverpool City Council last week voted to Mr. P. J. Robinson, city electrical engineer, the sum of £700 per annum for not exceeding two years, out of such engineering fees that will be incurred during the erection of the new Clarence Dock station.

Mr. H. McNaul, electrical engineer to Gellygaer U.D.C. for nearly ten years, has resigned that position, having accepted an appointment in the Midlands. He was presented with a fitted travelling case and smoker's cabinet on the occasion of his leaving Bargoed and Mrs. McNaul was presented with a set of silver entrée dishes.

The current I.M.E.A. "Report to Members," in congratulating Mr. F. W. Purse on his appointment as chief engineer to the London and Home Counties Joint Electricity Authority, recalls that in addition to filling the office of President in 1928, he has been a member of the Council of the Association for 21 years, and chairman of the Law and Emergency Committee for four years.

Mr. S. E. Fedden, who recently resigned his position as city electrical engineer of Sheffield to become district engineer for the Mid-East England Electricity Scheme, has been elected an honorary member of the I.M.E.A. In the Lord Mayor's parlour at the Town Hall, Sheffield, on July 31st, the Lord Mayor, Ald. H. Bolton, presented to Mr. Fedden, an illuminated copy of the resolution of Sheffield Council expressing appreciation of his services.

The marriage of Mr. Hugh Buchanan Campbell, technical assistant at the central power station, Ipswich, and only son of Mr. H. M. Campbell, electrical engineer, of Oxford Lodge, Oxford Road, Colchester, and Miss Kathleen Lucy Milliken, was solemnised at the Church of St. Mary-at-the-Wells, Colchester, on July 22nd. The bridegroom received a canteen of cutlery from the staff of the electricity supply and transport department of the Ipswich Corporation.

Obituary.

MR. J. P. THOMPSON, on July 30th, engineer and manager of the Fife Electric Power Co.

MR. KARL AUER RITTER VON WELSBACH, on August 4th, aged 70 years. He invented among other things the osmium filament lamp, in 1897.

MR. EMILE BERLINER, aged 78 years. Soon after his migration to the United States from Germany in 1870 he was attracted by the possibility of transmitting speech by telegraph wire. He set to work, using for a receiver an apparatus as shown in the Bell patent of 1876. In 1878 he joined the Bell Telephone Co. In 1881 he paid a visit to Europe and laid the foundation for a telephone factory in Hanover. After considerable discussion between Edison, the U.S. Patent Office, and others about the priority of invention of loose contact transmission Berliner was granted complete letters patent for this principle. Other inventions of electrical interest were his molecularium and secondary battery. Berliner was also the first (1877) to discover that an electric contact connected to a membrane would act as a reproducing telephone instead of a Bell instrument.

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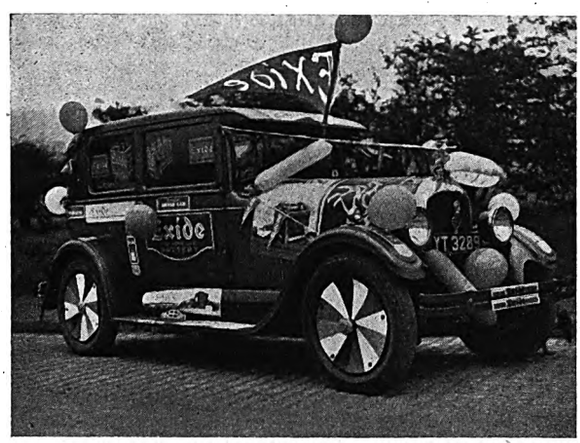
BUSINESS ITEMS.

THE TAUNTON WIRELESS AND ELECTRICAL CO. has opened premises at 2, The Bridge, Taunton.

The RANSOMES, SIMS AND JEFFERIES' electric lawn mower "Electra" was awarded a gold medal at the recent Wolverhampton Floral Fete.



THE "Paige" saloon of Mr. R. H. Jackson which was awarded second prize in the class for decorated cars at the recent Harwood Rose Queen Carnival. The decorations were exclusively "Exide."

VENNER TIME SWITCHES, LTD., of 45, Horseferry Road, Westminster, London, S.W.1, ask us to point out that they have installed additional telephone facilities. The number remains as hitherto, Victoria 2552.

The WESTERN ELECTRIC CO., LTD., Bush House, Aldwych, London, W.C.2, announces that the price of the standard equipment for talking films exhibition has been reduced. A hire-purchase scheme has also been developed.

With reference to the advertisement of the MARCONI'S WIRELESS TELEGRAPH CO., LTD., which appeared on page xxiv of our last issue the power of the transmitter of the Type A.D. 22 light-weight telephone set is 75 W. The figure five having "dropped" this read as 7 W.

A new telegraph code, compiled by E. L Bentley, is to be published in September by Messrs. E. L. BENTLEY, 4, Fenchurch Avenue, London, E.C.3. The new code will comply with the new international telegraph regulations in force from October 1st next, and pending the announcement of the title of the new issue, orders should be placed for the "New Code, by E. L. Bentley of London."

BIRMINGHAM ELECTRIC FURNACES, LTD., of Birmingham, inform us that they have received an order from Chas. Clifford and Son, Ltd., Fazeley Street Mills, Birmingham, for an electric furnace having a usable hearth 7 ft. long by 3 ft. 9 in. wide within a maximum rating of approximately 120 kW. for brass annealing. This furnace will be supplied complete with a "Birlec" 3-arm electrically-driven charging machine and loading trolleys.

With reference to the statement on page 145 of THE ELECTRICIAN for August 2nd to the effect that the Mullard Company has brought out a new six volt screened grid valve and that this is stated to be the only 6 V screened grid valve on the market in this country, the General Electric Co., Ltd., has pointed out that the Osram S.625, a double ended six volt screened grid valve, was actually on the market in August, 1927, and the Osram S.610, a single ended six volt screened grid valve, which is directly comparable with the Mullard P.M.16, was introduced on the market in this country in May of this year.

On and after August 12th, as the result of arrangements made between the EDISON SWAN ELECTRIC CO., LTD., and the BRITISH THOMSON-HOUSTON CO., LTD., the wiring supplies, lighting engineering, electric refrigeration and radio business of the B.T.-H. Co. will be taken over by the Edison Swan Electric Co., who will market the British Thomson-Houston Company's products in these lines. "Mazda" radio valves will also be marketed by the Edison Swan Electric Co., for the British Thomson-Houston Co. "Mazda" lamps will not be included under this arrangement, but will continue to be marketed by the Lamp Sales Department of the British Thomson-Houston Co., Ltd.

DESIGNS COMPETITION.

Industrial Designs of Electrical Interest in Royal Society of Arts Competition.

THE public exhibition of works sent in for this year's competition of Industrial Designs, organised by the Royal Society of Arts, opened at the Imperial Institute, South Kensington, London, on August 3rd until September 1st. Among the prizes offered was one by John Walsh Walsh, Ltd., for a design for a modern form of indirect table or pedestal illumination suitable for electric light. The designs submitted were such that, with the exception of those of one competitor, none conformed to the conditions. The judges, therefore, awarded to Mr. J. E. Tindall, of the L.C.C. Central School of Arts and Crafts, a prize of £10 10s. for his No. 3 287, and highly commended him for his Nos. 3 284, 3 285, 3 286, and 3 288. The designs of the other competitors with the exception of the Indian exhibits, were merely Victorian cut-glass lamps.

W. T. Henley's Telegraph Works Co., Ltd., offered a prize for a design to advertise the Henley wiring system, but the judges were unable to recommend that the full prize of £25 should be given. The result of the competition was that a prize of £10 was awarded to Mr. R. M. Clark, of the Liverpool City School of Art, for his No. 3 497, while Mr. W. Blamire, of 35, Eskdaill Street, Kettering, for his No. 201; Mr. R. M. Clark, for his No. 3 498; Mr. P. T. A. Roberson, City of Oxford School of Arts and Crafts, for his No. 2 307, and Mr. L. Towers, Liverpool City School of Art (No. 3 581) were commended. None of the designs submitted for competition was considered suitable for the purpose. No. 3 497 came nearest to the required standard, and this design, together with No. 3 581, No. 2 307, No. 3 498, and No. 201, showed a good standard of draughtsmanship.

NEW WIRING PLAN.

Professor's Proposed Substitute for the Three-wire System.

A PROPOSED revolutionary change in electric wiring which, it is claimed, will save consumers a considerable amount of money, was discussed at the convention of the Wisconsin Utilities Association held at Wausau, Wis., in July, when, according to the "Electrical World," Mr. Edward Bennett, professor of electrical engineering at the University of Wisconsin, announced that he has developed a substitute for the present three-wire system of distribution, substituting the steel conduit itself for one of the three wires. The first application of Prof. Bennett's discovery will be made in the wiring system of the Mechanical Engineering Building at Madison.

Prof. Bennett said that the great advantage of his proposed system is that the cost in conduit and wire will be approximately 20% less than for the three-wire system, while the reduction in labour costs is expected to amount to approximately 15%. It is claimed that electrical loss will be substantially less than for the average building as now equipped utilising one copper wire to complete the circuit, but enclosing it in the steel conduit for mechanical protection.

THE SOCIAL SIDE.

On July 20th, the Revo Electric Co., which includes the Revo Electric Main Works, the Revo Electric Heating and Cooking Department, the Revo Foundry Co., the Groveland Brass Foundry Co. and the Tividale Enamel Co., spent a very pleasant time at Bearnett House, Penn, the residence of Mr. F. H. Reeves, managing director. The Sports Committee organised the events, and Mr. Reeves entertained over 1 200 employees to tea in a marquee, tea being taken in relays of about 400 per sitting. The Revo Electric Works Prize Band was also in attendance. One of the events which caused great amusement and was a huge success, was the musical band race, the players in the band having to play their instruments and at the same time find the hidden prizes which had been placed in the pockets of two of the members of the sports committee.

A large collection of prizes had been got together, totalling 61 in all, and these were distributed in the evening by Mrs. F. H. Reeves. A delightful day was concluded with a vote of thanks being proposed by the chairman of the sports committee, Mr. Revill, and seconded by Mr. Holds, secretary to Mr. and Mrs. Reeves.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

SALFORD CORPORATION, August 10th.—Low tension, paper insulated, lead covered and armoured cables. Forms of tender from the City Electrical Engineer.

SHARDLOW BOARD OF GUARDIANS, August 10th.—Installing electricity at the Institution. Specification from Mr. J. Spencer, 4, Full Street, Derby; deposit £2 2s., returnable.

KINGSTON AND DISTRICT HOSPITAL, August 12th.—Supply of portable X-ray apparatus. Particulars from the Medical Superintendent of the Hospital.

LONDON COUNTY COUNCIL, August 12th.—Supply and installation of nine 1 000 kW rotary convertors, with static transformers. Specification, etc., from the General Manager, Tramways Offices, 23, Belvedere Road, London, S.E.1; deposit £1 1s.

UTTOXETER URBAN DISTRICT COUNCIL, August 12th.—Overhead 11 000 V transmission line; e.h.t. and l.t. cables and roadwork and public lighting; and sub-station equipment. Persons desiring to tender must notify Mr. W. C. C. Hawtayne, 9, Queen Street Place, London, E.C.4.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., August 13th.—Supply of ironclad unit type switchgear, at the National Physical Laboratory, Teddington. Specifications, etc., from the Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1; deposit £1 1s.

DUNDEE CORPORATION, August 14th.—Supply of two outdoor type transformers 400 kVA, and one 1 000 kVA indoor type transformer. Specifications from Mr. D. H. Bishop, general manager and engineer, Dudhope Crescent Road, Dundee.

CENTRAL ELECTRICITY BOARD, August 24th.—Supply, delivery, and erection of metering equipment for certain stations in the area of the South-East England Electricity Scheme, 1927. Specification No. S.E.E.—G.M.1, from Mr. Richard H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2. Deposit, £2 2s. for first copy, £1 1s. for each subsequent copy.

NEWCASTLE ENDOWED SCHOOLS, August 24th.—Electric light installation in a new wing to be erected at each of two schools, viz.: Newcastle-under-Lyme High School, and Newcastle-under-Lyme Orme Girls' School. Specifications, etc., from Messrs. Cramp and Frith, 1, Dickinson Street, Manchester; deposit £3 3s. in respect of one contract, or £6 6s. in respect of both contracts. Tenders are invited only from firms on the National Register of Electrical Installation Contractors.

COMMITTEE OF VISITORS OF GLOUCESTERSHIRE MENTAL HOSPITALS, August 26th.—Electric wiring of Wotton and Coney Hill Mental Hospitals, on "Stannos" earthed concentric system. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

MANCHESTER CORPORATION, August 30th.—Supply and delivery of one water-tube boiler superheater for Barton power station. Continuous actual evaporation of boiler 130 000 lb. of water per hour. Specification, etc., from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester.

Refrigeration Plant.

BURY AND DISTRICT JOINT HOSPITAL BOARD, August 31st.—Supply, delivery and installation of electric refrigerator at (1) Florence Nightingale Hospital, Bury, and (2) Aitken Sanatorium, Holcombe. Specifications, etc., from Mr. F. Wild, clerk, 2, Cross Street, Bury.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled, duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links, one 30 000 kVA busbar coupler equipment with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £3.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

YOGOSLAVIA.—Supply and delivery of two electric lifts for a local company. (Reference A.X. 8 315.)

CHILEAN MINISTRY OF MARINE, August 9th (extension of time).—Supply and erection of two aerial towers for new wireless station at Arica. (Reference A.X. 8 244.)

ORADEA MORE MUNICIPALITY, BUCHAREST, August 9th.—Supply and delivery, 400 single phase supply meters, 150 V, 42 cycles, 3 A; 200 single-phase supply meters, 150 V, 42 cycles, 5 A. (Reference B.X. 5 519.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, August 12th.—Supply and erection at Burrinjuck of auxiliary hydro-electric generating plant. (Reference B.X. 5 365.)

EGYPTIAN MINISTRY OF THE INTERIOR, August 13th.—Supply of electric power plant, with undergound and overhead network, for the town of Maghagha, Minieh Province. (Reference B.X. 5 318.)

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., August 13th.—Supply of 70 a.c. motors and starters, with spares, for Perambur works remodelling. Forms of tender (£1, not returnable) from the company's office, 25, Buckingham Palace Road, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 13th.—Water turbine driven generating sets and switchgear for Waitaki power development (section 2). (Reference B.X. 5 278.)

PIETERSBURG (TRANSVAAL) MUNICIPALITY, August 13th.—Supply and erection of steam raising plant, engine, alternator and switchgear (contract A). (Reference A.X. 7 983.)

PIETERSBURG (TRANSVAAL) MUNICIPALITY, August 15th.—Supply of h.t. and l.t. cable, lamps and sundries, in connection with extensions of the electricity undertaking. (Reference B.X. 5 312.)

EGYPTIAN MINISTRY OF THE INTERIOR, August 15th.—Supply and erection of additional Diesel engine and alternator at Zagazig power station. (Reference B.X. 5 393.)

LOURENÇO MARQUES TREASURY DEPARTMENT, August 15th.—Supply and delivery of one electric motor and set of type for gilding books. (Reference B.X. 5 520.)

SOUTH AFRICAN RAILWAYS AND HARBOUR, August 15th.—Electrically-driven plate bending and flattening machine (tender No. 1498). (Reference A.X. 8 164.)

CHILEAN STATE RAILWAYS, August 16th.—Material for overhead lines, underground cable and cable boxes (Group 41); and material for lighting of locomotives and carriages (Group 43). (Reference C. 3 069*.)

CHILEAN STATE RAILWAYS, August 16th.—Telegraph and telephone materials, including copper wire and cable, switches, table telephones (Ericsson type), telephone cords, etc. (Reference C, 3 072*.)

CHILEAN STATE RAILWAYS, August 16th.—Supply of instruments of staff or tablet type, for installation at 36 stations between Alameda and Talca, locking apparatus for switches, batteries and telephone combinations. (Specification C. 3 070*.)

URUGUAY POSTS, TELEGRAPHS AND TELEPHONES, August 17th.—Supply of telegraph wire. (Reference A.X. 8 229.)

AUCKLAND ELECTRIC POWER BOARD, August 19th.—Single-phase transformers. (Reference B.X. 5 324.)

INDIA STORE DEPARTMENT, SIMLA, August 20th.—Supply and delivery of one 80 kW, 2-wire d.c. generating set for the Military Engineering Services, Razmak. (Reference B.X. 5 522.)

JOHANNESBURG CORPORATION, August 22nd.—Supply and delivery of automatic traffic signals. (Reference B.X. 5 547.)

PORT ELIZABETH MUNICIPALITY.—August 22nd. — One 10 000 kW turbo generator and condenser, boiler, steam and feed water pipes, etc. (Reference B.X. 5 430.)

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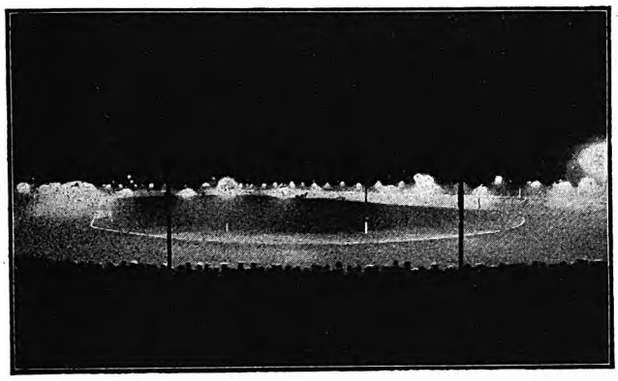
SOUTH AFRICAN POSTS AND TELEGRAPHS, August 22nd.—Extension magneto bells, bell sets, condensers, magneto generators, central battery switchboard tumbler switches, wall and table telephones, etc. (Reference B.X. 5 415.)

GREY ELECTRIC POWER BOARD, August 27th.—Supply and erection of generating plant, for the Arnold river hydro-electric scheme. (Reference B.X. 5 422.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 27th.—Supply of cord type switchboards (schedule C. 448). (Reference B.X. 5 428.)

DUBLIN PORT AND DOCKS BOARD, September 3rd.—Supply and erection of two 4-ton level luffing electric portal cranes.



THE lighting of the Lea Bridge Speedway, planned by The British Thomson-Houston Co., Ltd., and installed by the Bective Electrical Co., Ltd. The installation is divided into three sections—the track, stands, and general lighting (i.e., car park, pay boxes, paddock, etc.). The supply is three-phase, 240 V, a.c., taken from the Leyton Corporation and run to a control switchboard. Each section of the lighting is equally balanced on the three phases, and, in addition, the stand lighting is operated through automatic contactors with remote control. The units for track lighting are suspended at a uniform height by means of a special catenary system, and although no less than 66 units are employed in this section of the lighting there are only 36 poles, 28 of which are on the inside of the track.

Specifications from the engineer of the board, Mr. J. Mallagh, East Wall, Dublin.

OUDTSHOORN MUNICIPALITY, SOUTH AFRICA, September 3rd.—Supply and delivery of 35 kW steam-driven generating set together with the supply and delivery only of certain switchgear material. (Reference B.X. 5 524.)

CAPE TOWN ELECTRICITY DEPARTMENT, September 4th.—Supply of overhead line material. (Reference A.X. 8 334.)

NEW ZEALAND GOVERNMENT RAILWAYS, September 4th.—Supply of motor generator (specification 287.) (Reference B.X. 5 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 7th.—Supply of v.i.r. wire. (No. P. and T. 151/1 573.) (Reference B.X. 5 416.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 10th.—Two-conductor cores (P. and T. 151/1 600.) Reference B.X. 5 462.)

LOURENÇO MARQUES PORT AND RAILWAYS, September 11th.—Battery tractors and trailers. (Reference A.X. 8 172.)

BULAWAYO MUNICIPALITY, September 13th.—Supply of h.t. overhead transmission lines, stepdown transformers, pumps with motors, etc. (Reference A.X. 8 181.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, September 16th.—Supply of automatic sub-station at Remuera (two 500 kW machines and switchgear); automatic sub-station at Point Chevalier (two 1 000 kW machines and switchgear); 22 000 V switchgear; 6 600 V switchgear, and supervisory control apparatus. (Reference B.X. 5 506.)

MELBOURNE POSTS AND TELEGRAPHS DEPARTMENT, September 17th.—Supply and erection of petrol-electric sets. (Reference B.X. 5 537.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 23rd.—Electric light installation and distribution system for the town of Kafr-el-Cheikh (Gharbick Province). (Reference B.X. 5 502.)

INVERCARGILL (N.Z.) CORPORATION, September 23rd.—Supply and delivery of switchboard to be directly operated and suitable for controlling 11 000 V, 3-phase, 50-cycle current, it may be either of the draw-out truck type or totally armour clad, and will at first consist of seven units. (Reference B.X. 5 507.)

MELBOURNE POSTS AND TELEGRAPHS DEPARTMENT, September 24th.—Supply of condensers (schedule C. 461). (Reference B.X. 5 488.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

MELBOURNE POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of switchboard instruments, test plugs and sleeves. (Reference B.X. 5 541.)

Tenders Accepted.

WAR OFFICE.—Edison Swan Electric Co., Ltd., supply of batteries.

BICESTER URBAN DISTRICT COUNCIL.—Western Electricity Co., street lighting.

LEEDS CORPORATION.—English Electric Co., Ltd., repairs to alternator, £2 750.

HULL CORPORATION.—Siemens Bros. and Co., Ltd., laying underground cables for three years.

CASTLEFORD URBAN DISTRICT COUNCIL.—F. Burrows, 3 H.P. electric motor for the baths, £13 10s.

ROTHERHAM CORPORATION.—Solus Electrical Co., installation of X-ray apparatus at Oakwood Hall, £553.

SALISBURY CORPORATION.—Salisbury Electric Light Co., electric light installation at new police station, £99.

HERTFORDSHIRE COUNTY COUNCIL.—Giffins, renewing electric light installation at Shire Hall, Hertford, £340.

DARTFORD URBAN DISTRICT COUNCIL.—Hackbridge Cable Co., Ltd., distribution cable for extensions, £202 10s.

WALSALL EDUCATION COMMITTEE.—Truman Electrical Co., electric light installation at Elmore Green School, £102.

BEDFORD RURAL DISTRICT COUNCIL.—Gollings and Ayres, electric light installation at Isolation Hospital, £81 12s.

KINGSWINFORD RURAL DISTRICT COUNCIL.—H. Victor Jones, electric light installation at Isolation Hospital, £101 10s.

AYR CORPORATION.—D. Henderson, electric light wiring of 68 houses in Seaforth Road, £18 per block of four houses.

CREWE EDUCATION COMMITTEE.—Charlesworth and Whiston, electric light installation, at Edleston Road schools.

BURY ST. EDMUNDS CORPORATION.—Electricity Committee, installation of electric heating apparatus in council chamber, £75 6s. 8d.

BROMSGROVE, DROITWICH AND REDDITCH HOSPITAL COMMITTEE.—H. Jennings and Son, electric light installation, £454 8s. 9d.

SHIPTON-UNDER-WYCHWOOD PARISH COUNCIL.—Wessex Electricity Co., Ltd., public lighting from October 1st to March next.

MAIDSTONE CORPORATION.—Johnson and Phillips, Ltd., supply and erection of overhead lines from Aylesford to West Malling, £1 361.

HALESOWEN URBAN DISTRICT COUNCIL.—W. Harrison, wiring houses on Alexander Road site, £255 5s., and houses at Long Lane, £27 10s.

HERTFORD CORPORATION.—Thomas J. Digby Illuminating Engineering Co., Ltd., improving electric lighting installation at Corn Exchange, £284 10s.

CAPE TOWN CORPORATION.—A. Reyrolle and Co., Ltd., switchgear in connection with strengthening of 11 000 V transmission system, £7 263.

GRANGE-OVER-SANDS URBAN DISTRICT COUNCIL.—Johnson and Phillips, Ltd., supply and laying of underground cables and erection of overhead lines.

EAST HAM CORPORATION.—Bertram Thomas, electrical equipment for operation of feeder circuit breakers at Church Road sub-station, £250. (Recommended.)

WAKEFIELD CORPORATION.—W. Robb, Ltd., wiring 16 houses on Thornes estate; Holden and Brooke, supply of electrically driven pumps at filtration works, £250.

COLCHESTER CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., supply and erection of overhead lines for supply to West Bergolt, £1 436 3s. 6d. (Recommended.)

BROADSTAIRS URBAN DISTRICT COUNCIL.—Isle of Thanet Electric Supply Co., Ltd., supply of electricity for North Foreland screening chamber, 3¾d. per kWh for lighting, 2¼d. for power, and 2¼d. for heating.

ESSEX COUNCIL.—Work at Black Notley sanatorium:—Electric lighting of memorial hall, H. G. Tumilty, £98; electric light fittings, General Electric Co., Ltd., £34 3s. 5d.; and F. Thomas and Co., Ltd., £25 8s. 6d.

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LONDON COUNTY COUNCIL.—John Cochrane and Sons, Ltd., enlargement of tramway subway from Victoria Embankment to Southampton Row, £171 246 (lowest tender). Seven tenders received, highest £273 166.

ROTHERHAM CORPORATION.—Hogan and Wardrop, supply of cable, £6 360 10s.; A. Reyrolle and Co., Ltd., supply of two e.h.t. ring main switches, £350 13s. 6d.; British Brown Boveri, Ltd., automatic switchgear, £565.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—Enfield Cable Works, Ltd., 10 000 yds. 0·01 twin cable, £1 080; 750 yds. 0·15 by 0·08 by 0·15 three-core cable, £390; and 800 yds. 0·15 four-core cable, £648. (Recommended.)

ST. HELENS BOROUGH EDUCATION COMMITTEE.—Corporation Electricity Department, electric light installation at new Boys' Secondary School. The contractor whose tender was accepted on April 3rd last, was not willing to enter into the usual contract.

Overhead Wiring for Houses.

STOKE-ON-TRENT CORPORATION.—E. Holloway, overhead wiring and services for 230 houses, Vivian Road and Warrington Street, Fenton, £550; 28 houses, Marlborough Street and Evelyn Street, Fenton, £66; and 20 houses, Shelton New Road, Basford, £20.

DARTFORD CORPORATION.—The Hackbridge Cable Co., Ltd., cable for ring main scheme, £1 041 19s. 10d., and distribution cable for extensions, £202 10s.; Johnson and Phillips, Ltd., cable and joint boxes, in connection with supply to the Zinc Manufacturing Co., Ltd., £176 7s. 9d.

LONDON COUNTY COUNCIL.—Alexander Hawkins and Sons, electric wiring and fitting electric current in quarters at seven fire-stations, £639; also tendered: A. Dean and Co., £676; Rhymos, £744; Electrical Installations, Ltd., £834; Smethurst and Co. (London), Ltd., £857; Barlow Bros. and Co., £875.

CHESTERFIELD CORPORATION.—Croydon Cable Works, Ltd., 1 000 yds. e.h.t. cable, £374; Macintosh Cable Co., Ltd., 1 823 yds. l.t. cable, £1 315; English Electric Co., Ltd., switchgear, £75 10s.; Yorkshire Switchgear and Engineering Co., equipment for transformer kiosk sub-station, £257 10s.

STEPNEY (LONDON) BOROUGH COUNCIL.—Supply of meters, Reason Mfg. Co., Ltd., 5 A demand meters, £1 850, and ½ A demand meters, £1 672; Measurement, Ltd., prepayment meters, £3 087, 20 A, £480, 50 A, £275, 100 A, £36; Aron Electricity Meter, Ltd., 200-1 000 A combined demand meters, £214.

CAPE TOWN CORPORATION.—British Insulated Cables, Ltd., supply of cross arms, stay rods, spindles, etc., £1 529 4s.; British General Electric Co., supply of 1 000 channel cross arms, £214 5s.; Griffin Engineering Co., supply of fuse carriers, etc., £656; Davis and Soper, Ltd., supply of insulators, £431 3s. 10d.

HOLYWOOD URBAN DISTRICT COUNCIL.—Johnson and Phillips, Ltd., supply of (1) three-phase transformers; (2) l.t. underground and overhead mains, laying and erection; (3) l.t. switchboard, erected; (4) h.t. armour-clad switchgear, erected; (5) h.t. truck-type switchgear, erected; and (6) h.t. cable, laid and erected.

SALFORD CORPORATION.—Saunders and Taylor, Ltd., electric thermal storage system in extension of offices at Frederick Road generating station, £995; W. T. Glover and Co., Ltd., supply of 1 170 yards of single core cables, £626; Metropolitan-Vickers Electrical Co., Ltd., £536; Hackbridge Electric Construction Co., Ltd., 12 months' supply of three phase, oil immersed power transformers. (All recommended.)

CROYDON CORPORATION.—Messrs. Babcock and Wilcox, boiler house and equipment, £101 712—Metropolitan-Vickers Electrical Co., Ltd., supply of turbo-alternator, etc., £76 851; English Electric Co., Ltd., supply of switchgear, £44 227 10s.; A. Reyrolle and Co., Ltd., switchboard for control at new factory, £814; D. P. Battery Co., Ltd., new battery for tower wagon, for tramways department, £147. (All recommended.)

FERRO CARRIL CENTRAL DE BUENOS AIRES.—Westinghouse Brake and Saxby Signal Co., Ltd., electro-pneumatic signalling on new section of subway line from Federico Lacrozc to Callao, including the terminal station Federico Lacroze and six kilometres of double track, constructed partly through tube and partly through "cut and cover." The contract covers the complete apparatus, including three power frames of 23, 15 and 11 levers each, two-aspect colour light signals, electro-pneumatic train stops and point layouts, impedance bonds, track circuits, etc.

MANCHESTER CORPORATION.—Supply of incandescent lamps:—Baxendale and Co., Ltd., S. Gratrix, Jun. and Brother, Ltd., Wholesale Fittings, Ltd., John Russell and Co., Ltd., W. E. Beardsall and Co., Ltd., Hirst, Ibbetson and Taylor, Ltd., R. O'Brien and Co., Falk, Stadelmann and Co., Ltd., J. C. White and Co., Ltd., Underwood (Manchester), Ltd., F. C. Ride and Co., Berrys Electric, Ltd., "Z" Electric Lamp and Supplies, Ltd., Drake and Gorham Wholesale, Ltd., Sloan Electrical Co., Ltd., Electric Lamp Factors, Ltd., and Downes and Davies.

WEST HAM CORPORATION.—M. J. T. Thomas and Co., electric light installation at Fyfield Residential Open-air School, £421 Also tendered: G. W. Day and Co., £598; Corporation Electricity Department, £575; Weston Electric Contracts Co., £541; Warren, Smith and Co., £539; Rylands Electrical Co., £533; Woodward Bros., Ltd., £529; Burdett, and Co., Ltd., £524; Alpha Mfg. and Electrical Co., Ltd., £485; Brentwood District Electric Installation Co., Ltd., £475; Samuel Reed and Sons, £464; Central Power Engineering Co., Ltd., £455; Telephone and Electrical Maintenance Co., Ltd., £445.

METROPOLITAN ASYLUMS BOARD.—E. A. Foulds, two electric lifts at Colindale Hospital, £900. Also tendered: Titan Lift Co., Ltd., £960; Glasgow Engineers, Ltd., £1 079; J. Bennie, Ltd., £1 096; Medway's Safety Lift Co., Ltd., £1 180; W. Wadsworth and Sons, Ltd., £1 210; Express Lift Co., Ltd., £1 322; Pickerings, Ltd., £1 364; R. A. Evans, Ltd., £1 400; Waygood-Otis, Ltd., £1 430; Smith, Major and Stevens, Ltd., £1 675. Telephone and Electric Maintenance Co., fire alarm system at High Wood Hospital for Children, £290. Also tendered: Carr Bros., £248; L. G. Tate and Co., Ltd., £315; H. Lewis and Co., £344; Alpha Mfg. and Electrical Co., Ltd., £384; S. Reed and Sons, £420.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—Standard Telephones and Cables, Ltd., supply of 3 500 yards of 0·2 sq. in. cable, required in connection with supply to "Olympia" extension, £3 731 2s. 11d. (Recommended.) Also tendered:—Pirelli General Cable Works, Ltd., £3 780; Callender's Cable and Construction Co., Ltd., £3 796; Enfield Cable Works, Ltd., £3 815; W. T. Henley's Telegraph Works, Co., Ltd., £3 834; Siemens Bros. and Co., Ltd., £3 843 1s. 9d.; Macintosh Cable Co., Ltd., £3 852. A. Reyrolle and Co., Ltd., supply and erection of two and three phase switchgear in connection with supply to "Olympia" extension, £3 001 19s. (Recommended.) Also tendered:—Switchgear and Cowans, Ltd., £2 865 11s.; Park Royal Engineering Co., Ltd., £3 001 19s.; General Electric Co., Ltd., £3 001 19s.; Ferguson, Pailin, Ltd., £3 001 19s.; Metropolitan-Vickers Electrical Co., Ltd., £3 016 19s.; J. G. Statter, £1 300.

THE E.T.B.I. COMPETITION.

Nearly All Tickets Sold—Further List of Prizes and Donors.

ALTHOUGH the competition organised to raise funds for the Electrical Trades' Benevolent Institution has only been open for one month there are barely 100 tickets left for disposal. The competition, of which full details were given in our issue of June 28th, calls for general knowledge rather than for technical skill, and a number of valuable prizes are offered

The list of firms who have given prizes, published in our June 28th issue, has been considerably augmented and the following donors should be added:—

NAME OF FIRM.	PRIZE.
British Thomson-Houston Co., Ltd.	Four prizes consisting of 3-valve wireless set; 2-valve wireless set; C.2 loud speaker and cone loud speaker.
Durham Duplex Razor Co., Ltd.	Durham Duplex razors (6).
Duophone and Unbreakable Record Co., Ltd.	Three prizes of one doz. "Duophone" new electrical process records.
L. G. Hawkins and Co., Ltd. ..	"Universal" chromium plated toaster; "Noritake" table standard, flex, pushbar and holder; and 14 in. dia. silk hand-painted shade.
S. G. Leach and Co., Ltd. ..	"Dry Fan" cleaner.
Venner Time Switches, Ltd. ..	"Venner" silver grill.
Messrs. Young and Wildsmith	Wooden floor standard and shade.

Anyone who wishes to obtain tickets should apply without delay to the offices of the E.T.B.I. at 9, Southampton Street, London, W.C.1, as no further tickets will be printed when those remaining are disposed of.

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WORK IN PROSPECT.

ASHTON-UNDER-LYNE.—Telephone exchange, for H.M. Office of Works, King Charles Street, London, S.W.

AYLESBURY.—Houses (22), Ledgers Road, for Finefield Estates.

BARKING.—School clinic. Particulars from Clerk.

BARNSLEY.—School (300 places), Ardsley. Particulars from the Priest in Charge.

BRADENHAM (HIGH WYCOMBE).—School, for Bucks Education Committee. Particulars from Director of Education, Aylesbury.

BURY ST. EDMUNDS.—Houses (40), for Town Council. Particulars from contractors, Messrs. Thompson and Sons, Grimsby.

CAERPHILLY.—Wesleyan church. Particulars from architects, Messrs. Phillips and Wride, Cardiff.

CARLISLE.—Houses (20), London Road, for Harrison and Hetherington. Particulars from architects, Messrs. Benwell and Slack, 28, Lowther Street.

CHESTERFIELD.—Sunday schools, Holmwood. Particulars, architects, Messrs. Jackson and Fryer, Chesterfield.

CONGRESBURY.—Houses, for Axbridge Rural District Council. Particulars from the architects, Messrs. Ball and Pope, 30, West Street, Weston-super-Mare.

CROYDON.—Church, Downs View Road. Particulars from Secretary, Moffatt Road.

CROYDON.—Church and schools. Particulars from Rev. Willis Bryars.

DARLINGTON.—Additional 50 houses. Particulars from Borough Surveyor.

DUDLEY.—School (200 places), Netherton. Particulars from clerk, Mr. G. C. V. Cant.

DULVERTON.—Housing scheme, the Rural Council. Particulars from Surveyor.

EAST HAM.—Isolation hospital extensions. Particulars from Borough Engineer.

EAST RAINTON (CO. DURHAM).—School (200 places), for Church of England managers. Particulars from Vicar.

EASTLEIGH.—School (200 places). Particulars from county architect, Mr. A. L. Roberts, The Castle, Winchester.

GLOUCESTER.—Central Hostel, Domestic College. Particulars from Clerk, Gloucester.

HIGH WYCOMBE.—Extensions, Royal Grammar School. Particulars from contractor, Mr. W. S. Try, Cowley, Uxbridge.

HUDDERSFIELD.—Additional 35 houses, Newsome, for Town Council. Particulars from Borough Architect, 26, Ramsden Street.

KETTERING.—Nurses' accommodation, for Board of Guardians. Particulars from Clerk.

KEYNSHAM.—School. Particulars from Director of Education, Weston-super-Mare.

KINGSTON-ON-THAMES.—Additional 94 houses, Norbiton, for Town Council. Particulars from Borough Surveyor.

LEITH.—Labour Exchange, for H.M. Office of Works. Particulars from the contractor, Mr. John Taylor, Yoker.

MARGATE.—Laboratory, Boys' Central School. Particulars from Borough Surveyor, 40, Grosvenor Place.

MAUCHLINE.—Remodelling and extending public school. Particulars from Director of Education, Ayr.

MOTHERWELL.—Extensions, Dalziel School. Particulars from clerk, Mr. R. C. T. Mair, 9, Clydesdale Street, Hamilton.

NEWTON-IN-MAKERFIELD.—Offices for Urban District Council. Particularsr from Mr. R. T. Surtees, Earlestow.

ORSETT.—Houses, Stifford, for Rural District Council. Particulars from surveyor, Mr. G. F. Andrassy, Palmer's Avenue, Grays.

OXFORD.—Girls' school, Headington. Particulars from architect, Mr. G. T. Gardner, 7, St. Aldates.

PRESTON.—Catholic church, Fishwick. Particulars from architects, Messrs. Mercer and Duckworth, Preston and Fleetwood.

ROCHESTER.—Outpatients' Department, St. Bartholomew's Hospital. Particulars from contractors, Messrs. W. W. Martin and Sons, Ramsgate.

SHAP (WESTMORLAND).—Church and Sunday schools. Particulars from Secretary.

TILBURY.—Housing scheme. Particulars from the Borough Surveyor.

WARRINGTON.—Re-erecting premises for the Co-operative Society. Particulars from the C.W.S. Architect, 1, Balloon Street, Manchester.

TRADE PUBLICATIONS.

THE ST. HELENS CABLE AND RUBBER CO., LTD., of Slough has published a leaflet devoted to N type adhesive rubber tape.

The ARORA Co., Loughborough, has published a new leaflet concerning the No. 124 oven, and the "Arora" immersion heater.

The BAYER SOOT BLOWER CO., LTD., 125, Balham High Road, London, S.W.12, has sent us a special folder dealing with soot-blowing equipment.

Time-discipline apparatus for factory and workshop use is dealt with in leaflet 35/F just issued by GENT AND CO., LTD., Faraday Works, Leicester.

The ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2, has issued publication No. 977 dealing with distribution boards for power circuits.

The CROYDON CABLE WORKS, LTD., Mitcham Road, Croydon, Surrey, have issued a new catalogue relative to "Pernax" sheathed lead-covered cables and bird guards.

Among the latest literature issued by the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1, is a new folder dealing with the "Junior" cooker.

DRAKE AND GORHAM, LTD., Rockingham Works, Newington Causeway, London, S.E.1, has issued to the trade list No. 102, illustrating and describing e.h.t. ring controllers.

The MULLARD WIRELESS SERVICE CO., LTD., Mullard House, Charing Cross Road, London, W.C.2, has issued leaflet No. V.R. 50, illustrating valve type P.M. 254.

Publication No. H. 116, dealing with cab tyre sheathed cables and flexible, and replacing No. H.85, has been published by BRITISH INSULATED CABLES LTD., of Prescot, Lancs.

FESCOL, LTD., 101, Grosvenor Road, London, S.W.1, electro-chemical depositors and engineers, have issued a special illustrated booklet, entitled "Why It Pays to Fescolise."

"Electrical Control of Woodworking Machinery" is the title given to a new booklet by BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester. The reference is No. 291.

The latest publications of FERRANTI, LTD., of Hollinwood, Lancs., are pamphlets T.C. 155, dealing with standard a.c. testing equipments, and T.C. 155/1, devoted to the same subject.

The WHOLESALE ELECTRIC LAMP CO., LTD., 37, Vauxhall Bridge Road, London, S.W.1, has published a new leaflet giving particulars of the revised prices of "Royalstone" fittings.

We have received from S. G. LEACH AND CO., LTD., 26/30, Artillery Lane, London, E.1, a copy of catalogue No. N.S.106, illustrating and describing repulsion-induction and split-phase motors for a.c. supply.

Leaflet No. 1512, descriptive of the "KY" relay for increasing the loads handled by lifting magnets has been published by the IGRANIC ELECTRIC CO., LTD., of 149, Queen Victoria Street, London, E.C.4.

The HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, London, E.15, has published a folder entitled "Useful Battery Information for Electric Lighting Contractors." The reference is No. 232.

We have received from the BRITISH ELECTRIC RESISTANCE CO., Ohmic Works, Ponders End, Middlesex, a copy of list No. 400. This is a new publication describing vitreous enamelled resistance units, rheostats and resistance wires.

The DRAYTON REGULATOR AND INSTRUMENT CO., LTD., West Drayton,, Middlesex, has published leaflet P.P. 6 B, dealing with radiator and industrial steam traps, and P.P. 6 C, describing the "Drayton and Nicholson" differential steam traps.

The ELECTRICAL EQUIPMENT AND CARBON CO., LTD., Bank Buildings, 107-111, New Oxford Street, London, W.C.1, has sent us list S.C. 14, giving particulars of Silitom voltage dividers, and list B.T. 3, dealing with Elin-Bell transformers, transformer bells and buzzers.

Two new publications of FERRANTI, LTD., Hollinwood, Lancs., are list Wb 418/1 and Ga 238/1, dealing with the company's valve tester and multi-range test set, respectively. Ferranti, Ltd., has also published a new chart for the construction of a screened grid three-valve receiver.

The MULLARD WIRELESS SERVICE CO., LTD., Mullard House, Charing Cross Road, London, W.C.2, has issued leaflets V.R. 44/1a, V.R. 85/1a, V.R. 68/1a, V.R. 70/1a, V.R. 54/1a, and W.A. 20/1a, dealing with P.M. 2, P.M. 6, P.M. 4DX, P.M. 6D, P.M. 256 valves and H. type loud speakers respectively.

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ELECTRICITY SUPPLY.

Liverpool and the Lister Drive Station—Overhead Lines at March—Barking and the Greatfields Estate—Electrical Development at Chesterfield—Valuation of the Watford Undertaking—The West Midlands Joint Authority.

COVENTRY City Council has applied for a loan of £4 120 for mains.

Ilkeston Corporation has decided to supply electricity at the sewage outfall works.

Lancaster R.D.C. has received sanction to borrow £12 000 for supply to Aughton.

St. Pancras (London) Electricity Committee is to extend mains at a cost of £947.

Newton Abbot U.D.C. has arranged for a supply of electricity for use in connection with its new pumping station near the River Teign.

Overhead lines are to be erected for the supply of electricity to houses on the Sandford Road estate, now being erected by the Allied Building Corporation, Chelmsford.

In connection with the forthcoming electric light scheme, Portland U.D.C. has fixed the charge for lighting at 8d. per kWh, and for all other purposes at 3d. per kWh.

Ampthill R.D.C. offers no objection to the erection of overhead lines to the Marston Valley Brick Co., at Lidlington, and in Silsoe Road, Maulden, to the Great Farm House.

Warrington electricity undertaking shows a net profit for the year of £18 464. The Electricity Committee has arranged to supply electricity to the works of the Dussek Bitumen Co., Ltd., in Lousher Lane.

The March, Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co. is to carry out works in connection with a supply to March, and is to construct an overhead line between Whittlesey and March.

Bath Electricity Committee has recommended a reduction in the charge for electricity for lighting, from 6d. to 5½d. per kWh for the first 1 500 units per quarter, and a reduction of ½d. per kWh in the charge under the domestic rate.

Barking U.D.C. has decided to supply electric light on the Greatfields Estate. Sanction is to be sought to borrow £17 800 in respect of sub-station, switchgear, cables and public lighting on the No. 12 (Barking) section of the Becontree Estate.

In order to cope with the heavily increasing demands made by new consumers, the Electricity Commissioners have given sanction to Chesterfield Corporation to the borrowing of a further sum of £43 355 for e.h.t. and l.t. feeder cables and miscellaneous extensions to mains.

Hastings Electricity Committee has recommended the following reductions in charges:—Lighting, from 4½d. to 4d.; sliding scale of 4½d. to 3½d. reduced by 1d.; street lighting and shop window and outside decorative lighting reduced by ½d.; domestic power, from 1d. to ¾d. per kWh.

Watford Electricity Committee has met the Council's experts in regard to the valuation of the electricity undertaking with the result that the assessment had been reduced from £20 000 to £19 000. The Central Electricity Board is in negotiation with the Corporation for the acquisition of a sub-station site.

Isle of Thanet Rural Council on July 25th received an intimation of the intention of Pearson and Dorman Long, Ltd., to apply for a Special Order to supply electricity in the parishes of Stonar, Minster, and St. Lawrence Extra. The applicants pointed out that the anticipated load would be an industrial one, as there was no residential population to supply. The Council assented to the application.

Accounts of the St. Pancras B.C. electricity undertaking for the year show the gross income amounts to £293 836 14s. 9d., which is £11 043 0s. 10d. more than last year, and £42 160 15s. more than the income for 1927. The gross expenditure for the year amounts to £256 250, which is £20 804 more than last year, and £17 936 more than in 1927. The net result of the year's working is a profit of £37 586, against a profit of £47 348 last year, and a profit of £13 389 in 1927.

Liverpool City Council has rescinded its resolution of December last authorising application for the borrowing of £96 000 for the purpose of extending the Lister Drive power station No. 3, and has substituted therefor an application to borrow £46 305. The Corporation has decided to make application to the Electricity Commissioners for their sanction to the borrowing of the sum of £35 700 in respect of engineering fees in connection with the erection of the Clarence Dock station.

Hastings T.C. has agreed to pay an ex-gratia sum of £500 to Messrs. C. J. Bannister and Son, who have been supplying electricity to Northiam, as compensation in respect of their plant and goodwill of the undertaking. The plant is to remain the property of the firm, whose supply in the parish will be discontinued as from October 1st. The firm will, however, continue to supply the east end of the parish until the Council is in a position to do so, but in any case not later than October 1st, 1931.

Maidenhead T.C. has made the following reductions in charges: Lighting, by 1d. per kWh flat rate; high rate charge under maximum demand system by 2d. per kWh; fixed annual charges under the two-part tariff to business consumers, by 5% on the first £10 of the fixed charge, 10% on the next £30, and 20% on the remainder of the fixed charge; rebate of 10% on the charges for power on special contracts, prepayment two-part tariff, private consumers, a rebate of 1d. in the 1s.

The L.C.C. Special Electricity Committee reports that it has under consideration the question of the charges made for the supply of electricity to consumers through slot meters, and is in communication with the London and Home Counties Joint Electricity Authority on a suggestion that the matter could be dealt with by a general application to electricity supply undertakings of provisions in respect of meters, etc., on the lines of the relevant provisions of the Metropolitan Gas (Prepayment Meter) Act, 1900.

Chelmsford Electricity Committee has decided to ask the Electric Supply Corporation, Ltd., if it is prepared to agree not to charge more than 6d. per kWh for lighting and 1½d. for power—if the Council agrees to the cost of the change of frequency being met by a sinking fund. The Town Clerk has been instructed to communicate with the Central Electricity Board inquiring why the Board declined to bear the cost of changing the frequency in Chelmsford, and at the same time urging that Chelmsford should be included in the national scheme.

Torquay Electricity Committee has decided that a special tariff for strip lighting purposes be issued, the standing charge to be based on 25% of the wattage installed at the rate of 3s. 4½d. per quarter per 40 W lamp installed for the two summer quarters; a standing charge based on 50% of the wattage installed at the rate of 3s. 4½d. per quarter per 40 W lamp installed for the two winter quarters and a kWh charge of ¾d. in respect of all energy used for floodlighting or strip lighting purposes. The Electricity Committee has asked Mr. W. M. Selvey to report upon a scheme for the supply of the ten parishes in the Totnes rural district at a fee of 50 guineas, plus out of pocket expenses.

Statistics relating to the West Midlands Joint Electricity Authority are contained in the abstract of accounts for the year ended March 31st, 1929. The extent of the area of supply is given approximately as 1 000 square miles. Borrowing powers under the Order of 1925 are £5 000 000, total borrowing powers granted to March, 1929, amounted to £2 725 670; the public loan debt was £2 000 000, and the amount provided for redemption was £66 049. Total capacity of plant installed at the end of the year was 105 000 kW; the maximum demand was 73 320 kW; units generated totalled 213 279 120, of which 195 218 010 were sold, 16 307 140 were used on works, and 1 753 970 were lost in transmission. The percentage of units sold to units generated was 91·53.

Guildford Corporation Lighting Committee has considered schemes for the lighting by electricity those streets in the borough now lighted by gas. The cost of new standards and the supply of lamps would be £4 773. For the year ended March 31st the annual cost of lighting by gas, the lights being extinguished at midnight, with no lights in June or July, was £2 746. The estimated cost of lighting these additional streets by electricity with a similar number of lamps all the year round, the lights being extinguished at midnight, is £2 591. The Committee recommends that as from April 1st, 1930, street lighting by electricity be substituted for street lighting by gas. The Borough Electrical Engineer has reported that the cost of laying mains in streets where mains are not already laid would be £14 420, and the Electricity Committee has decided that such mains be laid.

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WORKS LIGHTING.

The Bearing of Illumination on Industrial Efficiency.

WORKS efficiency is a subject which engages the attention of all works executives, and is of first importance to every department, whatever the nature of the output. Consequently correct artificial lighting, by virtue of its beneficial effect on works efficiency, is also worthy of special consideration.

Every works manager is alive to the possibilities of new plant, with a view to increasing output. Data relating to any improved form of machine is eagerly perused, but the possibilities of good lighting, from a productive point of view, are frequently overlooked. Provision of artificial lighting is frequently considered as an expense which must be borne grudgingly. Actually, however, nothing can be further from the truth. During the last few years, production engineers and physicists have carefully investigated the effect of lighting on visual operation, and have conclusively shown that, in general, increased ilumination brings about a greater output of work, and, in addition, improves the quality of that ouput. Electric light properly installed can be looked upon as an investment in industry which pays handsome dividends.

By means of lighting the eye is able to distinguish the shape and form of the object that is illuminated; for instance, the eye automatically associates certain gradations of light and shade with a round object or a vee-shaped object. Some operations require more light than others: continued work on small objects, for instance, requires a greater intensity of light for the same degree of eye comfort or efficiency than is required for larger objects, and it is therefore not surprising to find that there is a direct relationship between the amount of light available and the ability to perceive details.

Experiments show that the eye takes a perceptible time in the process of seeing an object—in fact, the eye operates in a somewhat similar fashion to a camera; it is able to work faster in high intensities of illumination than it can under low intensities. There is, therefore, a time factor in seeing an object in just the same manner as in taking a photograph.

The intensity of the light necessary will vary according to the nature of the work, but in all cases the clearness with which the object can be seen is the vital factor. The smaller the work and the greater the detail, the greater the amount of light necessary to enable that work to be carried out, and illuminating engineers, as the result of experience, are able to specify the intensities which are necessary to permit different classes of work to be easily executed with accuracy and dispatch.

Although the general illumination of horizontal surfaces is the more important, sufficient light must be available to light up vertical or oblique surfaces. A lighting system, properly designed as regards reflectors, lamps and spacing, will ensure evenness of light on the horizontal, and adequate illumination for other surfaces. Crude and obsolete lighting equipment invariably produces dense and confusing shadows, while modern lighting equipment is specially designed to diffuse light efficiently from the large vitreous enamelled reflector or opal globes.

Avoidance of Glare.

Glare of all kinds must be rigorously excluded from the modern workshop, since it is a direct cause of inefficiency in the working of the eye. In the presence of glare, the eye definitely loses a percentage of its efficiency, whether this be in its power to perceive detail or its ability to follow moving objects, to say nothing of the deleterious effect of glare in producing eye-strain or permanent damage to the delicate membranes.

It is surprising how few factories have well-surpervised or well-planned systems for cleaning lamps, reflectors, and the maintenance of the electric lighting system in general. A recent survey of the prevailing conditions in factories shows that only 20 per cent. of the equipment could be considered clean, and therefore operating at maximum efficiency. It is surely not realised to what a tremendous extent dirt and dust reduce the intensity of the illumination. Tests show that dirty equipment may account for a drop of 30 per cent. or more in the value of lighting obtained on the work bench. Every factory should have a regular and definite system of maintenance to ensure that lamps and accessories are at all times in proper adjustment and in good repair, and a maintenance chart will prove a tremendous help in ensuring that the lighting installation is maintained at a high standard of efficiency.

ELECTRIC TRACTION.

Additions to Liverpool Services—Glasgow and the Electricity Commissioners.

LIVERPOOL Corporation will shortly place on its tramway service 14 new cars.

The trackless tram service on the Hexthorpe route at Doncaster was started recently, superseding the tramway.

Halifax T.C. has received from the Ministry of Transport sanction to a loan of £8 576 for tramway reconstruction.

A Light Railway Order has been granted to Liverpool Corporation for the construction of a new line partly in Liverpool and partly in Sefton rural district.

It is understood that Prestwick Council is now likely to renew the lease of Salford tramways department for running powers over the Bury New Road tramway.

Manchester Tramways Committee has passed a resolution in favour of pressing for a by-law to enforce the slowing down of motor vehicles at tramcar stopping places.

Electrification in Canada.

The Canadian House of Commons recently voted $50 000 000 to be spent by the Canadian National Railways in a complete reconstruction of its terminal facilities at Montreal. No steam engines will be permitted to enter the new metropolitan station, the lines in the City limits being completely electrified.

At the instance of the Railways Board, Mr. C. H. Lydall, on behalf of Messrs. Merz and M'Lellan, has prepared a scheme for a tube railway in Calcutta, which is to be considered in conjunction with a project for the electrification of the suburban lines of the East Indian and Eastern Bengal Railway.

A party of 21 representatives of municipalities and important electrical concerns in Germany visited Birmingham and Wolverhampton recently to inspect the transport systems, and particularly the railless trolley system. Dr. Goossens, the leader of the party, is reported to have said that they were astounded at the great development of the trolley system.

Nearly £40 000 is to be expended on a new lighting installation for the Central London Railway, some 65 miles of cable and wire being used. Hitherto the lighting supply has been by d.c. at 600 V, but a low-voltage a.c. system is to take its place. This will provide current suitable for working certain automatic ticket-issuing machines, small illuminated signs and automatic train describers on the platforms.

A fleet of new, single-bogie type tramcars embodying several improvements are to be constructed for use on the Birkenhead tramway system. One of the chief improvements, is the elimination of noise by means of rubber blocks between the chassis and the body of the car and by the use of cork mats inside the car. A sample vehicle of this type has been fitted at the Corporation's Laird Street depot, and has given complete satisfaction.

The accounts of London County Council Highways Committee for the year ended March 31st, 1929, show a surplus on the working of tramways for the past year of £688 957, against £522 958 in the previous year. After deducting debt and other charges, there is a deficit of £6 789, against £226 211. The outstanding debt is £8 432 453. Passengers carried were 712 694 996, against 705 762 261. The saving to the road authorities in consequence of the obligation of the Council to maintain the paving along the tramway routes is estimated at £233 500 a year.

After being in service 23 years, the last of the original cars with hand operated gates on the Piccadilly (London) Tube Railway have just been withdrawn, and all the cars on this line as well as on the Central London and the Hampstead and City lines have now pneumatically operated doors. The Bakerloo Line will be similarly equipped by next December. The conversion of the tubes from old to new rolling stock will then have been accomplished in three years, and the new cars, numbering 1 343, will have cost about £2 225 000. The replacement of the District Railway rolling stock will be completed early in next year.

The Electricity Commissioners have refused to permit the proposed plant extension in Glasgow Corporation's tramway power station at Pinkeston. The proposals included an expenditure of £237 000 on reconditioning the existing plant and the installation of a spare set. Mr. P. J. D. Dollan, subconvener of the Tramways Committee, states that two-thirds of that sum would be for reconditioning the plant, which the Commissioners have no power to prevent, and the Committee will probably decide to the carrying out of this work. He says the Tramways Department has the right to supply, from Pinkston, power for the whole tramway undertaking.

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COMPANY NEWS.

Little Dealing in Electrical Descriptions—Company Reports and Dividends—An American-German Electrical Move—Company Meetings.

THE electrical share market has, on the whole, been somewhat dull, the Bank Holiday accounting for a lack of interest. Supply and manufacturing descriptions are generally firm, while traction and telegraph stocks show very little movement.

DAVIS AND TIMMINS, LTD.—Intm. div. 8% ord. shs., less tax.

QUEBEC POWER CO.—Div. on common shs. of $\$\frac{1}{2}$ p. sh. has bn. declared for qrtr. endg. June 30.

RUSHDEN AND DISTRICT ELECTRIC SUPPLY CO., LTD., Intm. div. 3½% (same last year), payable Aug. 22.

BRISTOL TRAMWAYS AND CARRIAGE CO., LTD.—Int. div. 4%, less tax, on ord. shs. for half-year ended June 30.

KALGOORLIE ELECTRIC TRAMWAYS, LTD.—Receipts for 1928, £23 090, agst. £22 998; net pft. £4 721, agst. £4 300.

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD., Intm. div. 4% on Ord. shs. (same last year) payable Aug. 22.

YORKSHIRE ELECTRIC POWER CO.—Directors have declared intm. div. on pref. and ord. shs. of 6% for half-year ended June 30.

FALK STADELMANN AND CO., LTD.—Pft. for 1928, £97 708. Div. of 7½% proposed agst. nil, leavg. £13 261 to be carried fwd., agst. £3 927.

ELECTRIC SHOVEL CORPORATION.—Qrtrly. div. of $1 p. sh. on the 62 010 shs. of the $4 cum. participatg. pfd. stk. outstanding will be payable on Aug. 1.

TRAMWAYS AND LIGHT RAILWAYS ESTATES CO., LTD.—Receipts for 1928 were £1 210, agst. £966, and surplus was £1 011, plus £1 448 brt. in. To reduction of goodwill, £100; div. 5%; fwd. £1 606.

OLIVER PELL CONTROL, LTD.—Net pft. for year ended March 30, £8 747, as agst. £6 653, an increase of £2 094. Directors recommend 5% div. ord. shs., £1 000 to res. fund, £1 500 to special res. fund, and carrying fwd. £3 875.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.—Directors have declared intm. div. on shs. issued prior to this year of 9% for half-year ended June 30 (same). Div. on shs. issued in March last will be payable in accordance with the terms of issue concurrently with the final div. for 1929.

INTERNATIONAL POWER CO., OF CANADA.—Income from divs. int., etc., for 1928, $800 471, increase, $179 327. Net surplus, after provision for deb. int. and 1st pfd. stk. div., $68 914, makg. with prior surplus, $191 841. Gross earnings of controlled cos. were $4 340 114 and net earngs. $1 945 398.

BENN BROTHERS, LTD.—Directors recommend payment of the following final divs. for the year ended June 30: 3% on pref. shs., which with the intm. div. of 3% paid in Jan., makes 6% for year; 13¾% on ord. shs., which with the intm. div. of 6¼% paid in Feb., makes 20% for year; 2s. 9d. per sh. on def. shs., which with the intm. div. of 1s. 3d. per sh. paid in Feb., makes 4s. for year.

CENTRAL STATES ELECTRIC CORPORATION.—Reg. qrtrly. divs. on 7% and 6% pfd. stks., 6% convertible optional div. pfd. and common stk. are announced. Qrtrly. div. on common stk. was 25 cents in cash, and, in additn., a div. of 2½% payable in common stk.—An issue of $10 000 000 of Central States Electric Corporation convertible pfd. stk., at $100 and accrued divs., was made in New York by Dillon and Co., on June 12.

MONTEREY RAILWAY LIGHT AND POWER CO.—Gross earnings for 1928, $132 948, agst. $1 242 336. After provisn. for operatg. exes. and for renewals, blce. was $207 062, agst. $81 717. After mtg. administratn. exes., allowing for uncollectable accts. and addg. miscellaneous income, net earngs. were $204 360, agst. $75 528. Int. $170 494, leavg. surplus (exclusive of provisn. for dfd. int. and sinkg. fund and service convenience charges of $120 600 charged to cap. acct.), $33 866, agst. debit $94 965.

POWER CORPORATION OF CANADA, INC.—The Corporation announces (div. No. 10) stk. bonus whereby holders of Six per Cent. Non-cum. Participatg. Pref. shs. will receive two shs. of no par value Common stk. for each hundred shs. held (1.50 of a sh. for each sh. held), payable Sept. 25 to holders of record at close of business on Aug. 31. Holders of no par value Common stk. of record Aug. 31, will receive on Sept. 25, 1929, certificates for Common shs. to incr. number of their shs. by 5%.

ALLGEMEINE ELEKTRIZITATS GESELLSCHAFT.—According to "The Times," the details of the transaction by which the General Electric Company of New York acquires an important interest in the A.E.G. (Allgemeine Elektrizitäts Gesellschaft), are now published. The "communiqué" says a scheme of co-operation covering all parts of the world has been agreed upon between the A.E.G. and the International General Electric Company, which represents the foreign interests of the General Electric Company of New York. An essential part of the scheme is the acquirement part of the capital of the A.E.G. by the I.G.E. The I.G.E. is to acquire nominally 30 000 000 m. of A.E.G. Ord. shares which are to be rendered available by an increase of the capital and partly by the conversion of A.E.G. Pref. shares into Ord. shares. The A.E.G. general meeting on August 27th is to be asked to approve the increase of capital from 186 250 000 to 210 000 000 marks. Five representatives of the G.E.C., including Mr. Owen Young, the president, are to enter the board of the A.E.G. It is believed that the present holding of the American concern in A.E.G. shares amounts to some 15%, and the new transaction will place the G.E.C. in control of approximately a third of the A.E.G. capital.

Company Meetings.

WEST WILTS ELECTRIC LIGHT AND POWER CO., LTD.—Gratifying progress was reported at the annual meeting held last week at Trowbridge. During the year, the company's mains have been further extended in rural areas, and there has been a satisfactory number of new consumers in all districts, resulting in increasing sales of current for lighting and power. The chairman, Mr. A. A. Douglas, in his review of the year's work paid a warm tribute to Mr. J. H. Edwards and his foresight and courage. The directors' report showed that after charging £3 500 for depreciation reserve, there was a profit of £2 899 4s. 10d., and a dividend of 6% was declared on the ordinary and preference shares of the company, £500 being carried to special reserve and £619 18s. 4d. carried forward.

WILLIAM BEARDMORE AND CO., LTD.—A separate general meeting of the holders of Preference shares was held on Tuesday, in London, having been adjourned from July 29th, owing to the absence of a quorum, for the purpose of considering resolutions approving the scheme for the reorganisation of the share and loan capital of the company.

Mr. L. C. Ord, the chairman, said: The first resolution is to sanction the scheme for the reorganisation of the share and loan capital of the company dated July 19th, 1929. A copy of the scheme has been in your hands for a considerable time, and, as was pointed out at the general meeting of the company, at which all the persons present in person were Preference shareholders, it has been necessary to make a modification in the scheme in order to satisfy the noteholders. That alteration involves the issue to them of Seven and a-half per Cent. Non-Cumulative Second Preference shares instead of Six per Cent. Non-Cumulative Second Preference shares, and the shareholders in general meeting, consisting entirely of Preference shareholders, realised the necessity of accepting the modification required by the noteholders. Mr. Neilson seconded the resolution, and, after the chairman had replied to some questions and comments by shareholders, it was carried by the requisite majority.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—The Marquis of Winchester, presiding at the meeting on July 25th, said the profit for 1928, after providing for taxation and all requirements, amounted to £377 295, the highest figure yet reached. This had enabled the board again to pay the maximum dividend of 10% on the preference shares, and to repeat the dividend of 15% on the ordinary shares. The sum of £50 000 was again added to the reserve fund, bringing that fund up to £550 000; £15 000 was placed to the staff fund; and £158 746 carried forward to the current year. The demand for power by the gold mining industry had not only been well maintained, but had shown a gradual and steady increase, reaching a total of over 300 000 H.P., and there were outstanding notifications which would further increase the maximum load. In course of time each of the existing mines would work out its payable ore, but this would be compensated for to a considerable extent by the opening of new mining properties, particularly in the Far Eastern Rand. With regard to the company's right at the Victoria Falls, the subject was still under negotiation with the Govern-ment of Northern Rhodesia.

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NEW COMPANIES.

PEDALS, LTD.—Cap., £400. General manufacturers, electrical engineers, etc. Reg. Office: 76, Carver Street, Birmingham.

ELECTRIC SHARPENERS, LTD.—Cap., £7 500. Electricians, electrical and mechanical engineers, etc. Reg. Office: Balfour House, Finsbury Pavement, London, E.C.2.

MAGNETO DYNAMO AND CAR REPAIR WORKS, LTD.—Cap., £500. To carry on business of sale and repair of magnetos, dynamos, etc. Reg. Office: 14½, Douglas Street, Glasgow.

DENYS TURNER AND JAMES THOMAS, LTD.—Cap., £6 000. Motor, mechanical, electrical, wireless and general engineers, etc. Solicitors: MacIntosh, Thomas and Co., Cardiff.

ALWAY AND HUDSON, LTD.—Cap., £1 000. General engineers and contractors, manufacturers of and dealers in electrical machinery, etc. Reg. Office: 15, York Street, St. Pauls, Bristol.

KENNETH E. BESWICK, LTD.—Cap., £1 500. Manufacturers of components appertaining to electrical and mechanical trades. Reg. Office: Alert Works, Durban Road, Seven Kings, Essex.

SPECTAD DEVELOPMENT SYNDICATE, LTD.—Cap., £4 000. Manufacturers of and dealers in electrical and mechanical devices and signs, etc. Reg. Office: 252, West George Street, Glasgow, C.2.

CENTRAL WIRELESS CO., LTD.—Cap., £200. Manufacturers and distributors of and dealers in wireless, television and radio apparatus, etc. Secretary: C. J. Dykes, 21, Farringdon Avenue, London, E.C.

A. RANDOW, LTD.—Cap., £5 000. To acquire business of electric factor and manufacturer of silk and other lamp shades now carried on by A. E. A. Randow at 38, High Street, Colliers Wood, London, S.W.19.

SIDARBLEN ENGINES, LTD.—Cap., £500. To acquire inventions relating to engines, and to carry on business of mechanical and electrical engineers, electricians, etc. Reg. Office: 4, Old Burlington Street, London, W.1.

C. D. HALL, LTD.—Cap., £1 000. Electrical, radio and wireless engineers and manufacturers, dealers in electrical, radiographic and wireless instruments and apparatus, etc. Reg. Office: 4, St. John's Walk, Church Street, Blackpool.

VIMAX MACHINERY CO., LTD.—Cap., £100 000. To acquire trade mark "Vimax," and carry on business of mechanical and electrical engineers, etc. Reg. Office: Imrie House, 33–36, King William Street, London, E.C.4.

GISBURN MOTOR AND LIGHTING CO., LTD.—Cap., £500. To acquire business of a motor engineer, garage proprietor and producer and distributor of electricity at Gisburn, West Riding. Reg. Office: Ribblesdale Garage, Gisburn.

CHARLES CROFTON AND CO. (ENGINEERS), LTD.—Cap., £2 500. To acquire the business of general engineers and engineers' agents now carried on at 11, Marden Road South, Whitley Bay. Reg. Office: 11, Marden Road South, Whitley Bay.

EDSON ENGINEERING CO., LTD.—Cap., £100. Electrical, mechanical and general engineers, welders, electricians, producers of electricity or other motive power or source of light, etc. Reg. Office: 28A, Cathall Road, Leytonstone, London, E.11.

KENTMERE DIATOMITE CO., LTD.—Cap., £500. Producers and manufacturers of and dealers in articles which are capable of being used for heat, cold, electrical or other insulation or protection, etc. Reg. Office: 3/4, Clements Inn, Strand, London, W.C.2.

FURNEAUX AND THOMAS, LTD.—Cap., £1 000. To acquire business of electrical and mechanical engineer, electrical contractor, etc., recently carried on by A. G. Thomas at Swansea, as Furneaux and Thomas. Solicitors: Roderick and Richards, Llanelly.

TROJAN (MANCHESTER), LTD.—Cap., £8 000. To acquire businesses heretofore carried on by S. Jones and H. G. Jenkinson, trading as "The Trojan Electrical Co.," and "The Trojan Supply Co.," electrical and radio engineers, etc. Reg. Office: 13, St. Ann Street, Manchester.

SUPER ELECTRIC HEATERS (1929), LTD.—Cap., £1 000. To acquire from liquidator goodwill of business of electrical engineers and electrical apparatus manufacturers formerly carried on by Super Electric Heaters, Ltd. at Imperial Works, Lever Street, Wolverhampton.

EDIBELL SOUND FILM APPARATUS, LTD.—Cap., £200 000. Manufacturers and producers of and dealers in machinery, apparatus and appliances for recording and transmitting sound, pictures and the like, mechanical and electrical engineers, etc. Reg. Office: 40 and 41, Old Broad Street, London, E.C.2.

BURNARD'S DAIRY EQUIPMENT, LTD.—Cap., £85 000. To adopt agreement with Burnards (Established 1899) Ltd., and A. Burnard for the manufacturing of and dealing in dairy, refrigerating and ice cream plant, electrical engineers, etc. Solicitors: Ashurst, Morris, Crisp and Co., 17, Throgmorton Avenue, E.C.

THE LEAD MARKET.

The market opened with a firm tone last week, and according to James Forster and Co., by Tuesday £23 5s. had been paid for November and £23 1s. 3d. for August. Wednesday saw a sharp set back of 6s. 3d. per ton, but on Thursday the tone was again firm, particularly for the August position, which advanced 8s. 9d., while forward gained 5s., a backwardation of 1s. 3d. per ton thus being established.

Closing prices on August 2nd were £23 6s. 3d. for August and September, and £23 5s. for October and November, 13s. 9d. to 10s. per ton higher on the week.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

500 622. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy, wireless telephonic apparatus in combination with gramophones, and gramophones and parts thereof. Radio-Tri-Phone, Ltd., 6, Broad Street Place, London, E.C.2; manufacturers. March 4th, 1929. Registration of this trade mark shall give no right to the exclusive use of the word "Radio-Tri-Phone."

LOCK-ATKINSON WIRELESS. (Sign.)—501 128. Class 8. Wireless instruments and apparatus. Stephen Walter Atkinson, trading as Lock-Atkinson Wireless, 311, Camden Road, London, N.7; manufacturer. March 20th, 1929. Registration of this trade mark shall give no right to the exclusive use of the letters "L.A.W."

THREE TORCHES.—501 981. Class 8. Electric batteries. Hyman Selig Myers, 6, St. Andrew's Buildings, Gallowgate, Newcastle-on-Tyne; manufacturer. April 19th, 1929.

B501 454. Class 8. Fitted electrical switchboards. The applicants undertake that this mark, when registered, and the marks Nos. 378 537, B493 896, B501 455 and B501 456 shall be assigned or transmitted only as a whole and not separately. User claimed from September 11th, 1917. B501 455. Class 13. Electrical switches for switchboards and parts thereof, being goods made principally of ordinary metal not included in other classes. The applicants undertake that this mark, when registered, and the marks Nos. 378 537, B493 896, B501 454 and B501 456 shall be assigned or transmitted only as a whole and not separately. User claimed from September 11th, 1917. B501 456. Class 18. Electrical power generating and converting plant. The applicants undertake that this mark, when registered, and the marks Nos. 378 537, B493 896, B501 454 and B501 455 shall be assigned or transmitted only as a whole and not separately. User claimed from September 11th, 1917. B493 896. Class 6. Dynamos, electric motors and parts thereof. The Electric Constructions Co., Ltd., Ingersoll House, 9, Kingsway, London, W.C.2; electrical engineers and contractors. All, April 3rd, 1929, with exception of B493 896 which is dated August 8th, 1928. The applicants undertake that this mark, when registered, and the mark No. 378 537, shall be assigned or transmitted only as a whole and not separately. User claimed from September 11th, 1917.

500 800. Class 8. Gramophones and parts thereof, gramophone pick-ups, instruments and apparatus for radio signalling, sound reproducers and thermionic amplifiers. Pohlmann and Son, Ltd., 16, Hall Street, Halifax, Yorkshire; manufacturers. March 8th, 1929.

ROCKBESTOS.—502 372. Class 8. Philosophical and scientific instruments and apparatus. The Standard Insulator Co., Ltd., Winsley House, Wells Street, Oxford Street, London, W.1; manufacturers. May 2nd, 1929. To be associated with No. 502 373 : 1 (not yet advertised).

501 485. Class 8. Philosophical and scientific instruments and apparatus. Kelvin, Bottomley and Baird, Ltd., 16 to 20, Cambridge Street, Glasgow; scientific instrument makers. April 4th, 1929. Registration of this trade mark shall give no right to the exclusive use of the dial device.

QUEENSWAY.—501 567. Class 13. Electric lamps (ordinary). Queenway, Ltd., 13 and 14, Great Queen Street, Kingsway, London, W.C.2; manufacturers. April 6th, 1929.

LION.—498 920. Class 8. Wireless telephonic receiving apparatus, but not including loud speakers sold separately. Lionel William Holt, 196, Shaftesbury Avenue, London, W.C.2.; manufacturer. January 11th, 1929. (By consent.)

G.B.C. LTD. (Sign.)—499 417. Class 8. Electric batteries, not for medical purposes. The Grosvenor Battery Co., Ltd., 2–3, White Street, Moorgate, London, E.C.2; and Grosvenor Works, Lower High Street, Watford; manufacturers. January 26th, 1929.

501 042. Class 50. Electric insulating materials included in Class 50. Isomic Works, Ltd., 47, Adam Street, New Kent Road, London, S.E.1; 481, Fort Washington Avenue, New York; 81, Avenue Philippe Auguste, Paris, France; Palisandenstrasse 83, Berlin, Germany; and 3, Via Pietro Morocco, Milan, Italy; insulating material manufacturers. March 18th, 1929. Registration of this trade mark shall give no right to the exclusive use of the word "Isomic."

PALLAS. — 502 438. Class 8. Electric accumulators and instruments. Pallas Apparate Gesellschaft mit Beschrankter Haftung, Waitzstrasse 17, Charlottenburg 4, Berlin, Germany; manufacturers. May 3rd, 1929. To be associated with No. 502 437 xviii. and another (not yet advertised).

CHARMONIC.—502 574. Class 8. Wireless instruments and apparatus. The Midland Furnishing Co., Ltd., 15 to 23, Southampton Row, London, W.C.1; merchants. May 8th, 1929.

METAL AND CHEMICAL PRICES.

TUESDAY, August 6th.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£77 0 0	£1 10 0	—
Electro Wirebars .. .. „	£84 15 0	—	—
H.C. Wires, basis .. .. per lb.	11 11/16d.	—	—
Sheet .. .. „	11 11/16d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2 11/16d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	1/4d.	—
Sheet „ .. .. .. „	10 1/4d.	—	—
Wire „ .. .. .. „	11 1/4d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£24 15 0	10s. 0d.	—
Foreign or Colonial .. .. „	£23 5 0	5s. 0d.	—
Tin—			
Ingot .. .. .. per ton	£213 7 6	—	£1 12 6
Wire, basis .. .. .. per lb.	2s. 9 1/4d.	—	1/4d.
Aluminium Ingots .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£25 2 6	—	2s. 6d.
Mercury .. .. per bottle	£22 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
Sodium Bichromate—Per lb. 3½d.
Rubber—Para fine, 11½d.; plantation, 1st latex, 11½d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

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MUNICIPAL FINANCE.

Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1928-9 of the 53 undertakings included in the following table was £11,317,275. The gross profit on the year's working of the undertakings was £5 266 118, and the aggregate sales of electricity amounted to 2 097 742 165 kWh, while 24 undertakings out of the total number have contributed an aggregate of £287 613 to the relief of rates. In many cases the costs include items of a capital nature, and net profits have been reduced as the result of reduction of charges for current. As it is desired to make these tables as complete as possible the Editor will be pleased to receive similar particulars of other municipal electricity undertakings.

Authority.	Total Revenue. £	Gross Profit. £	Net Profit or Deficit. £	(a) Working Costs per kWh sold.	Total Cost per kWh (inc. capital charges).	Electricity sold (kWh).	Increase (+) (or) Decrease (−) in kWh sold.	Maximum Simultaneous Load in kW.	(h) Load Factor.	Radiators and Cookers Connected (total) in kW except where otherwise stated.	Other Domestic Appliances connected (total) kW.	Contributed in Aid of Rates. £
Barnes U.D.C.	69 178	31 183	(c)+15 636	1·073d.	1·300d.	8 500 850	+ 1 445 850	5 050	23·00	(b) 7 907	See footnote (b)	—
Barrow T.C.	104 607	44 373	+ 13 113	0·817d.	1·241d.	17 700 214	+ 1 064 810	5 700	35·45	(d) (No) 1 049	(d) (No) 1 627	—
Batley T.C.	32 153	11 025	+ 4 576	1·310d.	1·720d.	3 866 839	+ 366951	1 880	30·80	(e) 60	913	800
Bingley U.D.C.	26 054	5 669	(m) −2 106	1·750d.	2·539d.	2 364 278	+ 50 199	1 331	27·60	(b)(e) (No) 1 450	See footnote (b)	750
Birmingham C.C.	1 703 433	773 454	+ 168 435	0·709d.	1·171d.	314 560 336	+33 574 930	145 200	24·70	30 475	3 592	41 000
Blackburn T.C.	216 711	135 848	+ 4 293	0·696d.	1·829d.	27 868 939	+ 3 397 425	17 015	18·70	See footnote (f)	See footnote (f)	—
Blackpool T.C.	232 446	90 765	+ 34 862	1·070d.	1·490d.	31 720 341	+ 4 044 423	14 317	25·00	19 496	2 524	See footnote (g)
Burton-on-Trent T.C.	110 889	54 530	+ 3 374	0·642d.	1·228d.	21 062 528	+ 3 728 219	7 750	31·02	(b) 11 729	See footnote (b)	3 175
Bury T.C.	125 693	54 892	+ 6 669	0·624d.	0·953d.	27 232 015	+ 1 961 343	12 320	29·15	See footnote (f)	See footnote (f)	—
Canterbury	33 745	17 320	+ 7 901	1·220d.	1·970d.	3 045 738	+ 706 469	1 570	19·40	(b) 1 841	See footnote (b)	—
Carlisle C.C.	89 542	42 003	+ 4 793	0·883d.	1·575d.	12 919 432	+ 971 577	6 600	22·30	4 324	429	—
Chester C.C.	85 062	41 638	+ 16 120	0·951d.	1·642d.	8 863 660	+ 1 187 892	4 649	20·45	—	—	1 500
Chesterfield T.C.	70 927	39 081	+ 9 514	0·660d.	1·280d.	11 485 130	+ 784 379	5 757	26·80	(b) 6 724	See footnote (b)	5 000
Colne T.C.	33 695	13 119	+ 1 920	1·200d.	2·000d.	3 790 751	(h) +19 969	2 042	21·19	(b) 2 859	See footnote (b)	1 315
Doncaster T.C.	74 539	42 940	+ 10 222	0·830d.	1·670d.	8 889 818	+ 852 085	4 330	24·00	See footnote (f)	See footnote (f)	2 500
Dover T.C.	50 502	25 903	+ 7 642	1·870d.	3·260d.	3 157 516	+ 188 196	1 750	28·58	See footnote (f)	See footnote (f)	—
Dundee C.C.	224 654	92 836	+ 23 563	0·700d.	1·070d.	45 160 219	+ 2 737 803	22 890	26·60	See footnote (f)	See footnote (f)	See footnote (i)
Faversham T.C.	13 275	6 240	+ 1 883	2·373d.	3·842d.	711 596	+ 29 082	484	20·80	52	20	—
Grimsby T.C.	99 671	15 752	+ 12 357	0·754d.	1·264d.	15 857 764	+ 1 237 171	6 344	28·50	(b) 7 622	See footnote (b)	—
Hackney (London) B.C.	262 490	151 181	+ 42 174	0·730d.	1·360d.	39 151 689	+ 4 772 736	20 880	21·40	—	—	9 437
Hampstead (London) B.C.	161 715	40 771	(k) −22 382	1·320d.	1·770d.	21 306 463	+ 3 818 795	12 775	19·04	20 065	2 612	—
Harwich T.C.	12 460	5 824	+ 1 041	2·495d.	4·300d.	638 173	+ 30 397	399	22·47	See footnote (f)	See footnote (f)	—
Holmfirth U.D.C.	16 958	4 880	+ 51	1·220d.	1·847d.	1 847 978	+ 62 053	950	28·00	700	250	—
Huddersfield T.C.	207 806	98 675	+ 39 113	0·681d.	1·053d.	38 452 341	+ 4 674 314	16 200	27·02	—	—	—
Hull C.C.	360 950	187 318	(l) +46 154	0·600d.	0·950d.	74 601 164	+ 4 311 619	29 900	28·86	10 129	1 905	—
Ipswich T.C.	140 587	67 928	+ 19 368	0·859d.	1·552d.	16 789 068	+ 2 349 807	9 950	19·26	—	—	4 000
Kettering U.D.C.	70 192	35 152	+ 5 766	1·029d.	(n) 1·934d.	7 990 064	+ 787 228	4 589	19·88	(b) 9 225	See footnote (b)	1 480
Leeds C.C.	672 004	421 146	(r) +39 346	0·440d.	0·960d.	135 498 359	+15 113 147	58 000	26·67	See footnote (f)	See footnote (f)	31 720
Leek U.D.C.	25 591	10 781	+ 1 884	1·484d.	2·285d.	2 355 448	+ 164 864	1 364	19·70	—	—	650
Liverpool C.C.	1 350 688	652 345	o) +155 832	0·681d.	(p) 1·165d.	246 019 043	+22 377 371	93 700	29·97	See footnote (g)	(q) 3 600	155 832
Manchester C.C.	1 685 889	702 785	+ 80 892	0·629d.	1·027d.	375 253 335	+21 761 193	156 370	27·39	(b) 94 110	See footnote (b)	—
Mansfield T.C.	53 567	21 055	+ 2 350	1·428d.	2·270d.	5 326 058	+ 278 093	2 596	23·42	(b) 2 776	See footnote (b)	—
Marylebone (London) B.C.	512 238	229 486	+ 22 120	0·719d.	1·246d.	94 396 858	+16 131 999	51 525	20·90	(b) 42 303	See footnote (b)	—
Nelson T.C.	60 265	28 012	+ 4 638	0·830d.	1·360d.	9 905 894	+ 540 298	4 600	24·58	See footnote (f)	See footnote (f)	5 314
Newport T.C.	192 996	92 374	+ 16 013	0·777d.	1·291d.	32 831 179	+ 4 370 166	12 975	28·88	See footnote (f)	See footnote (f)	355
Nuneaton T.C.	46 058	16 802	(s) +2 234	0·673d.	1·845d.	6 188 624	+ 339 070	3 089	22·87	(e) 3 300	(e) 350	—
Oldham T.C.	238 445	145 076	+ 26 618	0·462d.	(t) 1·066d.	48 523 688	+ 1 043 333	25 600	25·56	See footnote (f)	See footnote (f)	—
Peterborough C.C.	118 685	53 318	− 5 560	0·573d.	1·108d.	24 795 000	+ 4 831 084	8 500	33·30	(u) 6 876	See footnote (f)	—
Poplar (London) B.C.	246 794	99 945	+ 13 848	0·897d.	1·425d.	39 266 427	+ 2 893 680	18 450	24·30	—	—	—
Rawtenstall T.C.	68 478	28 172	+ 5 595	0·522d.	0·926d.	13 449 971	+ 46 295	6 300	24·37	(b) 2 358	See footnote (b)	—
Rochdale T.C.	2 995 524	62 375	+ 7 002	0·711d.	0·880d.	79 980 635	+13 506 953	31 194	29·26	(b) 25 650	See footnote (b)	—
Rotherham T.C.	252 976	133 484	+ 30 322	0·357d.	0·665d.	80 258 345	+16 697 332	34 400	26·60	(b) 7 604	See footnote (b)	—
Shrewsbury T.C.	21 628	7 302	+ 1 780	1·480d.	2·210d.	2 163 943	+ 321 082	1 393	18·55	—	—	660
Southport T.C.	95 197	52 716	+ 18 835	0·789d.	1·430d.	12 546 047	+ 1 671 241	7 080	20·23	(b) 1 056	See footnote (b)	4 000
Tunbridge Wells T.C.	77 930	44 288	+ 17 500	0·770d.	1·390d.	10 450 235	+ 2 608 650	5 600	25·50	See footnote (a)	(x) (No) 363	—
Wallasey T.C.	158 301	81 934	+ 37 912	0·506d.	0·802d.	36 028 492	+ 4 519 801	15 510	26·52	9 372	1 962	5 000
Walsall T.C.	119 247	44 765	+ 18 523	0·990d.	1·330d.	18 061 848	+ 868 123	7 730	29·50	5 350	826	4 600
Watford T.C.	122 830	61 540	+ 20 661	0·810d.	1·370d.	18 064 254	+ 3 732 227	8 550	24·10	See footnote (f)	See footnote (f)	1 500
West Hartlepool T.C.	83 541	30 078	+ 11 403	0·835d.	1·070d.	15 571 728	+ 3 679 443	5 280	33·00	3 503	1 125	2 000
Weymouth T.C.	31 847	16 337	+ 6 764	1·430d.	2·400d.	2 588 898	+ 395 423	1 492	19·80	(b) 1 518	See footnote (b)	—
Worcester C.C.	79 749	(y) 41 619	+ 8 754	0·660d.	(y) 1·280d.	13 222 193	+ 1 574 410	6 750	31·00	6 897	594	3 000
Workington T.C.	6 132	2 832	+ 952	2·480d.	3·890d.	319 592	+ 49 533	300	14·77	(b) 223	See footnote (b)	—
Worthing T.C.	68 731	55 251	+ 13 481	1·420d.	2·600d.	5 141 167	+ 1 194 550	2 931	20·20	5 453	See footnote (f)	2 025

(a) Usually include management, repairs and maintenance, rates and taxes and special charges. (b) Including other domestic electrical appliances. (c) After paying income tax, £4 685. (d) On hire. (e) Approximate. (f) Not available. (g) Not yet allocated. (h) Small increase due to depressed trade conditions. (i) Rates and taxes paid by department are very high, and it is not the practice to ask for further contribution to rate relief. (k) Net deficit due to facts that whole of loans were repaid at March 31, 1929, amounting to £38 212, and that capital outlay met from revenue was £26 528. (l) After provision for special expenditure, £22 399. (m) Less £750 contributed in aid of rates. (n) Including revenue expenditure on market lighting and public lighting and all loan charges, including meters, etc. (o) After provision for interest, sinking fund and expenditure on new services, meters and cooking appliances. (p) Including special expenditure—see note (o). (q) Cookers on hire. No record of other appliances. (r) After contributing £86 103 to capital expenditure. (s) After expenditure of £1 492 on special charges of a capital nature. (t) Including £35 210 for motors, lamps, wages and materials in connection with change over from d.c. to a.c. services, costs on sale of fittings account, and income tax schedule "D." (u) Cookers only. No detailed information of other classes. (x) Approximate; 250 coppers and 113 water boilers. (y) 12 904 paid for capital works out of revenue.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BENNETT, N. S., 283, Monument Road, Birmingham, wireless factor. £42 14s. 10d. June 25th.

HERMON RADIO SUPPLIES, 2A, Wellesley Road, Wanstead, wireless and electrical engineers. £16 1s. 6d. June 5th.

HUTCHINSON, Mr. J. A., Main Street, Frodsham, radio engineer. £11 0s. 11d. June 4th.

KELLY, Mr. J., 19, Talbot Street, Rochdale, wireless dealer. £14 3s. 3d. June 27th.

MINSHALL, Mr. R., 4, Passmore Street, S.W.1, wireless engineer £20 9s. 3d. June 26th.

SAUNDERS, Cyril A. V., "Bradiston," Hare Lane, Claygate, wireless dealer. £15 13s. 2d. June 20th.

WHITE, Mr. W., "Aston Villa," Cosley Road, near Coventry, wireless dealer. £15 18s. 10d. June 4th.

STANSBURY, Leonard (trading as L. STANSBURY AND SON), 2, Empire Parade, Beckenham, wireless engineer. £54 11s. 8d. June 28th.

SYKES, Mr. W., 62, Bolton Street, Ramsbottom, wireless dealer. £12 4s. 3d. July 1st.

Bills of Sale.

SQUIRES, George Harry, 103, Ellesmere Road, Sheffield, electrical engineer. Dated July 16th, filed July 17th. £50.

WINKWORTH, David George, 20, Skinner Street, Clerkenwell, electrical engineer. Dated July 29th, filed July 31st. £35.

Receiverships.

FRANKLIN EBONITE CO., LTD.—G. R. Woollard, of 5, John Dalton Street, Manchester, was appointed receiver and manager on July 26th, 1929, under powers contained in debentures dated July 12th and 19th, 1929.

PARK ELECTRICAL AND ENGINEERING CO., LTD.—E. A. Chambers, of 40, Brazennose Street, Manchester, was appointed receiver on July 26th, 1929, under powers contained in debenture dated August 22nd, 1922. F. W. Palmer, of 74, Wellington Road, Oldham, ceased to act as receiver on July 26th, 1929.

UNITED WELDINGS AND ELECTRICAL CO., LTD.—W. H. Watson, of 36, Bulls Head Chambers, Manchester, ceased to act as receiver or manager on July 25th, 1929.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

DECORATIVE LIGHTING, LTD., 146, High Street, Kensington, and 16, Church Street, Chelsea, electrical engineers and decorative lighting experts. A meeting of creditors was held on July 31st at the offices of Beecroft, Sons and Nicholson, 12, Wood Street, E.C., when Mr. Thos. Taylor, the liquidator of the company, stated that the liabilities amounted to £1 220, and net assets £332, a deficiency of £888.

The company was incorporated on November 18th, 1927, to take over a business which had been formerly carried on by Messrs. Cunningham and Slater, who were the present directors of the company. The nominal capital was £100, in shares of 1s. each, and 40 shares had been issued for cash and were fully paid. In October 1928 the company acquired as from September 30th, 1928, the assets and liabilities of the Artistic Shade Co., a partnership concern which was being carried on by the two directors of the company at the same address as the registered offices of the present company, namely 146, High Street, Kensington.

During the first year's trading a profit was made, but subsequently losses were incurred, and, owing to the very small issued capital, the company were unable to continue the business, and, consequently, resolutions were passed for voluntary liquidation.

The creditors present passed a resolution confirming the appointment of Mr. Taylor as liquidator. An informal committee of inspection consisting of the three principal creditors was also appointed.

GOTTLIEB (J. L.) AND CO., LTD., electrical wire manufacturers, late Cromer Street, W.C. The statutory meeting of creditors in the voluntary winding-up of this company was held on August 6th at Salisbury House, London Wall, when the liquidator, Mr. F. F. Charles, stated that the meeting was purely a formal one, as all the debts of the company had been or would be paid in full, but the meeting was necessary to comply with the Companies Acts. There had been an amalgamation of Messrs. Gottlieb's business with another concern, and the whole had more recently been taken over by Aeonic Radio, Ltd. With regard to the present position, the unsecured creditors' claims, apart from a claim for income tax, amounted to £502, against which there were book debts put down at £3 478, which were estimated to be worth £1 200; cash in hand £55, and cash at bank £190. The claim for income tax amounted to £600 or thereabouts, but for the moment the claim was disputed. No questions being asked, it was decided to leave the matter in the hands of the present liquidator.

LEADBETTER, Joseph, trading as FLEETWOOD ACCUMULATOR SERVICE, The Esplanade, Fleetwood, wireless dealer. The creditors were called together on July 30th at Blackpool, when a statement of affairs was submitted which showed ranking liabilities of £1 112, and assets estimated to realise £216, or a deficiency of £896. It was reported that the debtor commenced trading at his present address in 1926 with a capital of about £20. A full set of books had not been kept, but the business was apparently successful up to January last, when a fire broke out on the premises. The debtor received £254 from the insurance company, but he estimated that he suffered a loss of at least £200. The business was also dislocated through the fire, and the charging receipts, which had averaged £6 weekly, dropped to 30s. a week. It was estimated that including the fire there was a loss during the year to May 31st last amounting to £470. The drawings had been small. An offer was made of a composition of 10s. in the £, which it was unanimously decided should be accepted.

SOUTHEND RADIO AND GRAMOPHONE CO., LTD., Queen's Road, Southend-on-Sea, and at Wickford, Essex. The statutory meeting of the creditors of the above was held in London on August 1st. It was reported that the usual resolution for voluntary liquidation had been passed, but the liquidator stated that he had not had time to go fully into the position of the company, and no detailed statement of affairs had been prepared. He estimated that the liabilities were about £500, whilst the assets comprised stock at cost £375; book debts £50; fixtures and fittings £5; and plant £50. The gramophone department of the business had been disposed of to one of the late directors of the company. That director had also taken over one of the shops at Southend, and agreed to discharge the rent outstanding. The stock at that shop had been disposed of on advantageous terms. The lease of the premises at Wickford belonged to the mother of one of the directors. The business there had been a small one, and consisted chiefly of accumulator charging. At one time the company had a branch business at Rayleigh, but it was sold to one of the directors last April. The sale price was £180. The liquidator further stated that the company was registered on October 13th, 1928, with a nominal capital of £1,000, all of which was issued for cash. He understood that the trading actually started on January 1st last, when certain businesses which had previously been carried on by Mr. F. A. Mayer were taken over. He could not say what the turnover had been, although he had been informed that since March last the sales had fallen off considerably.

After discussion, a resolution was passed in favour of an application being made to the Court for the appointment of Mr. C. Latham, of the Wireless and Radio Trades Guardian Association, 78, New Oxford Street, London, W., as liquidator.

London Gazette, etc.

Companies Winding-up Voluntarily.

GUARANTEED, LTD. By reason of its liabilities, July 25th. W. A. J. Osborne, of Balfour House, Finsbury Pavement, London, E.C.2, appointed as liquidator.

INGHAM ELECTRICAL CO., LTD. By reason of its liabilities, July 26th. W. H. Curry, Incorporated Accountant, of 8, Beech Grove, Undercliffe, Bradford, Yorks, appointed as liquidator, Meeting of creditors at the registered offices of the company, 34, Union Street, Bradford, on Friday, August 9th, 1929, at 3 p.m. Claims by August 31st.

Bankruptcy Information.

WHITTLE, Frank, 41, Mawdsley Street, Bolton, Lancs, Electrician. Receiving order, July 31st, debtor's petition.

WHITING, John Lawrence, 4, Portland Street, Newark, county of Nottingham, electrical engineer and contractor. Receiving order, July 31st. Creditor's petition. First meeting, August 14th, 11 a.m., Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. Public examination, October 3rd, 10 a.m., County Court House, St. Peter's Gate, Nottingham.

Notice of Intended Dividend.

CHARLEY, Henry Victor (trading as DINAS POWIS ELECTRICAL SUPPLY CO.), carrying on business at Station Road, Dinas Powis, county of Glamorgan, electrical engineer. Last day for receiving proofs, August 17th. Trustee, Ellis Owen, 34, Park Place, Cardiff, Official Receiver.

Order Made on Application for Discharge.

TARVER, Charles Reekes, 16, Forest Street, lately carrying on business in co-partnership with Frederick Price, at 15, Working Street, Cardiff, under the style of FRED PRICE TARVER AND CO., electrical engineers. Discharge of C. R. Tarver suspended for six months, July 2nd.

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PATENT RECORD.

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Specifications Accepted.

312 617 OLDHAM AND SON, LTD. and W. D. WILDE. Electric couplings for galvanic batteries. (27/2/28.)
312 659 A. LIERENFELD. Methods of manufacturing electric lamps, discharge tubes, and the like. (27/2/28.)
312 622 ENGLISH ELECTRIC CO., LTD. and F. A. HARPER. Protective devices for electric generating and transmitting systems. (29/2/28.)
312 701 A. REYROLLE AND CO., LTD. and F. COATES. Electric couplings. (6/3/28.
312 706 SIEMENS BROS. AND CO., LTD. and D. A. CHRISTIAN. Electric signalling. (6/3/28.)
312 713 DR. A. WACKER GES. FUR ELEKTRO-CHEMISCHE INDUSTRIE GES., and DR. H. MULLER. Diaphragms and the like for electrolytic cells. (9/3/28.)
312 714 T. VARNEY and ALUMINUM CO. OF AMERICA. Method of and means for suspending and protecting aerial cables. (9/3/28.)
312 715 G. H. FLETCHER, R. BROOKS and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electric motors. (9/3/28.)
312 720 G. R. HIGGS and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electrically-propelled locomotives and trains. (13/3/28.)
312 724 W. M. THORNTON. Voltmeter. (15/3/28.)
312 725 J. WHITCHER, R. O. KAPP and C. G. CARRUTHERS. Protective arrangements for electric power lines or the like. (19/3/28.)
312 730 BRITISH THOMSON-HOUSTON CO., LTD., F. H. HARRIS, L. R. NIXON and J. V. PEACOCK. Systems of electric motor control. (19/3/28.)
312 734 G. WALL and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Devices employing electromagnets. (21/3/28.)
312 735 J. ALEXANDER. Automatically-operated electric switches. (22/3/28.)
312 740 E. J. JENKINS. Tanks, more particularly for oil-immersed electrical apparatus. (24/3/28.)
288 210 INTERNATIONAL GENERAL ELECTRIC CO., INC. Electric relays. (4/4/27.)
312 750 GENERAL ELECTRIC CO., LTD., G. H. WILSON and L. B. W. JOLLEY. Refractors for directional illumination. (3/4/28.)
289 054 M. MONEYRON. Electrical phase converters. (21/4/27.)
312 756 C. J. NESBITT-DUFORT and O. AND S. OILLESS BEARING CO., LTD. Electrically-operated loud-speakers. (13/4/28.)
292 579 SIEMENS AND HALSKE AKT.-GES. Arrangement for the testing of electric resistances by means of a cross-coil instrument. (24/6/27.)
312 779 A. REYROLLE AND CO., LTD. and H. BICKERTON. Circuit-breakers affording overload protection for two electric motors of different powers. (4/5/28.)
312 807 C. HILL. Telephone apparatus for self-connecting telephone-exchange offices. (29/5/28.)
312 810 W. PETO, H. M. GENESE and PRITCHETT AND GOLD AND E.P.S. CO., LTD. Electric cells or batteries. (31/5/28.)
308 748 FELTEN AND GUILLEAUME CARLSWERK AKT.-GES. Method of treating substances used for the impregnation of cables. (30/3/28.)
292 144 SOC. DES TELEPHONES GRAMMONT. Filter for preventing distortion of telephone currents. (15/6/27.)
312 821 F. W. COOK. Printing telegraph receiver. (14/6/28.)
312 822 A. PREEN. Variable-capacity electrical condensers. (14/6/28.)
303 852 CABLON, LTD. and DUSSEK BROS. AND CO., LTD. Insulating-compound for electrical conductors. (11/1/28.)
312 823 N. DENNES and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Thermally-operated electrical switches. (14/6/28.)
312 828 H. SHIMIDZU. Electric dry cell. (19/6/28.)
293 798 SOC. DES ETABLISSEMENTS AERA. Compensating-device for magnetic compasses. (12/7/27.)
293 708 AKT.-GES. BROWN, BOVERI ET CIE. Means for effecting the accurate or relative synchronism of working motors, for instance for driving paper-making machines. (8/7/27.)
312 848 H. DEAN and CHLORIDE ELECTRICAL STORAGE CO., LTD. Electric accumulators. (17/7/28.)
312 851 B. HEAP and CHLORIDE ELECTRICAL STORAGE CO., LTD. Electric accumulators. (26/7/28.)
312 853 G. H. IDE and H. L. BENTLEY. Electric switches. (27/7/28.)
312 854 G. H. IDE and H. L. BENTLEY. Electric tumbler switches. (27/7/28.)
295 031 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Control system for rectifiers and other high vacuum apparatus. (6/8/27.)
294 962 INTERNATIONAL GENERAL ELECTRIC CO., INC. Electric transformers (2/8/27.)
296 433 SIEMENS AND HALSKE AKT.-GES. Electrical apparatus for measuring the acuteness of hearing. (1/9/27.)
309 115 IDEAL WERKE AKT.-GES. FUR DRAHTLOSE TELEPHONIE. Loud-speakers (5/4/28.)
312 879 GENERAL ELECTRIC CO., LTD. and F. M. JACKSON. Ventilation of dynamo-electric machines. (7/9/28.)
312 885 E. D. FELDMAN. Electric motors. (20/9/28.)
297 465 BRITISH THOMSON-HOUSTON CO., LTD. Electromagnetic compasses of the earth inductor type. (22/9/27.)
298 531 BURGESS BATTERY CO. Battery hand lamp. (10/10/27.)
299 717 INTERNATIONAL GENERAL ELECTRIC CO., INC. Electric conductors for high voltages. (29/10/27.)
312 598 ELECTRO BLEACH AND BY-PRODUCTS, LTD., J. HOLLINS and D. JEPSON. Electro-deposition of metals. (25/2/28.)
312 599 ELECTRO BLEACH AND BY-PRODUCTS, LTD. and J. HOLLINS. Electro-deposition of metals. (25/2/28.)
312 600 ELECTRO BLEACH AND BY-PRODUCTS, LTD. J. HOLLINS and D. JEPSON. Electro-deposition of metals. (25/2/28.)
313 014 J. NEALE. Instrument for indicating and/or recording electrical pressures, currents or resistances. (1/12/27.)
312 945 F. REYNOLDS and L. SAMPLE. Electric heating, more particularly intended for use with mercury vapour lamps. (2/12/27.)
313 178 J. NEALE. Burglar and like alarms. (8/12/27.)
286 243 WAYGOOD-OTIS, LTD. Elevator safety system. (1/3/27.)
313 184 S. G. S. DICKER (NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN). Electric discharge tubes. (30/1/28.)
312 952 D. T. JONES, F. J. MOORE and IMPERIAL CHEMICAL INDUSTRIES, LTD. Manufacture of fuse heads for electrical firing. (2/2/28.)

Applications for Patents.

May 10th.

14 690 BRITISH THOMSON-HOUSTON CO., LTD. Means for regulating operation o space discharge devices. (10/5/28, U.S.)
14 659 J. W. CLOUD. Development, etc., of electrical energy.
14 694 J. M. DEAN, H. J. GARNETT and W. S. SMITH. Manufacture of insulating materials.
14 669 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Current smoothing devices.
14 724 G. F. DUTTON. Microphones, etc.
14 684 FELTEN AND GUILLEAUME CARLSWERK A.G. Junctions for cables. (11/5/28, Germany.)
14 611 G. T. FUERY (VOIGT AND HAEFFNER A.G.). Electric oil brake switch.
14 626 R. GALLAHER. Electric trackless vehicles.
14 719 J. HANAUSKE. High tension cables. (11/5/28, Czecho-Slovakia.)
14 686, 14 687 MAGNET-WERK GES. EISENACH SPEZIALFABRIK FUR ELEKTROMAGNETE APPARATE. Machine for production of wood pulp for manufacture of paper. (6/2/28, Germany.)
14 613 P. L. J. MIGNET and M. P. PERRON. Electric furnaces. (7/8/28, France.)
14 580 J. MURRAY. Tramway points.
14 670 N. V. PHILIPS' GLOEILAMPENFABRIEKEN. Devices for irradiating substances with ultra-violet light. (14/6/28, Holland.)
14 709 N. V. PHILIPS' GLOEILAMPENFABRIEKEN. Thermionic valves. etc. (12/1/29, Holland.)
14 665 E. F. NORTHRUP. Induction furnaces. (5/6/28, U.S.)
14 646 M. OFFNER. Telephonic reception.
14 613 M. P. PERRON. Electric furnaces. (7/6/28, France.)
14 650 W. M. RAND. Traffic signs. (16/5/28, U.S.)
14 716 S. J. RUBINSTEIN. Batteries.
14 697 SIEMENS-SCHUCKERTWERKE A.G. Absorption refrigerators, etc. (22/5/28, Germany.)
14 698 SIEMENS-SCHUCKERTWERKE A.G. Electric switches. (23/5/28, Germany.)
14 696 SIEMENS AND HALSKE A.G. Production of diaphragm for electro-osmotic purposes. (18/5/28, Germany.)
14 672 J. R. SPINK. Electric fuses.
12 720 H. J. THOMSON. Control of electromechanical variable speed gearing.
14 700 WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. Thermionic valve amplifiers. (17/5/28, U.S.)

May 11th.

14 744 E. BENNETT and W. LYONS. Battery ignition systems for motor vehicles.
14 804 H. H. BERRY. Sign frames.
14 760 F. BRAMALD. Railway signalling apparatus.
14 809 S. G. BROWN. Electromegaphones.
14 734 M. P. FAVRE-BULLE. Electric track racing mechanisms. (11/5/28, France.)
14 741 C. CRISP and W. PRIOR. Selenium cells.
14 738 W. EASTWOOD. Motor control gear.
14 817 L. EMANUELI and SOC. ITALIANA PIRELLI. High tension cables.
14 799 J. P. HALL. Electromagnetic brakes, etc.

May 13th.

14 842 ARCTURUS RADIO TUBE CO. Electrical discharge devices.
14 907 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electric insulators. (11/5/28, U.S.)
14 903 BRITISH THOMSON-HOUSTON CO., LTD. Cut-outs. (12/5/28, U.S.)
14 904 BRITISH THOMSON-HOUSTON CO., LTD. Magnetic vane instruments. (12/5/28, U.S.)
14 905 BRITISH THOMSON-HOUSTON CO., LTD. Electric heaters. (14/5/28, U.S.)
14 877 J. E. COLLYER and COVENTRY AUTOMATIC TELEPHONES, LTD. Telephone systems.
14 829 M. A. CROSBY. Automatic electric fire alarm.
14 915 F. H. DART, GRAMOPHONE CO., LTD., and E. M. PAYNE. Electromagnetic vibratory devices for recording sound.
14 887 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Electric rectifying installations.
14 888 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Devices for irradiation of substances with ultra-violet rays.
14 819 ELECTRIC FIRES, LTD., and C. H. SMITH. Electrically heated hot water tanks.
14 844 GENERAL ELECTRIC CO., LTD. Luminous electric discharge tubes. (17/7/28, Germany.)
14 953 H. A. GILL (R. F. MCCARTNEY). Electrical immersion water heaters.
14 872 GRAHAM-AMPLION, LTD., and E. H. ROBINSON. Electromagnetic loud-speakers, etc.
14 899 M. HOLBROOK (NÉE NOCENZO). Electric batteries. (21/6/28, France.)
14 864 J. B. LANE and J. J. PRITTY. Overhead electric cables.
14 825 F. J. PEARCE, G. H. SCHOLES, and G. H. SCHOLES AND CO., LTD. Electrical plug and socket couplings.
14 874 B. QUENDT. Guide for cable of electric irons.
14 880 A. REYROLLE AND CO., LTD., and H. WRIGHT. Traffic signalling apparatus.
14 862 D. N. SHARMA. Transmitting and receiving kinematograph films with cathode, etc., rays.
14 896 TELEFONAKTIEBOLAGET L. M. ERICSSON. Automatic telephone systems. (14/5/28, Sweden.)
14 941 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Cells sensitive to infra-red rays. (11/5/28, Germany.)

May 14th.

15 020 F. H. ADAMS (1926), LTD., and C. VAUGHAN. Armature coils for electrical machines, etc.
15 021 F. H. AINSLIE and H. LEVINSON. Electric heating unit.
15 119, 15 120 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Thermal regulating devices.
14 961 H. E. BAYLISS and A. C. WOODROW AND CO. Switch control for burglar alarms.
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15 063 BURNDEPT WIRELESS (1928), LTD., and M. G. SCROGGIE. Variable inductances.
15 034 E. FISCHER. Telephone cables, etc.
14 980 G. S. HOLLAND. Wireless signalling.
15 097 D. P. A. A. KAYSER. Electric flashlights. (26/5/28, France.)
14 045 E. F. NORTHRUP. Inductor furnaces. (2/8/28, U.S.)
14 985 R. I. SCORER. Light diffusing device for electric lamps, etc.
15 034 SIEMENS-SCHUCKERTWERKE A.-G. Telephone, etc., cables.
15 088 SIEMENS AND HALSKE A.-G. Apparatus for telephonic delivery of audible indications in public conveyances. (11/9/28, Germany.)
15 006, 15 007 STANDARD TELEPHONES AND CABLES, LTD. (G. DEAKIN and L. POLINKOWSKY). Telephone exchange systems.
15 008 STANDARD TELEPHONES AND CABLES, LTD. (G. DEAKIN and L. POLINKOWSKY). Testing arrangements for telephone systems.
15 105 TELEFONAKTIEBOLAGET L. M. ERICSSON. Heavy current cables. (16/5/28, Sweden.)
15 022 A. R. THOMAS. Electric starters for engines.
15 030 B. VOICECHANSKIS. Safety device for wiring systems.
15 109 WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. Vacuum electric tube devices. (17/5/28, U.S.)

May 15th.

15 151 E. ADAMSON and G. R. CROSKELL. Driving mechanism for electrically operated reciprocating tools.
15 218 ASSOCIATED ELECTRICAL INDUSTRIES, LTD., N. R. DAVIS, and G. A. WOOD. Electric furnaces.
15 219 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Current interruptors. (19/5/28, U.S.)
15 222 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Telephone systems. (15/6/28, U.S.)
15 221 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and L. M. SIMPSON. Electric totalisators.
15 191 BRITISH THOMSON-HOUSTON CO., LTD. Electric discharge devices. (19/5/28, U.S.)
15 190 BRITISH THOMSON-HOUSTON CO., LTD. (GENERAL ELECTRIC CO. OF NEW YORK). Electric condensers.
15 142 H. G. CAMPBELL. Electric furnace.
15 144 S. O. COWPER-COLES. Electrodeposition of metals.
15 206 H. H. COWLEY and LANGHAM RADIO, LTD. Portable wireless sets.
15 126 H. M. DUDGEON and T. C. E. ROWLAND. Current collectors.
15 246 ELECTRICAL RESEARCH PRODUCTS, INC. Cable armouring. (28/2/29, U.S.)
15 247 ELECTRICAL RESEARCH PRODUCTS, INC. Loaded signalling conductors. (6/6/28, U.S.)
15 225 ETABLISSEMENTS E. BELIN and F. HOLWECK. Electrically maintained tuning forks, etc. (15/5/28, France.)
15 226 ETABLISSEMENTS E. BELIN and F. HOLWECK. Television systems. (15/5/28, France.)
15 196 G. FISCHER. Current collectors for electric vehicles. (19/3/29, Hungary.)
15 197 G. FISCHER. Current collectors for electric vehicles. (3/5/29, Hungary.)

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THE ELECTRICIAN

Vol. CIII.—No. 2672. Friday, August 16, 1929. [Registered at the General Post Office.] Sixpence

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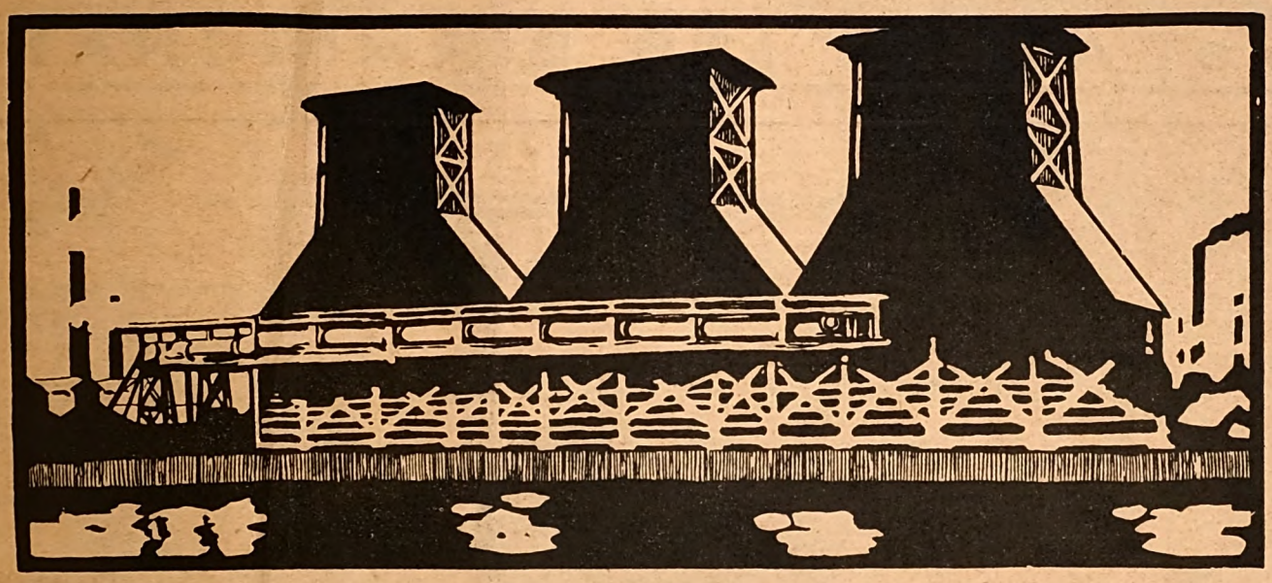

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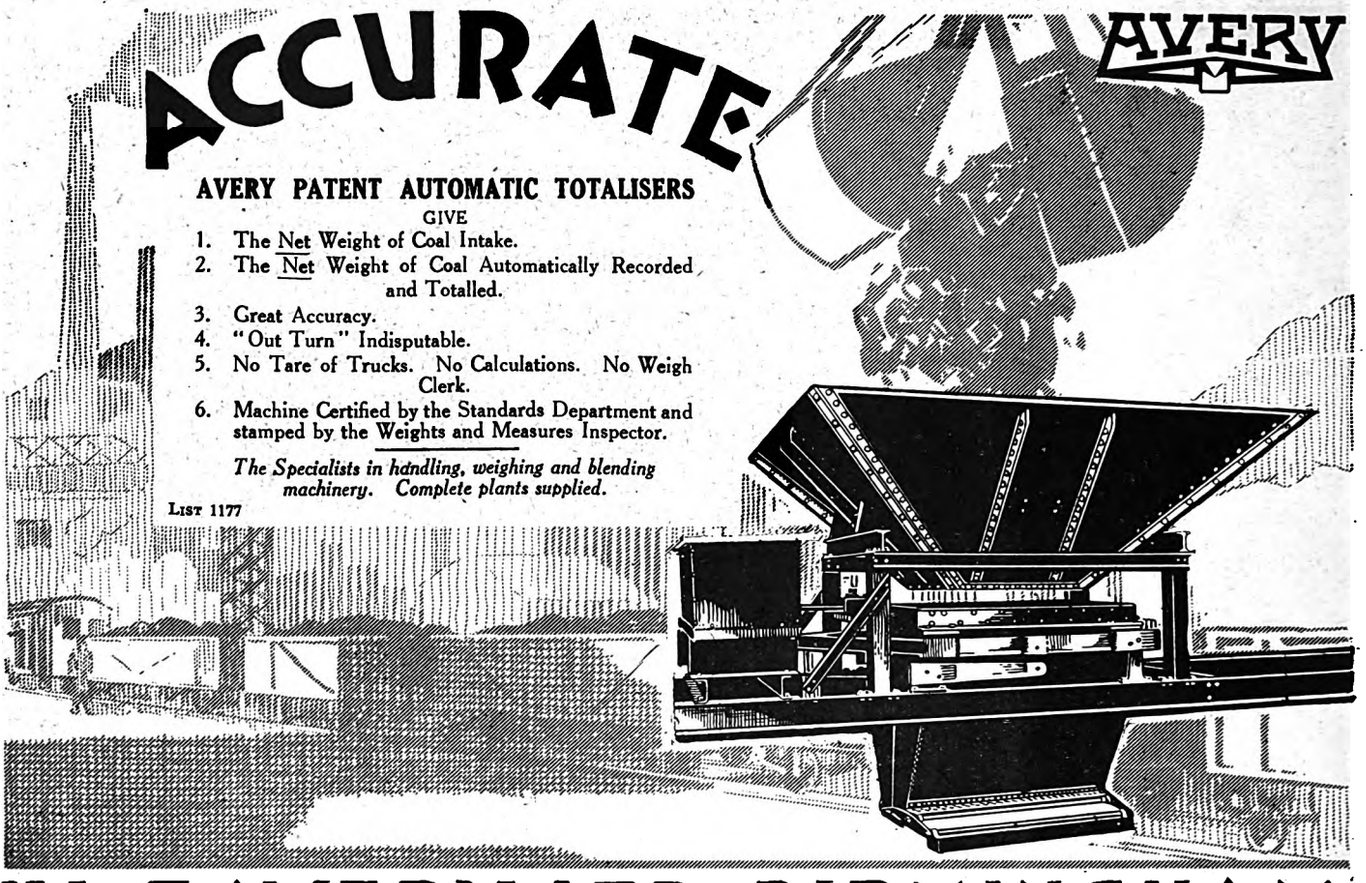

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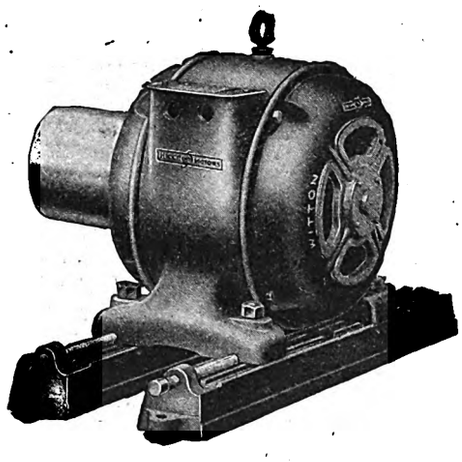

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Current Topics.

Faraday Electromagnetic Centenary.

THE arrangements initiated by the Royal Institution for the celebration of the Centenary of Faraday's discovery of electromagnetic induction have already been announced in these columns. At the representative meeting held at the house of the Institution on February 5th last, the formation of two committees was agreed to, and we learn that these committees are now at work. The first, consisting of representatives of the Royal Society, the British Association, and other scientific societies, as well as the Royal Institution, is concerned with the purely scientific aspects of Faraday's work in relation to the proposed celebrations; the second committee, which has been called together by the Institution of Electrical Engineers, consists of representatives of the principal organisations of those industries which have risen in the past hundred years upon the scientific foundation of Faraday's discoveries, and is dealing with the industrial aspects of the celebrations. The two committees are working in close co-operation; the preliminary discussions which have taken place indicate that the significance of the Centenary is very widely appreciated and that the celebrations are likely to arouse world-wide interest and support. The dates have now been fixed, and the proceedings will commence in London on Monday, September 21st, 1931. Further, an intimation has been received from the British Association that their Centenary Meeting will be held in London during the week commencing September 23rd, 1931. These two Centenaries, with important electrical conferences and other events which are to take place about the same time, will thus conjoin to make the year 1931 a memorable one in this and every country where the genius of Faraday has borne fruit.

The Wedding Present Problem.

How effectively electrical appliances for the home have solved the problem of what to give as a wedding present is shown by the pages of the London, and possibly other, suburban newspapers. In their descriptions of local weddings these papers conclude with a list of presents given to the bridal pair, and we note with interest, though without surprise, that such items as electric kettles, irons, table standards and the like are mentioned with pleasing frequency. It would appear that such gifts as cruets, smokers' companions, syphon holders and all those other accessories which were so often duplicated, have at last given way to articles which, besides expressing the esteem of the givers, are sure to be welcome, and in this turn of the tide lies an opportunity for the electrical contractor. Whereas the giving of electrical gifts for Christmas is a tremendous boost to trade, it is nevertheless confined to a few weeks. Weddings, on the other hand, do not seem to be so much governed by the seasons, and represent, therefore, opportunities for sales at all times of the year. It is true that the buying public is not so large as at Christmas, but, at the same time, the number of weddings during a year in any one locality can easily result in more electrical sales per annum than our Christmas rush; furthermore, by fostering both wedding and Christmas gifts the electrical contractor is ensuring that the "electrical present" side of his business is always alive. Suitably worded advertisements in those suburban papers which feature local affairs should soon create round the advertiser the atmosphere it is desired to make, with the result that intended guests at a local wedding will look to their local contractor for a solution of the all-important problem of what to give.

Testing Fan Performance.

A NEW British Standard Specification (No. 367–1929) has been issued with the object of defining certain features of propeller-type ceiling fans which relate to their performances, and to regulate the method of testing ceiling fans so that the results of the tests may be reasonably comparable. The type of fan covered by the specification is designed to rotate in free air, and to produce disturbance of the air in the room in which it is operating. It is obvious that to obtain a determination of the true air-movement in a room with a fan under working conditions would be extremely difficult and costly, since a large number of points would need to be examined, using instruments of high sensitivity and precision. In order to simplify the test, therefore, and make it suitable for commercial use, the specification provides a test which, whilst not strictly complying with the working conditions of the fan, is such that the effectiveness of the fan is not impaired. In preliminary tests in which the fan was suspended at the centre of a four-sided screen, it was found that the type of air-flow is characteristic and consists of a central stream of relatively high-speed air, covering an area only slightly larger than the sweep of the fan-blades, and a surrounding

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stream of air which is moving relatively slowly downwards. An analysis of the test-results has shown that practically all the variation takes place in this outer, or induced, stream, and that the volume of air being removed directly by the fan-blades is practically constant. It therefore appeared that uniform results could only be obtained if the test were confined to the central air-stream. Consequently, for the purpose of this specification, the measurements are confined to this stream. The specification suggests, and we agree, that a statement of the air-delivery per watt of input is abetter indication of the service value of this type of fan than a determination of the overall mechanical efficiency, i.e., the ratio of the actual power output to the power input.

Rural Electrification.

MR. R. BORLASE MATTHEWS, the promoter of the Lincolnshire rural electrification scheme, has now lodged an application for power to supply an adjoining area in the counties of Leicestershire, Rutlandshire, Northamptonshire and the Soke of Peterborough, the granting of which would bring his total area up to 1 833 square miles, serving a population of 193 330 persons. The scheme is of interest, not only because it is the first rural scheme based upon the anticipation of the operation of the national "grid," but also because it proposes to bring electricity to the door of all but the most isolated dwellings throughout the area, instead of catering almost exclusively for urban and industrial demands. In this scheme he has an excellent opportunity to demonstrate the rightness of his contention that the rural load, properly cultivated, can be met at a price which is mutually satisfactory to the distributor and the consumer.

Our Overseas Trade.

WHEREAS June, 1929, was the first month since 1926 during which our overseas trade as a whole did not register £50 000 000 in exported goods, an increase of £16 626 347 over the June figures is shown by the returns for July. the total being £66 519 691. During the seven months of the year the total value of British exports was £425 261 977, an increase of over £9 000 000 when compared with the same period of last year, largely made up in exports of manufactured goods, coal, iron and steel manufactures. A further fall in imports of £1 937 163 compared with July, 1928, reduces the adverse trade balance to £27 031 265 for the month under review and £272 964 914 for the seven months. Bearing in mind the present labour conditions the returns may be regarded as encouraging, for, apart from the substantial increases in the exportation of manufactures of iron and steel, machinery and ships recorded for the seven months of the year, these same goods showed substantial advances during July.

The Electrical Position.

So far as the electrical position is concerned, the details of the Board of Trade returns published on another page show that shipments of machinery and apparatus and material improved during July by £592 336 when compared with the June figures. Imports of similar goods, on the other hand, increased by £103 464, making the excess of exports over imports for the month £1 114 247, compared with only £761 604 in June. With the exception of motors and generators, switchboards and batteries, every export heading showed a substantial advance, the largest shipment being in telegraph and telephone instruments, which improved by over £100 000. The increase in imports was, with the exception of machinery, switchboards, arc lamps and searchlights, due to slight advances under all headings, the largest increase being £36 272 in the case of various electrical apparatus. On the whole the returns for July, so far as the electrical industry is concerned, may be looked upon as a distinct improvement on the June figures, for with a favourable trade balance now standing at £7 008 829, and with all works busy with both home and oversea manufactures, the industry is one of the most prosperous in the country. The slight slump which set in during June is definitely checked, and it is to be hoped that the advice given in our review of the June returns will be acted upon, namely, to foster the overseas market not only when trade is bad, but also during those periods when immediate business can be conducted without the undivided attention which it ought to get. Overseas trade, whether Empire or foreign, calls for the expert experienced in overseas conditions, and so long as a certain portion of our salesmen devote their time solely to such markets, their experience will not only bring them larger sales, but will encourage that anticipation of future needs which makes for even greater expansion. The July trade shows a good recovery from the setback of June, and there is reason to believe that the gain now recorded will be consolidated and improved upon in succeeding months.

Electrical Merchandising Developments.

THE topic of the week in electricity trade circles has undoubtedly been the sequel to the recent fusion of interests between the Edison Swan Electric Co. and the British Thomson-Houston Co., as part of the great combination now gathered under one control in Associated Electrical Industries. In furtherance of the new policy of the amalgamated businesses, the Edison Swan Co. on Monday took over the wiring supplies, lighting, engineering, electric refrigeration and radio business of the B.T.H. Co. This change may be said to mark the beginning of a big development in electrical merchandising in this country, and the joint efforts of these companies under one organisation will be watched with interest.

Odorous Comparisons.

RECENT domestic discussions in the gas industry have emphasised one of the greatest of the many disadvantages of the gas cooker, and it is one that many electrical salesmen are inclined to overlook, and so may merit notice here. Briefly, the trouble is that some public-spirited member of the gas industry has discovered that the flueless gas cooker is a serious menace to health, and even life. It appears that in the early days of gas cooking the use of a flue pipe, on the oven, at any rate, was the invariable rule. But, in the modern gas cooker, there is no provision for the collection and discharge into the outer air of the products of combustion, and the gas industry relies upon the normal changing of air through doors and windows to dissipate the fumes arising from the combustion of anything up to 90 cu. ft. of gas per hour. In the more enlightened circles in the gas industry it is acknowledged that it is unfair to expose people to the risk of asphyxiation in their kitchens, and efforts to secure adequate ventilation are recommended. While this may not be a very difficult problem it seems as if any solution must by its nature act as a further setback in a field where electrical competition is daily making itself more widely felt.

"Light's Golden Jubilee."

CONVERSATIONS with Continental electrical engineers on the claims made by Americans that MR. EDISON is the sole inventor of the incandescent electric lamp suggest that objections to "Light's Golden Jubilee" in its present form are not by any means confined to this country. It is felt that a country intending to promote an international celebration might at least have consulted its proposed collaborators before finally deciding the form the activities should take. It has also been suggested that if the Americans are unwilling to make mention of the late SIR JOSEPH SWAN as the inventor of the first incandescent electric lamp they might be less reluctant to modify their arrangements if a way could be found whereby honour could be done simultaneously to all those who have notably assisted the development of the electric lamp during the past fifty years. This suggestion is certainly worth consideration; it would give the N.E.L.A. an opportunity to make a graceful withdrawal from what seems likely to become an untenable position, and would, at the same time, permit other countries to play an active part in the celebration of "Light's Golden Jubilee."

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SCIENCE AND ENGINEERING.*

Our Indebtedness to Fundamental Discoveries of Science—What Further Research Work May Produce—The Training of Engineering Craftsmen.

By PROF. F. C. LEA, D.Sc.

A LITTLE more than sixty years after Watt built his first steam engine, Michael Faraday, supplementing by his unique genius the experimental work of many who preceded him, discovered that a magnet could be made to spin round a fixed wire through which a current of electricity was flowing and a wire containing a current could be made to spin round a fixed magnet. Without these and other equally fundamental experiments the wonderful developments of the generation and transmission of power which have taken place during the last fifty years, as well as the application of electricity to almost every need of the engineer, would have been impossible.

It is true that Carnot and Clausius came after Watt to perfect thermo-dynamic theory, and the modern theories of electricity were not known when Siemens made his first dynamos, but experimental and mathematical science had shown the way to engineering developments of the greatest significance to the life of the world. It has already been noticed that water-wheels were known and used to raise water 2 000 and more years ago, but in the seventeenth century water-wheels were little different from those described by Vitruvius in the first century before Christ, and had efficiencies well below 50%.

In the latter part of the eighteenth century and the beginning of the nineteenth, organised experiments on the flow of fluids had been carried out, relative velocities, momentum and kinetic energy were well understood and the next step was made by Poncelet in 1832, who enunciated the guiding principles underlying the design of vanes receiving moving fluids, and from that time progress has been so remarkable that to-day water turbines of more than 70 000 H.P. having efficiencies greater than 80% are being constructed, and millions of horse power are being generated by water-power.

The brilliant achievements in the development of the steam turbine of Sir Charles Parsons and others following in his steps are to-day well known. At the beginning of the nineteenth century there were probably 10 000 engines in England giving a total horse-power of about 200 000. To-day steam turbines, each capable of developing more than 200 000 H.P., have been or are being made for stations in various parts of the world. It seems very doubtful if this could have been possible except as a consequence of the work of Poncelet and two centuries of scientific experiment.

Achievement Through Research.

The rapid developments of high-tension distribution of power have been made possible by research in the laboratory. Many attempts had been made to utilise the explosive force of gunpowder, hydrogen, and coal gas for power production before the modern four-cycle internal combustion engine was developed, but without success, until it was recognised from thermodynamical considerations that compression is essential before ignition.

Thus it can be said that the important steps that have been made in engineering during the last hundred years and that distinguish this century from all preceding ones, were commenced and made possible by fundamental discoveries of science, and it can safely be anticipated that no new epoch-making developments in the future will be possible unless preceded by new fundamental scientific discoveries. Sufficient energy can be transmitted across oceans by directed beams to allow of telephonic communication. It seems improbable that wireless transmission will be possible for the large outputs of power-generating stations, but what the future is to reveal cannot be known. In any case the fundamental scientific work of Maxwell, Crookes, Hertz, and Fleming was essential before even a start could be made.

At present we depend upon the natural forces of air and water or the energy of controllable chemical reactions in boilers, engines, and batteries for our sources of power. Visions of engineers controlling sources of atomic energy immeasurably more powerful than those available at present sometimes come to the hopeful, inspired by the developments of experimental and mathematical physics. Rutherford has shattered the nucleus of the atom. Dr. Krapitza, in the Cavendish Laboratory at Cambridge, has claimed to have reached temperatures of 1 000 000 deg. C., and Eddington tells us that in the great power houses of the sun and the stars, where the temperatures are, it is estimated, as high as 40 000 000 deg. C., the energy of the escaping electrons of the atoms is the source which for millions of years has made and will make it possible for the sun and stars to radiate energy without appreciable fall in temperature.

It may be, and until man is more worthy at least it is hoped that it will be, impossible for atomic energy in large quantities to be obtained and controlled. Also it may be equally impossible to obtain energy by the synthetic building up of other elements from the fundamental element hydrogen, which can be obtained in abundance by the electrolysis of sea-water, but, whatever the future has to unfold, it seems certain that only by following the new ways opened by pure science can there be hope of success.

Path of the New Knowledge.

Perhaps it may be that not along this path that modern physics seems to suggest will the new knowledge come, but, as many years ago there came the new and wonderful discovery of voltaic electricity while Galvani was making experiments with frogs, so in the future a biologist or chemist or physicist, working on some problem entirely remote from the production of energy, may make discoveries which the Watts and Faradays of the future may use to change the life of the world.

From the point of view, then, of developments in engineering, modern communities cannot afford to neglect the encouragement of scientific research even in those subjects which at present may seem most remote from its activities.

In the workshops, in design, in choosing materials, very considerable difficulties have to be overcome before success is possible. The principles of the independent condenser were clearly grasped by Watt, he tells us, as he walked over Glasgow Green, but many years of labour experimenting with materials, many ingenious mechanisms were necessary before the steam engine was at all perfect, and in every step that has been taken in the direction of higher pressures and higher temperatures new materials, new processes, and new ingenious devices have been necessary before success could be achieved.

Inventive ability allied with experiments, research in the development of new metals for tools and machine elements, precise measurement, the perfection of machine shop methods, especially the very extraordinary improvements in machine tools encouraged by the new tool steels and electric driving and control, have all contributed, and wherever success has been sure the methods of science have been followed.

But though so much has been done in the development of prime movers there is perhaps no movement in engineering to-day that is of greater interest, not only to engineers but to the general community, than the attempts that are being made considerably to increase the efficiency of power production from coal and other fuels. The average overall thermodynamic efficiency of the public stations distributing electrical energy in Great Britain for the year ending March 1928 was about 15%. The best station had an efficiency of 21·3%. Recently a power unit has been supplied from England to Chicago which on test gave an efficiency of 34%—a remarkable figure.

Making allowance for boiler losses, efficiencies of from 25% to 35% ought to be possible, therefore, in the future, and if only suitable materials can be developed to meet the onerous conditions of temperature, corrosion and erosion, higher efficiencies than 35% may be anticipated with steam plant. Still higher thermodynamic efficiencies may be expected, as well as the chemical riches of the coals preserved, if, as a result of research, solid fuel engines or gas turbines can be developed.

At the temperature of from 400 deg. to 600 deg. F. at which boilers and super-heaters have until recently worked, mild steels have been found suitable. To realise higher efficiencies than at present, much higher temperatures will be required, and at contemplated temperatures of 1 000 deg. F. and upwards carbon steels creep at low stresses. Below a certain stress, at a particular temperature, which I have ventured to call "The Limiting Creep Stress," the creep ceases or becomes so small that it cannot be observed in, say, a number of days.

This "Limiting Creep Stress" is evidently the important factor in the problem of high working temperatures. Experi-

* Extracts from the Presidential Address to Section G. of the British Association, at its meeting in South Africa on August 1st.

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ments indicate that with alloy steels limiting creep stresses much higher than those obtained from carbon steels may be expected and that alloys of iron, nickel, chromium, and with or without other alloyed elements, containing as much as 60% of nickel and chromium have considerable strength at high temperatures and also resist corrosion and erosion. There is still, however, a very large amount of research to be done in which the laboratory and the workshop must co-operate, as new workshop technique is required before these alloys can be used for specific purposes.

Manufacturers' Work for the Public.

Research is being undertaken by many manufacturers at great expense and the public finally reap the benefit, but it would appear that in a matter of such vital concern to industry and the community more rapid progress could be made and a much bolder policy pursued if the public organisations and the large power distributing companies and authorities accepted the responsibility of the provision of funds for research. In the Universities much fundamental work can be done if funds are available. The Department of Scientific and Industrial Research has recognised recently the importance of the subject and is assisting industry and the National Physical Laboratory to carry out researches on the physical properties of metals at high temperatures. The metal problem, associated with the hope of higher efficiencies in heat engines, is also of very great importance in connection with " low temperature " carbonisation of coal and other similar large-scale chemical engineering processes.

It may quite reasonably be said that practice in the past has led to safety. That certainly must always be the first consideration, but undue safety involving the use of too much material or even too narrow a margin of safety by using materials unsatisfactorily cannot be said to be good engineering, and engineers as well as the general public—for whom engineers are trustees—cannot be satisfied until all uncertainties that can be removed by careful scientific inquiry give place to more accurate knowledge.

Allied to the subject of structures is that of the strength of materials and their behaviour under various types of stress. For nearly seventy years experiments have been carried out to determine the effect of repeated stresses on metals, but the development of high-speed machinery during the last twenty years has focused attention upon this important subject, and it is now realised how imperfect is our knowledge. A vast amount of experimental data has been accumulated and it has been clearly shown that the safe range of stress to which a piece of material can be subjected for, let us say, an indefinite number of times, depends in some way, not yet clearly defined, upon other and more easily determined physical properties. But it is not yet always possible to foretell that some element of a locomotive or of an aeroplane engine, or structure, or other machine will not fail under the conditions it has to meet in practice.

The whole problem is bound up, not only with the physical properties which statical experiments are capable of testing, but apparently in some unknown way with the nature of the crystal structure of a metal; perhaps the stress that produces fracture depends upon the distribution of very small quantities of so-called impurities in the space lattice of the crystal, or upon the nature and properties of the material forming the crystal boundaries, and upon the surface conditions, including hardly perceptible corrosion, as well as the existence of other discontinuities incidental to the manufacture of metals. Some metals appear to fail by slipping on the crystal plane, and others by cracks commencing at crystal boundaries, or at surface discontinuities.

To the metallurgists, engineers must unstintingly pay tribute for the splendid work they have done in supplying materials to meet the ever growing and exacting needs of modern engineering. By the careful scientific control which characterises a modern steelworks, thousands of tons of apparently uniform material can be turned out, but the engineer does not always use the materials as they should be used, and the metallurgist has not always the knowledge required to insure perfect reliability under the exacting conditions of service. These, allied to the difficulties to which reference has been made, make it imperative that in this problem of the reasons for failure of metals, under repeated stresses, and their prevention, the co-operation of engineers, metallurgists, physicists, and mathematicians must be enlisted; experience alone is by no means satisfactory.

Incidental to the failure of materials in service, the recognition of synchronism as an important contributing factor, and the assistance given by experiment and dynamical theory in anticipating synchronous speeds, has been of the greatest service in the design of modern high-speed machines. Crank shafts of aeroplane engines and of internal combustion engines have been known to fail in a few minutes because designers have failed to recognise the possibilities of synchronism. Such disasters can now be avoided in many cases.

The argument of this address can be summarised into a few sentences. New epoch-making developments in engineering depend upon the discovery of new facts of science, and upon materials and technical processes. The only hope of solving many of the problems which face the engineer to-day is by carefully organised experiment. Engineering is of such vital importance to modern life that not only manufacturers but large users, public authorities and governments must be interested and provide funds for research.

In Great Britain a good deal of engineering research is being done by large firms, by research associations connected with certain industries, by the universities and by the technical colleges, the national physical and the building research laboratories, which are under the direction of the Department of Scientific and Industrial Research. This department also assists research associations by grants, and the universities by the provision of research scholarships and research assistants, but at present it seems that sufficient research is not being done, and that not nearly enough researchers are being trained to meet the needs. How can the demands of the case best be met?

It would appear that we must look largely to the universities to train researchers. I suggested that I wished to avoid the subject of the training of engineers, but one word I wish to say, and that is to refer to the necessity for the training in the universities of a considerable number of engineering students with the research outlook. Training in strict habits of observation and in the investigation of problems theoretically and by experiment should form part of the work of all engineering students. Much of the theoretical knowledge that a young engineer requires to learn is now to be found in excellent textbooks and in current periodicals, and these he should be taught to read critically and with understanding, but he should also be taught to face all his problems in the spirit of an investigator.

Certain selected students should be encouraged to remain at the universities after graduation or to return after some experience of actual works to engage specifically in research. Engineering needs such men, some to give their whole time to research while others carry the spirit of research into the ordinary problems of industry and engineering. Employers, public authorities, and governments must utilise this research ability, and more men should find their way into industry from the research institutions. The universities, however, cannot do this most important work of training researchers unless they are adequately equipped and staffed to give members of the staff the necessary time for research and to devote themselves to the training of students in research. To this end sufficient funds must be provided from private and public sources.

Training for Engineering.

One word should be said about the desirability of training engineering craftsmen to the appreciation of the scientific problems underlying their craft. When this can be done, and much more is possible than at present, it leads to an increase in efficiency and adaptability, to a greater tolerance and interest in new methods, and in the immediate task. It also leads them to appreciate the relationship of their problems to the great world of nature, and thus to a widening of that interest to which the work of the association is directed.

The engineer is faced with many unsolved problems. Nevertheless he must find immediate, if only approximate and tentative, solutions to many of them, and in the solution he often has to deal with many types of men. If experimental science and mathematics cannot give him an exact solution he must still carry on, and in this way much has been achieved. It is for this reason that the engineer has to learn much by actual experience in the workshop, in the field, and frequently he becomes impatient of science and lays too great emphasis upon experience. Manufacturers wish to see returns upon their capital and remuneration for their energy, but as an effective guarantee of future progress and in the solution of many problems in design, in processes, in materials, as well as in the discovery of new methods, it is necessary, as Francis Bacon would to-day remind us, " to apply natural philosophy to particular problems and particular problems must be carried back to natural philosophy."

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UNIVERSITIES AND ELECTRICAL TECHNOLOGY.

Summer School for Teachers of Engineering at Merton College—Objects of the Course—Lectures on Electrical Subjects.

By LEWIS W. PHILLIPS, M.I.E.E.

THE halls and rooms of our ancient universities are not allowed to remain empty and lifeless during the vacation. Many summer schools are held, and one of the most popular of these is that arranged by the Board of Education at Oxford for teachers of mechanical and electrical engineering.

The first of these was held in 1921, a week of the time being spent in the laboratories of some modern university, as Birmingham, and another week at Oxford. For several years past, however, the whole of the time—about eleven days—has been spent at Oxford, usually at Oriel College, but in 1927, and again this year, the gathering was held at Merton College. This is the oldest of the colleges in Oxford, where the old and the new now blend, for the shadows of its quads at night are illuminated by floodlights and the quaint dark turnings of its staircases are made easily ascendable (till 11 p.m.) by incandescent electric lamps.

The idea of holding these courses and the working out of their practical details are largely due to Mr. A. S. Barnes, who until his retirement last year was H.M.I. of the Board of Education responsible for their organisation. His genial personality, his knowledge and love of Oxford, were great assets this year in his position as Chairman of the Course.

Mr. W. Hartas Jackson was the organising inspector responsible for this year's arrangements, and his untiring efforts and unceasing thoughtful care ensured for everyone at Oxford a wonderful time.

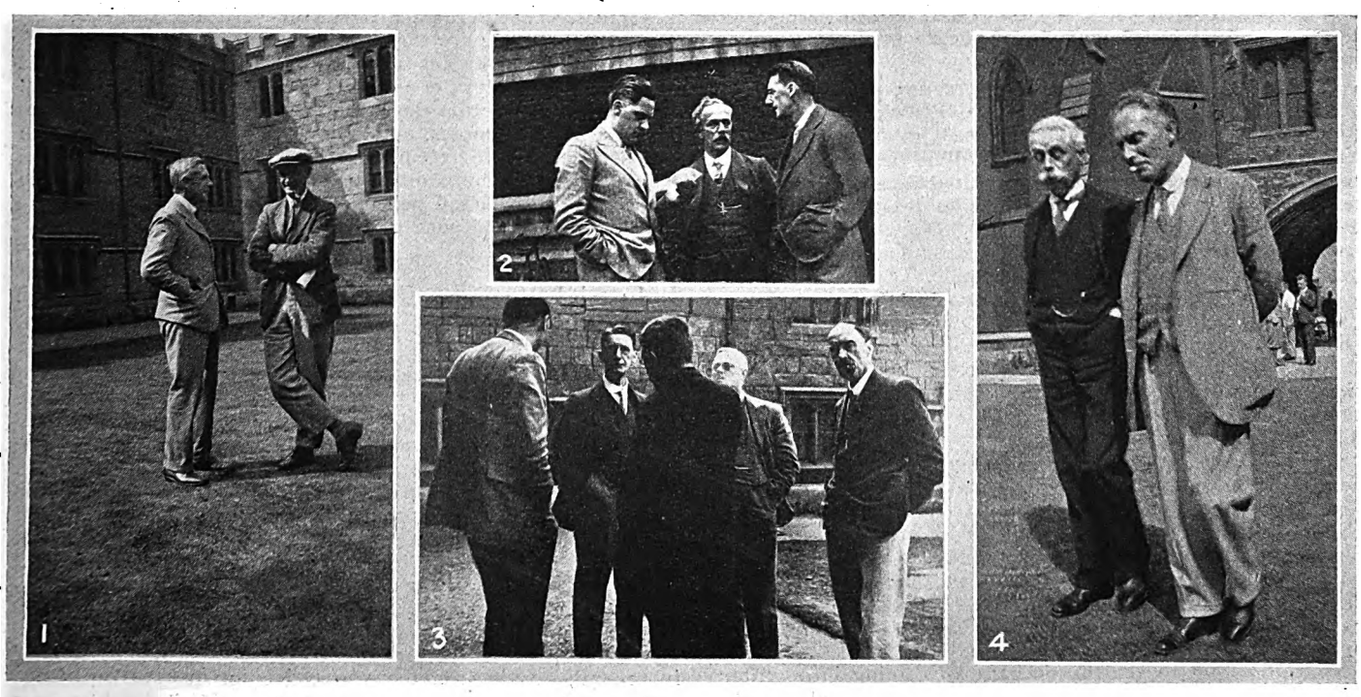
The objects of the course are primarily: (1) The increasing—and, if necessary, the rekindling—of the enthusiasm of technical teachers for their work. (2) Making contacts with other teachers for the interchange and comparison of experience, ideas and methods. (3) Providing teachers with the opportunity of hearing lectures from, and coming in personal contact with, experts in different branches of industry. (4) Humanising technical education and uniting it with the cultural aspects by discussing modern developments in a mood influenced by the atmosphere of old-world college life. (5) Bringing teachers and Board of Education Inspectors together that they might learn of each other and realise that the Board is not a dead organisation encased in red tape, but a living organism seeking to develop educational activity.

Those taking part in this year's course at Merton College had rooms in the college, meals in the old Hall, and shared as far as possible the general life of the college. The week-day activities consisted of two lectures and discussions in the morning followed by a tutorial class, the whole lasting from about 9.20 a.m. till 1 p.m. The afternoons were free for study or recreation, and after dinner there was a discussion following a lecture, closing between 10 and 10.30 p.m.

During the mornings the mechanical and electrical students had their separate lectures and tutorial classes, but in the evenings all attended the lectures held in the Technical Department of the University.

Some 45 mechanical engineering teachers and 25 electrical engineering lecturers drawn from all parts of the country attended the course. The staff for lecture and tutorial work included, on the mechanical side, Prof. Mellanby (Royal Technical College, Glasgow); Prof. B. P. Haigh (Royal Naval College, Greenwich); Prof. F. W. Burstall (Birmingham University); Prof. A. R. Horne (Heriot Watt College, Edinburgh); Prof. A. H. Gibson (Manchester University); Dr. D. S. Anderson (Principal of Birmingham Municipal Technical School); Prof. E. F. Mitchell (Imperial College of Science and Technology); Dr. A. Morley (H.M.I.); and Mr. J. A. Pearce (British Cast Iron Research Association). On the electrical engineering side were Prof. S. Parker Smith (Royal Technical College, Glasgow); Prof. J. S. Townsend (Oxford University); Dr. A. E. Clayton (Manchester University); Mr. W. John (London University); Mr. E. W. B. Gill (Merton College); Mr. H. E. Dance; Dr. J. W. T. Walsh (National Physical Laboratory); Mr. W. Wilson (General Electric Co.); Dr. A. E. Chapman (H.M.I.); Dr. C. E. Smith (H.M.I.); Mr. H. Marryat (Marryat and Scott); and Mr. H. J. Shelley (H.M.I.).

At one of the evening lectures "The Economics of the National Grid" was dealt with in a very able manner by Mr. H. Hobson, of the Central Electricity Board, and Mr. V. Z. de Ferranti presided. The lecturer indicated how the grid



THESE snapshots taken during the course at Oxford (see accompanying article) show: (1) Mr. Hartas Jackson (left) and Mr. Gill in Fellows' Quad; (2) A serious group: Mr. Shelley, Dr. Morley and Dr. Chapman; (3) A quiet talk after lecture. Facing the camera (left to right) are Dr. Chapman, Dr. Clayton and Dr. C. F. Smith. Dr. S. P. Smith is facing the centre of the group; (4) Mr. H. Marryat and Mr. A. S. Barnes enjoying a stroll in the Front Quad.

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scheme had been evolved, the estimated saving to be effected and the anticipated increased demand by 1940, also the allocation of load to the different generating stations. A good discussion followed, showing the interest in, and the desire for understanding of, the scheme by the teachers.

A few years ago the Institutions of Electrical and Mechanical Engineers in conjunction with the Board of Education developed the National Certificate Scheme by means of which a student attending evening classes for five or six years and passing an Ordinary and a Higher Examination would possess the general and technical educational qualifications for admission to the Institutions as an Associate Member. The Mechanical Engineers have included Economics with their Examination (Section C) and at one of the lectures Prof. Dempster Smith spoke on "Engineering Economics with special reference to the Institution Examination." The discussion which followed made it clear that all teachers did not consider this study essential for all grades of engineers at the student stage of their careers, and that an appreciation of the rapidly changing conditions and outlook is essential.

Col. Kenelm Edgcumbe, President of the I.E.E., was at Merton for dinner in Hall one night when the toast of the Institution and its President was drunk with enthusiasm. Col. Edgcumbe later took the chair, when Prof. Thornton spoke on "The Measurement of High Voltage." This lecture, which dealt with the various methods made use of in practice, introduced some new phenomena discovered by Prof. Thornton. Two experiments never before shown in public demonstrated these. The cooling of a hot wire in air when in a strong electric field, also the cooling of a wire in a bulb of low pressure gas under similar electrical conditions revealed a very simple and effective method of high voltage measurement.

Those dealing with technical education are very keen on keeping in touch with industry and sending out into works the most effectively trained students. This was emphasised at one of the evening meetings when several leaders of industry were present. The lecturer was Sir Alfred Herbert, of Coventry. The chairman was Mr. Briggs, of the English Electric Co., and he, with Dr. Railing, of the General Electric Co., dined in Hall, spent the night in College and also attended a lecture by Prof. Townsend the following morning.

In his lecture Sir Alfred Herbert emphasised the need of allowing the boy a chance to choose for himself, and the importance of character and the development of imagination in training. A sense of humour and the quality of politeness were also essentials in dealing with the human material. The object of the technical school was to teach the underlying principles, develop breadth of mind, encourage the right kind of reading, and to give just the right amount of technical knowledge. It was necessary always to remember not only the head and the hands, but also the heart, in all our engineering training and industrial relations.

Of the morning lectures space does not permit of a full description. Mr. H. Marryat, of the Electrical Contractors' Association, spoke of the new scheme for "The Training of Young Wiremen," which it is hoped will be very helpful to that branch of industry. Prof. S. P. Smith always forces home his points in a very happy manner and he dealt with "Modern Developments in Electrical Traction," "Domestic Appliances," and gave particulars of his very successful work in Glasgow in "Courses for Automobile Engineers."

Mr. John, who is an expert in transmission, lectured on "Outdoor Sub-stations" and "Low Tension Overhead Distribution Lines." Dr. Clayton dealt with the subjects of "Power Factor Correction," "Arc Rectifiers," and "Induction Regulators." Dr. J. W. T. Walsh treated of "Illumination and its Measurement," as might be expected of him, in an illuminating but no light manner.

Mr. H. Dance, who is a consulting engineer, gave two very helpful lectures, which produced a good discussion, on "The Consumer's View of Electric Supply" and "kVA and Power Factor Measurement," demonstrating a model to show to non-technical consumers the meaning and importance of power factor. Mr. W. Wilson gave particulars of the latest developments of "Low Tension Switchgear," and Mr. Gill gave a very interesting experimental lecture on his researches in connection with the "Electric Arc."

One must not forget the pleasure of coming into contact with the charming personality of Prof. Townsend and the quiet enthusiasm he put into his lecture on his work in connection with "Conduction of Electricity in Gases."

Lectures having finished, there was a very happy concert on the evening of July 30th when technical teachers showed that they were not lacking in musical ability and appreciation, not to mention humour.

The course is over, and it is impossible to convey in words all that it meant in fellowship, joy and laughter, inspiration and knowledge to those taking part in it. But for many a day in lecture room and laboratory its effect will be manifest, and large numbers of students to whom Oxford is but a name will benefit thereby.

BOOK REVIEWS.

Electric Rectifiers and Valves. By A. GUNTHERSCHULZE. Second Edition. (Berlin: Julius Springer.) Pp. 330. 29 Marks.

Rectifiers have assumed such great importance in the last few years that books on the subject are always very welcome.

With the coming of transmissions of heavy energies by alternating current many serious problems will be encountered. For instance, surge disturbances, corona and power factor losses, etc., and, though a long way off, it may be that high voltage d.c. distribution will, at some future time, receive greater consideration.

Prof. Guntherschulze's second edition has been in many portions completely rewritten, in fact one might almost say that it has become a new book.

The first section deals with physical principles and physical properties of various classes of valves, the hot cathode, arc, and the spark valves are included. The section is dealt with very fully, and much trouble has been taken with regard to the subject of electric conduction through gases.

The second section deals with the technical aspects, wave form, and analysis of the voltage and current curves, measurements, calculations of the rectifier, special peculiarities, control, etc. This section we feel has not been as fully treated as we should have liked. The author, however, defends this curtailment in his preface by stating that the second edition of Kurt. E. Muller's book "Mercury Vapour Rectifiers," appeared whilst his own was being written. In the former the calculations, etc., of rectifiers are exhaustively treated. The rectifier is still in its infancy, and since the first edition appeared much progress has been made. The book, therefore, fulfils a real want, since in spite of constant explorations into the laws governing gas-filled valves and the dry plate rectifiers there are still wide gaps remaining in this knowledge.

The third section deals with the different types of rectifiers. After a brief mention of rotary converting plant, the various types of rectifiers are dealt with in a very interesting manner under the following headings:—(a) Electrolytic rectifiers; (b) hot cathode rectifiers; (c) vacuum rectifiers; (d) gas-filled rectifiers; (e) dry plate rectifiers; (f) arc rectifiers.

Very interesting are the details given with regard to Prof. Hartman's wave-stream rectifier. This is the first time that the theory of this type of rectifier has been so clearly expounded.

In the fourth section the author deals with the use of valves for measuring purposes, and concludes with a list of German patents relating to rectifiers, and a bibliography, a feature which could be more often given in technical books with advantage, since many points covered by various patents are hardly ever treated with the consideration they deserve.

A. MANIGHETTI.

Industrial Furnace Technique. By A. HERMANSEN. Translated from the Swedish. (London: Ernest Benn, Ltd.) Pp. xii+293. 25s. net.

The author is widely known as a designer and maker of industrial furnaces, and this attempt to rationalise furnace technique, a subject notably deficient in authoritative literature, is, to say the least, noteworthy. As electric furnaces are gradually assuming more important applications in this field it is a pity that they receive no detailed treatment in this book. In fact, the only references to electrical methods noted by the reviewer are concerned with such incidental matters as thermo-electric and electric resistance pyrometers and electric fans for producing artificial draught. Notwithstanding the slight attention devoted to electric furnaces as such, the book contains a considerable amount of material—notably in the chapters on transmission of heat, furnace-building in general, working chambers, materials for furnace building, supporting the furnace, and heat balance—which should prove useful to electrical designers. The book is commendably free from the catalogue-type descriptions which so often form the basis of works of this kind.

H. B.

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ILLUMINATING ENGINEERING—AS IT SHOULDN'T BE.

How Rules for Good Lighting Installations are Ignored—Plenty of Light, but Wrongly Applied—Incorrect Use of Industrial Reflectors—Lighting a Passage.

By CYRIL SYLVESTER, A.M.I.E.E., A.M.I.Mech.E.

IT is now some years since Mr. W. E. Bush, when in charge of the B.T.H. Lighting Service Bureau (later to become the E.L.M.A. Lighting Service Bureau), coined the phrase or slogan: "Seeing Is Believing." The phrase was meant to convey that, if comparisons were made between good and bad lighting systems, it would readily be seen that good lighting was a paying proposition from every point of view, and that bad lighting was not only inefficient and wasteful, but dangerous. Both the E.L.M.A. and the E.D.A. have accomplished great things since the early days, and the reformation of electric lighting has been considerably developed. I would venture to suggest, however, that neither of the bodies I have mentioned is receiving the fullest support from those they are out to assist. It is, in all probability, through this cause that progress in illumination practice on the right lines is not as rapid as it might have been.

The fact is that although very definite rules are laid down which, if followed, must result in good lighting installations, the rules are simply ignored. It is still considered by some of those responsible for the installation of electric lighting systems that a lamp is just a lamp, a reflector a reflector, and that alone, or combined, they will meet any lighting requirement. I would substantiate my remarks by quoting the slogan: "Seeing Is Believing," but in a different sense to that already mentioned. What I have seen of "Modern Lighting Practice That Isn't" is supported by the illustrations in this article. I obtained the photographs a few days ago, and in each case the installations were quite recently installed.

A Hatter's Installation.

In Fig. 3 is illustrated an example of "modern" shop window lighting. Illuminating engineers will look upon this illustration and weep. It shows a reflector, designed for top lighting, located at the bottom of a window in which is displayed men's wear, chiefly hats. This reflector is only one of several employed in this window; others are located in corners, and some of them are actually fitted in positions half-way up the window sides.

Of all types of displays, a display of hats should be illuminated from the top. There is no object in projecting light under the hats; it is the shape of the hat, as seen from the front and top, that appeals to the prospective customer. The goods should be seen in their three dimensions, as when the purchaser is wearing them. This is impossible if the tops of the goods are in semi-darkness.

If the installation were redesigned with the use of the same lighting units the window would be well illuminated. The units should be moved from the bottom and sides, and fitted behind a pelmet at the top of the window. There are sufficient lighting units in each window to permit an 18-in. spacing with 150 W gasfilled lamps. In its present form, the installation is not creditable to those who installed it. The shopkeeper, too, is not getting his money's worth. The object for which he had the units installed is defeated, merely because the light obtained from the lamps is not correctly applied. His goods are not seen to their best advantage, and, as a result, his sales cannot be as great as they might be.

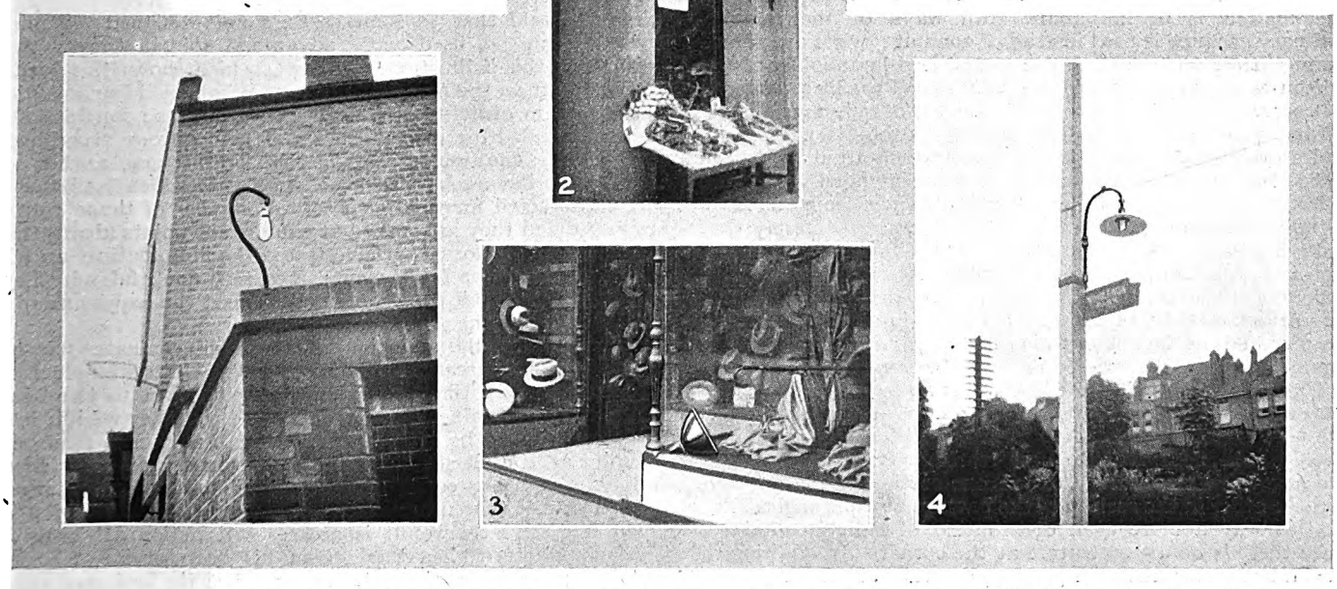
Wrong Use of Fittings.

In Fig. 2 is illustrated another example of bad lighting practice. It shows the outside of a greengrocer's shop, with the method adopted to illuminate the goods displayed on trays outside the shop. The lighting unit in this case is one which was specially designed for the illumination of industrial interiors. From a glance at the illustration it will be seen that one does not need to be an expert illumination engineer to know that not one tenth of the light from the unit is being usefully employed in illuminating the goods.

At least 50% of the light is projected into the street, to illuminate the footway and road. A large proportion of the remainder is projected through the window into the shop; a large proportion is also reflected from the window glass into the road. It may, in fact, be said that the only illumination on the goods is a small percentage of direct light.

This is not the only example of this kind of lighting that I have recently encountered. It would appear that industrial lighting units are considered as a panacea for all kinds of lighting troubles. I have seen them fitted outside drapers' establishments, inside grocery shops, and even in hotels. In the case illustrated, the correct type of unit to fit is an angle unit; one which collects the light rays which are at present being wasted. The installation of such a unit would be a practical application of the slogan: "Light on the Goods—Not on the Pavement."

Perhaps the "peach" of illuminating engineering "as it shouldn't be" is the example illustrated in Fig. 1. The installation is worth a brief description. The unit



THESE pictures of recent lighting installations, referred to above, show: (1) A curious attempt at outside lighting in a two-way passage; (2) an industrial type reflector wasting light outside a greengrocer's shop; (3) a top lighting reflector put to base uses; (4) one example of the successful use of a special-purpose fitting in a sphere for which it was not designed.

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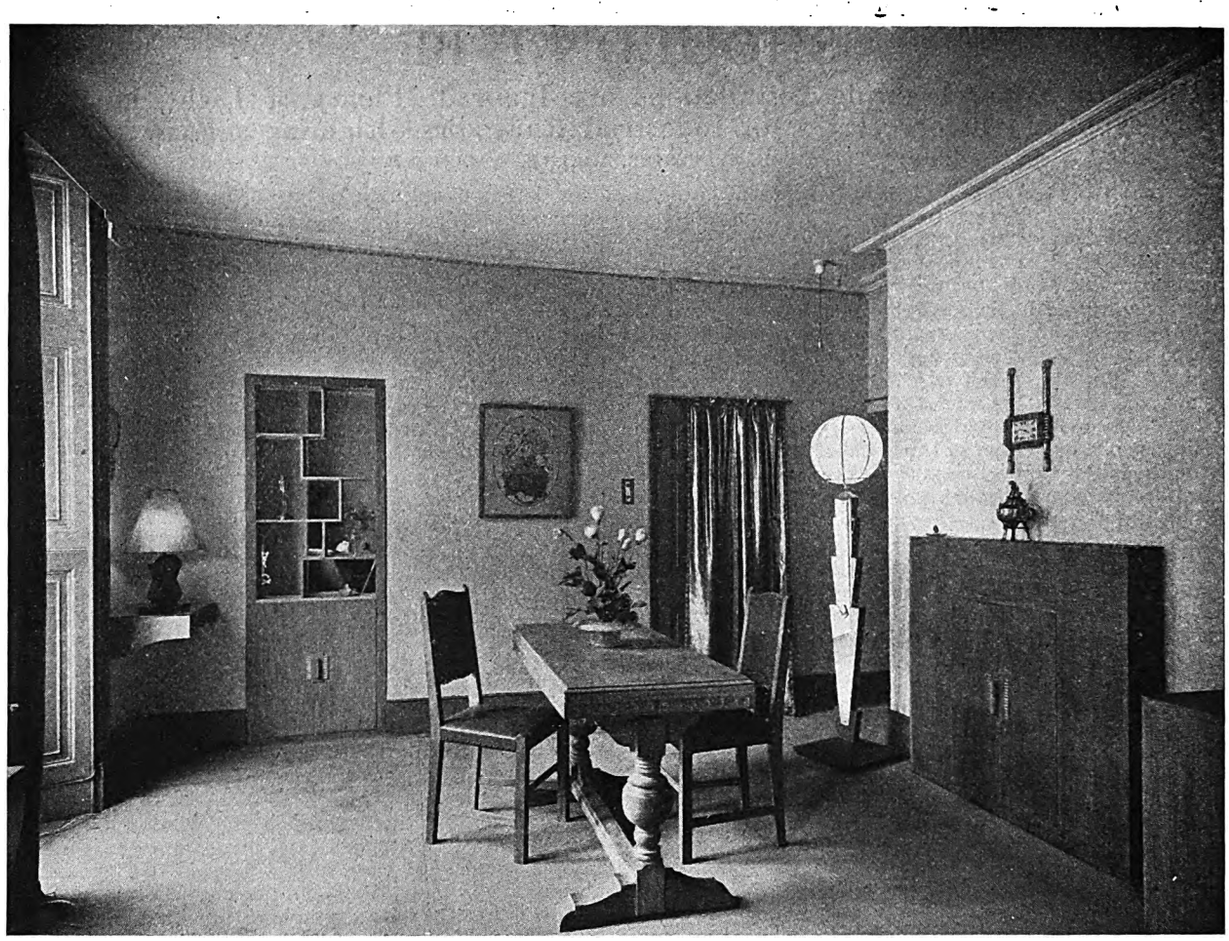

LIGHTING FOR THE MODERN INTERIOR.

THIS view of a typically modern interior emphasises to electrical manufacturers and contractors the importance of keeping closely acquainted with contemporary furnishing and interior decoration tendencies, and producing lighting fittings and fires in designs which are suitable for use in such surroundings. In décors of this kind there is ample scope for the provision of novel lighting effects which, while bearing little or no relation to traditional designs, are capable of striking a harmoniously distinctive note.

A point of interest to designers of electric fires is to be seen in the cupboard on the right of the picture, which covers a disused fireplace. The necessity of making electric heaters so that they may be fitted into existing fireplaces has seriously limited the development of the "casings" of electric heaters, but a treatment of the kind depicted promises to mitigate this disability and permit the introduction of new ideas into this field.

is mounted on the top of a wall at an angle in a passage, and its function is to illuminate both ways of the passage. Ordinary gas pipe is used instead of conduit; wires are passed through this, and terminate at a porcelain lampholder of the Edison screw type. The lamp is a 200 W gasfilled pattern; it is screwed into the holder and is devoid of reflector.

I happened to be near when this installation was completed, and, in reply to my question as to why such a unit had been fitted, I was told that the lampholder was intended for outside lighting, and that "more light" was obtained from the lamp without the use of a reflector. This shows very clearly that good lighting practice is not generally understood. It is true that the lampholder is designed for outside service, but not under these conditions. A glance at the illustration will serve to show that, in winter time, even in a slight snowfall, the terminals of the holder will quickly become short-circuited. Again, a heavy fall of rain will have the same effect.

The lampholder is intended for use in an appropriate type of reflector. More important, however, is that the location of the unit is not correct. Any unit situated at the angle of a passage will not give the best results. It is much better practice to fit two units; one in one section of the passage, and the other in the section of the passage at right angles to it. In this way a more even distribution of light is obtained, since there is no concentration at the corner. In addition, if the units are of the well-glass type, the upward rays are redirected into the passage, and watertightness is assured.

Although it is the slogan of some firms of illuminating engineers that "There is a reflector for every lighting purpose," it may be said that, in some cases, a unit designed for one purpose can be used with advantage for another. An example of this is illustrated in Fig. 4 which shows the location of a unit on the railway station at Wimbledon Park.

The system of lighting is an overhead one, the conductors being suspended by means of leather thongs from stretched steel wires. The unit is an industrial lighting one, and it is fitted, with its bracket, to a concrete pole which has been specially erected for this purpose. A number of these units are in use and they are spaced at equidistant points along the centre of the platform. I have tested the illumination and I have found it to be fairly even; it is very doubtful whether a better type of unit could be found to meet the requirements of platform lighting.

Returning to the question of the indiscriminate use of lighting units, the reason is not far to seek. Units are selected from catalogues without consideration being given to the best which can be obtained from them. The mistakes which are made can readily be overcome. Before a unit or a number of units are purchased from the sales counter of any firm supplying lighting equipment, the illuminating engineering department of that firm should be consulted. The advice is given free, and the result is greater satisfaction all round. The manufacturer has then given his best service to the installation engineer, the latter has supplied the best material to his customer, and, as a consumer, he reaps the benefit of better light output for a given energy consumption.

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ELECTRIC SERVICE FOR THE FARM.

New Interest in Practical Aspects—Developments in South Wales—The Use of Mobile Electrical Exhibitions in Farming Districts.

SINCE the subject of electrical service for the farmer was so appropriately introduced by Mr. H. R. Taunton to the attention of electrical contractors at the recent E.C.A. Conference at Bournemouth, contractors and supply authorities have shown a distinctly increased interest in the practical aspects of this potentially important field of electrical development. Some of the power companies, in particular, are devoting special attention to farm electrification, and in view of the difficulties which have to be encountered in schemes of this kind the progress that has already been made in some areas is very gratifying.

Mr. E. A. Reynolds's account of developments in the rural supply area of the Shropshire, Worcestershire and Staffordshire Co. (see THE ELECTRICIAN, July 5th, 1929, page 15), are still freshly in mind, and it is unnecessary to emphasise the lessons to be learnt from the successful pioneer work done in this district.

Another supply company, the South Wales Power Co., under the enthusiastic guidance of Mr. J. W. Beauchamp, is taking energetic measures to develop rural electrical service. One of its latest activities in this sphere is illustrated in the pictures reproduced below of its mobile caravan exhibition, which made its first appearance at the Royal Welsh Agricultural Show last week.

Study of recent American reports indicates that, with a few notable exceptions, the development of electrical service on farms is little further advanced there than it is in this country.

One of the organisations making good progess in this direction is the Alabama Power Co., which, at the beginning of this year, was serving 5 511 rural customers from 836½ miles of line, an average density of 6·8 consumers per mile of line. Approximately 70% of the rural customers served at this date were farmers, and the company was serving 2 000 farmers from distribution lines that are not classed as rural.

As the result of the work that has been put into the development of the rural side, the average energy consumption by rural consumers increased from 383 kWh in 1924 to 834 kWh in 1928. The company—whose rural methods and organisation are discussed in detail in Serial Report No. 289-65 of the Rural Electric Service Committee of the National Electric Light Association, New York—states that the use of domestic electrical appliances on the 256 rural lines now in operation is quite general, and that the application of electric power in farm operations is constantly increasing. While their rural power revenue is not as yet making a satisfactory return on its investment of £400 000 in this branch of activity, they are quite hopeful that the business will be built up to self-supporting proportions within a reasonable time.

It is interesting to note, in view of recent discussions as to the advisability of monthly meter readings in our highly concentrated city and suburban supply systems, that the meters of the Alabama Co.'s rural customers are read each month, accounts being rendered at similar intervals.

Farmers in the area are coming to realise that rural electric service is resulting in more comfortable and attractive living conditions on the farm, creating new interest in farming as an occupation, reducing farm operating costs and making practicable a better balanced farming programme, and making available a convenient source of power for the operation of rural industries.

SIEMENS' NEW BUILDINGS.

We have received from Siemens-Schuckert (Great Britain), Ltd., a profusely illustrated and elaborately produced volume describing the factory and administrative buildings erected for the Siemens concerns on the Continent during the last fourteen years, to the designs and under the direction of Baudirektor Hans Hertlein. The buildings described are at Berlin, Charlottenburg, Cologne, Meitingen, Vienna, Nurnberg, Mannheim, Hanover, The Hague, etc. The book, which contains a preface by Mr. Hermann Schmitz, conveys a somewhat astonishing impression of the nature of the Siemens undertakings and the enormous extent of the premises devoted to their work.

CARAVAN EXHIBITION.

THESE pictures show a novel exhibit made by the South Wales Power Co., at the Royal Welsh Agricultural Show at Cardiff last week. It takes the form of a travelling electrical exhibit, fitted in a caravan measuring inside about 15 ft. by 7 ft. by 7 ft. 3 in. high, and running on solid rubber tyred wheels. It can be trailed by a motor or drawn by horses. During the summer it will visit agricultural shows, and in the winter it will tour the numerous villages in the company's area.

ALL four sides of the caravan open, two-thirds of each opening upwards, being hinged at the top and forming a shelter roof. The lower portion of each side opens downwards, being hinged at the floor, and can either drop right down, or can be supported horizontally, so extending the floor when desired. The power wiring is by cab tyre sheathed cable, carried under a detachable false floor, to flush type 3-pin plug sockets sunk in the floor. The lighting wiring is in the roof, arranged by means of movable battens which can be shifted to any part. One batten holds 12 shop window fittings, with three switches controlling different colours, and the centre batten holds a selection of fancy shades.

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ADVERTISING FOR CONTRACTORS.

Some Fallacies Exposed—Maintaining Topical Interest—Synchronising Window Displays with Advertisements—Suitability of Illustrations.

By "PUBLICITY CONSULTANT."

(*Continued from page 78.*)

"I SUPPOSE I ought to do some advertising now and again, just to keep my name before the public." So said an electrical installation contractor who had been reading these articles. To him I said, and to all who share his desire to "keep their names before the public" I would say now, that if this is their idea of advertising they had better keep their money in their pockets. This mistaken notion is, of course, due to lack of thought, for a few moments' consideration will clearly show that members of the public are not primarily interested in the names of advertisers, but rather in the goods they offer for sale.

Fig. 1.—The introduction of human interest increases the appeal of advertisement illustrations.

Another misconception, shared by many advertisers both large and small, is that advertising costs them a certain sum of money. Naturally somebody pays for it, but the advertiser does not. Nor is it true to say that the customer pays, in the sense that the cost of the advertising is added to the normal selling price of the goods.

Actually two classes of people really pay for advertising and though the customer represents one of these classes, he pays by bringing along more money for more goods than he would have done without advertising. The advertiser's non-advertising competitors also help to pay for their rival's advertising if one takes into account the customers they lose to the advertiser.

Advertising for Direct Sales.

A further mistake commonly made is to assume that it is not much use trying to sell things outright by advertising, that one has to lead up gradually to the selling stage. With such a fallacious notion as the background of an advertising campaign it can hardly be expected that the results will be of maximum efficiency. Advertising of the right sort is responsible for the direct sale of many thousands of pounds worth of goods every day. To regard it as a mere preliminary aid to sales is to underestimate its power. It is in fact such a great selling force that many of those who use it get what seem to them to be very satisfactory results from what is undoubtedly very poor advertising. Regarded in its proper light as a printed salesman capable of taking a perfectly expressed sales message into the houses of a large proportion of your customers—actual and prospective—advertising will play a vital part in building up sales.

Retail advertisers of electrical goods, being acquainted with the E.D.A. seasonal advertising scheme, hardly need to be told that advertising should be topical, the class of goods advertised being changed in accordance with a predetermined plan which aims at selling the consumer what he needs at the time when he needs it most, and is therefore in the most receptive mood for our printed sales arguments.

But within the general advertising scheme provision should be made for participation in events of a still more topical nature. Some local happening of current news interest will often suggest a special electrical announcement, and sudden and notable changes in the weather are always good game for the electrical retail advertiser—for no matter whether it be hot or cold, he always has available the appropriate temperature-adjusting device.

Events of national as well as local importance are sometimes worth exploiting in advertisements, and the contractor who chooses the right time to announce that the radio valves used on the latest aeroplane to cross the Atlantic are similar in every way to those now available to local listeners will need to see that his stocks are adequate. If he can also convey, without undue exaggeration, the impression that the article which has played a part in some such outstanding achievement is only just good enough for Mr. or Mrs. Smith, so much the better.

What does the Public Want?

It has often been said that the secret of successful retail trading is to "give the public what it wants." But this is only a half-truth, for half the time the public does not really know what it does want, and it is up to the advertiser, by use of a species of auto-suggestion, to make the public realise what it does want. It is, indeed, fortunate for the advertiser that this is so, for if people only bought things of which they spontaneously felt the need, trade in this country would be of much smaller dimensions than it is. Within reason then, the public will want whatever you want it to want, provided you make the suggestion in the right way.

By hitching up his announcements to events of topical interest the advertiser tempts people to read them, and he also gives them the sub-conscious impression that he is "alive," and is capable of supplying everything that is up to date.

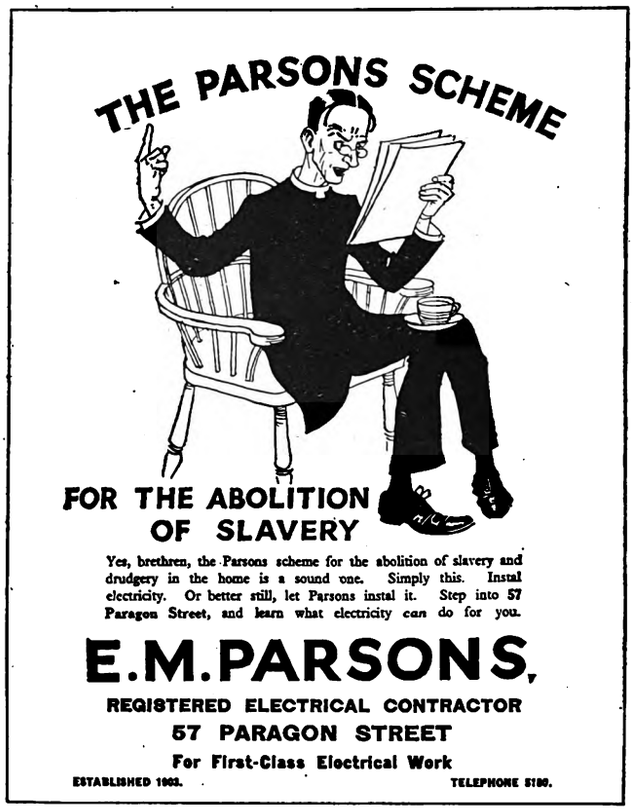

Fig. 2.—A recent example of the effective use of humour in advertising. The original announcement from which this is reproduced measured 7¼ in. by 9½ in.

More than many types of trader, the electrical retailer has ample and frequent opportunities to associate himself not only with local news events but with happenings of world-wide interest; events that form the newspaper topics of the day. Somebody flew a prodigious distance and was saved from disaster by his wireless set equipped with Blank's valves.

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It requires little imagination to see how this event can be made to swell the sales of Blank's valves.

To take another example: a well-known railway running a fast luxury train to and from Scotland uses electric cooking in the restaurant coaches and is about to convert other kitchen cars to electrical working. Here, again, there are a number of points which could be brought out to show why something so efficient and up to date as to be capable of rendering outstanding service under what are probably the worst imaginable conditions for cooking should give an even better account of itself in Mrs. Smith-Jones's kitchen.

Although I have mentioned the point before, it is well to repeat that specialised advertising, i.e.—of a few related items, rather than a mention of as many different things as can be squeezed into the available space—should always be reflected in the advertiser's show windows.

If electric suction cleaners and electric floor polishers are being advertised the windows should contain a special display of these appliances, and so on through the whole range of the stock.

Many electrical contractors now realise the advantages which specialised windows have over the hotch-potch, closely dressed windows, but there are still many more who continue in the old way, fearing that if the windows do not contain a fully representative selection from the whole of their stock, somebody looking in the window and failing to see the particular article he wants will conclude that it is not stocked at this particular shop.

I do not wish to enter into the deatils of window display, a subject on which others are more qualified to speak, but I would particularly urge that, from the advertising point of view, special attention should be paid by retail advertisers to the synchronisation of specialised windows with specialised newspaper advertisements.

Telling the Sales Staff.

Another point—one that would seem elementary had one not had experience over and over again of a complete disregard of it—is that when special attention is drawn in advertisements to a particular appliance or appliances, the salespeople in the shop should be made aware of the fact, and also of the arguments on which the appeal to the public's purse is based. Otherwise a customer, having read in the paper that a certain article is particularly desirable, comes to the shop and asks for it, only to find that the salesman knows nothing about it. The impression thus created is, of course, not very favourable, and it is not unlikely that the customer will depart feeling that he has been tricked; or, at any rate, that the advertiser has been exaggerating the merits of his goods in print.

Before leaving the window question it may be suggested that, when the advertiser has taken the trouble to synchronise display with advertising, the advertisement should contain some statement to the effect that the goods referred to can be seen in the advertiser's windows during a definitely specified period.

The question, "Do people read newspaper advertisements?" is one that occurs to advertisers and non-advertisers alike. The latter, perhaps, furnish a negative reply to excuse their lack of enterprise, and some of the former, though doubtful, are willing to run the risk. Naturally the reply to the question depends very largely on what is in the advertisement. Some advertisers' announcements would, by their perfunctory statements and appallingly bad arrangement, repel the most attentive reader; others, again, would catch the eye and ultimately convince the most inattentive and casual persons imaginable.

The proprietor of a large Berlin store which has a considerable advertising expenditure thought of a novel way of deciding whether his advertisements were read. He inserted in various papers a number of small advertisements in which were contained a certain amount of incorrect information and wrong dates of historic events. He mentioned, for example, that Napoleon was born in Cyprus, and that the Battle of Waterloo was fought in 1814. Within a week of publication, according to a Central News message, he received no fewer than 400 letters drawing attention to these historical lapses. The writers included a large number of schoolboys and girls, professors, teachers, clergymen, farmers, and even some writers of international repute.

The advertiser was himself surprised that such small announcements had been so carefully scrutinised, and he was much interested to compare the number of communications relating to the different papers used, and the class of their readers. The question was clearly answered in the affirmative, but whether this knowledge was worth the mistrust with which the writers of the 400 letters—and possibly of many more who did not trouble to write—will view any future statements made in the advertisements issued by this store, is rather an open question.

A feature of this test which is of definite practical interest to the advertiser using small spaces is that even the very small announcements are read—if they are interesting. Far too many of the small-space advertisers fill their tiny spaces in a perfunctory way because they feel that ambition is out of place on such a narrow stage. They must rid themselves of this delusion, for though, up to a point, it may be accepted that the bigger the space the better are the results, so much depends on the use which is made of it, that the small space user may, by making more intelligent use of this little area, achieve better results than the full-page advertiser who thinks that size alone is all-sufficing.

A False Economy.

Many people who use big spaces seem to suffer from fear of white spaces—they hate an empty space, and because they have paid good money for it, take care to see that it is as tightly packed as possible. This is false economy, for when there are so many advertisers competing at the same time for the reader's interest, those who make it easiest and most attractive for him to find out what they are trying to sell will have a decided advantage over those who emulate the sardine-packer.

But even when serious over-crowding is not indulged in, the big space advertiser, still feeling that he ought to use as much as possible of the space he has bought, sometimes uses a lot of unnecessary verbiage as "padding"—just to fill out the space. This too, is a mistake, for, with few exceptions, the shorter and simpler the terms in which the announcement is conveyed the more likely is it to be read—and acted on.

The majority of advertisements contain too many words; very seldom does any contain too few. In this connection, one may appropriate Mark Twain's story of his attendance at a charity service conducted by an eloquent but long-winded preacher. The initial appeal for funds went to everybody's heart, and Mark himself was so touched that he simply itched for the plate to come round in order that he might give the 100 dollars which he had in his pocket. But the preacher, unaware that his aim was accomplished, went on and on, the air grew hotter, Mark grew sleepier, and his enthusiasm went down several dollars a minute. At long last when the sermon finished, and the plate came round, he took ten cents out of it!

The use of illustrations in advertisements is really a matter worthy of an article to itself. Briefly, however, it may be said that a picture that does not help digestion of the wordy meal is not worth including, but that a good illustration, suitably reproduced, is a definite asset in most newspaper advertisements.

A curious point must be here noted. To the average engineering mind the picture of, say, an electric cooker, showing every possible detail of construction is the type best calculated to include in an advertisement. Actually—and it has been proved over and over again—the most effective advertisement picture of an electric cooker places the details of the cooker more or less in the background and concentrates on presenting a daintily dressed housewife who is obviously finding electric cooking to be great fun. The girl using the "Thor" combination washing and ironing machine, reproduced by courtesy of the Edison Swan Electric Co., in Fig. 1 is an excellent example of the style of illustration to aim at.

Humour in Advertising.

Humour in advertising needs very skilful handling if it is to be a real success. Of the many dangers associated with it is that of making it so funny that any selling point will be lost; at the other extreme is the fun which fails to materialise, and stamps the advertiser as a dull dog.

Just the right degree of humour is contained in Mr. Parsons' announcement reproduced in Fig. 2. Both copy and illustration are of a high standard of excellence, and the ease with which the entire message can be read, even in its reduced size (the original was 7¼ in. by 9½ in.), is especially noteworthy. The appearance of this announcement would have been improved by a doubling or thickening of the top and bottom sides of the rule border.

(*To be Continued.*)

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Light's Golden Jubilee."

[To the Editor.]

Sir,—The protests which have already appeared in your columns have slipped off our American friends like water off a duck's back. I believe that in American schools no history exists between the death of Columbus and the birth of Washington, but there is no reason why the rest of the world should accept the hiatus.

In the same way the American public is being taught that no electric lamp existed before Edison's, but, again, there is no reason why the rest of the world should not consider the truth.

The name of Edison is as much revered in this country as it is in America, and an Edison jubilee would be most heartily supported by Englishmen. But we do not forget that the true jubilee of the electric lamp was celebrated by us last year, and that it was coupled with the name of Swan, who had already made carbon filaments and mounted them in vacuo twenty years before Edison ever began to study the problem.

In December, 1878, Mr. Edison had given up carbon as hopeless, and was experimenting with filaments of platinum and alloys of platinum. Swan exhibited in Newcastle-on-Tyne his first carbon filament incandescent lamp. A year later Edison, having reverted to carbon, succeeded in showing the Americans what Swan had already demonstrated in England, namely, the practicability of making a durable lamp with a carbon filament.

The form of filament which Swan devised in the following year, a filament made by carbonising parchmentised cotton thread, was the form of filament which Edison, after a brief experiment with other materials, such as strips of carbonised bamboo, adopted as the staple filament for the lamps which bore his name.

The squirted filament which Swan devised some years later as an improvement on the parchmentised cotton filament was also incorporated in the Edison lamp, and was universally adopted as the standard method of filament manufacture. This form of carbon filament held the field until it was superseded by the metal filament, due to the successive inventions of Auer von Welsbach, who introduced the osmium filament, Messrs. Siemens, who produced the tantalum filament, and Messrs. Just and Hanaman, who were the patentees of the earliest type of tungsten filament. The gasfilled incandescent electric lamp, as is well known, is due to the gifted American, Langmuir.

On what ground, then, does America ask for international recognition of Edison as the inventor of the incandescent electric lamp, by coupling his name, and his alone, with this "Golden Jubilee of Light"?

If it is the invention of the carbon filament lamp that is being thus commemorated, it is undoubtedly the name of the Englishman, Sir Joseph Swan, that should be honoured.

It is to be hoped that the representative electrical institutions of the various countries which have been invited by the N.E.L.A. of America to co-operate in this celebration, will, if they do not already know the history of this invention, take steps to acquaint themselves with the facts before acceding to this request.

They cannot do better than read the very exact account of the invention given by Mr. James Swinburne, F.R.S., to the Institution of Electrical Engineers on December 21st, 1928, on the occasion of the commemoration by the Institution of the 50th anniversary of the invention of the carbon filament incandescent electric lamp by Sir Joseph Swan.—I am, etc.,

R. K. Morcom.

London. August 9th.

[To the Editor.]

Sir,—Your references to the propaganda of the N.E.L.A. in "telling the world" what is only a half-truth about the invention of the incandescent electric lamp prompts me to ask why the British Electrical Development Association—our organisation most nearly corresponding to the N.E.L.A.—has not so far taken any noticeable part in this international controversy. When even the severely professional Institution of Electrical Engineers feels it a duty to direct American attention to the British viewpoint, it seems strange that our propaganda organisation has not seen fit to take up the cudgels in defending the memory of one who was largely responsible for giving that association something to develop. You may be interested to know that the American story has not only circulated through most of the countries of the world, but was also repeated with much flourishing of trumpets in an English weekly paper with a popular circulation.—I am, etc.,

"Disgusted."

Bristol. August 13th.

[A letter drawing attention to Swan's work, signed by Dr. S. Z. de Ferranti as President of the E.D.A., was published in the "Daily Telegraph" recently.—Ed.]

"New Wiring Plan."

[To the Editor.]

Sir,—Having seen the remarks on page 172 of The Electrician for August 9th, regarding Prof. Edward Bennett's proposed substitute for the 3-wire system, may I take this opportunity of placing on record that the same system has for some time past been proposed by the writer and is illustrated and mentioned in detail towards and at the end of Chapter VII of his forthcoming book, "Electricity Supply Transformer Systems," now in page-proof form. The writer not only proposed one insulated copper wire per circuit, but also one terminal per lamp socket and/or domestic appliance. The non-current carrying parts of the installation are effectively and properly earthed *at one point* (of respective installations) through the non-insulated return wire or the non-insulated metal conduit which form part of the return circuit. In the writer's opinion, this is the only sure and positive method of providing "safety for the public," and it has the additional advantages of cost and losses referred to by you.

Wiring installations based on present-day Regulations do not provide a cure for the public from circuit hazards and dangers. The true cure is partly left to the consumer and the public. That is to say, safety to life at present depends upon the consumer and the public; yet, we, as a specially trained body in this particular class of work, knowingly permit and deliberately provide for hazards to life. The least of the several possible dangers to life is from a direct contact with, say, the non-current carrying part of a house or factory 230 V (a.c.) fitting. The real cure provides that this said part be *always* effectively earthed *on the consumer's premises*.

The hazards cannot be definitely overcome and made foolproof from the public until the neutral wire of every installation is *properly* earthed and the non-current carrying part of the fitting or appliance forms part of the effectively earthed circuit. To have one earth connection at the supply end only, and then to earth each fitting independently is not much unlike laying a trap for the public to unknowingly and accidentally fall into at some time or other—it is not a cure, and the provisions are not really and truly safe. In view of this condition, are we to blame the consumer, the Postmaster General, the wiring installation, the electric supply system, the law, or the profession?—I am, etc.,

William T. Taylor.

London. August 10th.

Where *is* that Battery?

[To the Editor.]

Sir,—Your editorial on the electric vehicle is in every way excellent, but it does not—like Homocea—"touch the spot," and that spot is the battery.

I respectfully suggest that the battery makers are now too rich to be worried about the traction battery. Before the war they were a poor crowd, disunited and scrambling for scraps of business from central stations and a struggling motor-car industry. The war crammed them with submarine battery orders at profitable prices. Since the war a revival of the pleasure and commercial car industry, a new and vigorous radio trade, an active and constant flow of business from electric supply services, and a fresh fountain of orders from "talkies," "totes," and telephones have strained the battery producing factories to their limits.

Why step aside from so useful a field in which to garner profits, long delayed, to do research work of a rather troublesome order, which would give to the world the traction battery for which it has waited so long?

Central stations will certainly use battery electrics in the way you suggest, but, on the score of first cost, flexibility, speed and general utility, the petrol machine—odoriferous as it always will be—must have preference.

Let the battery makers get busy before the oil kings with their "stink wagons" assume complete command of road transport.—I am, etc.,

"Battery Electric."

London, S.E.19.

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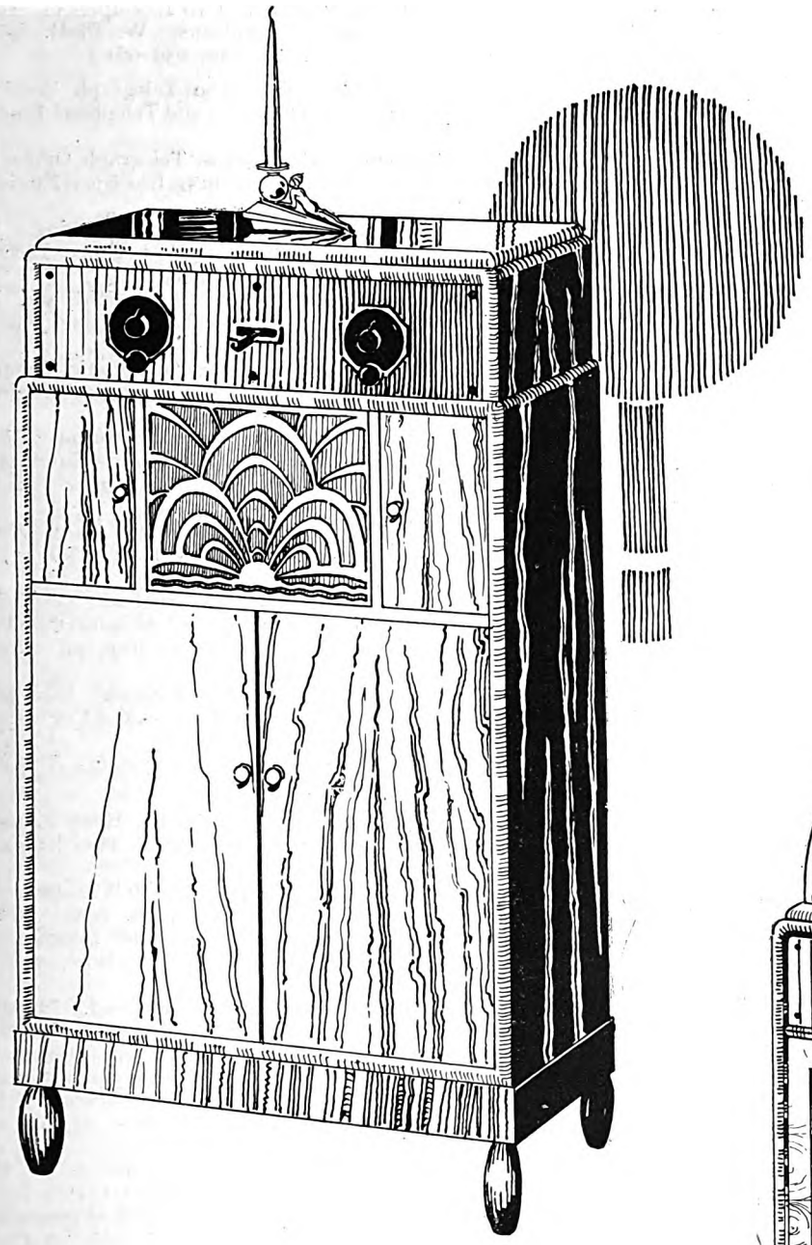
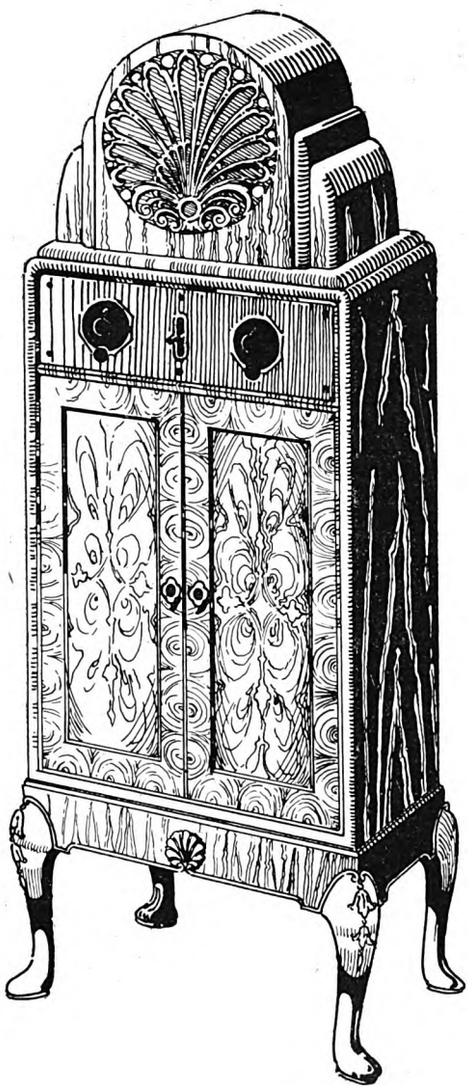
DESIGNS FOR WIRELESS RECEIVER CABINETS.

MANUFACTURERS of wireless receiving sets for domestic use realise that the housing of the equipment is in many cases as important a consideration with the purchaser as the performance of the receiver. From the crude rectangular box of the early days, wireless cabinet design has passed through the "camouflage" stage to the more satisfying point at which it becomes part of the furnishings of the house, without any undue attempt to conceal its purpose. The two contemporary designs illustrated on this page are reproduced by courtesy of "The Cabinet Maker."



TO the left above is a cabinet in Macassar ebony and Padouk. Panels and ends are veneered in Macassar ebony, with Padouk beads, plinth and knobs. The fret is veneered Padouk on plywood, and is backed with ivory silk. It is finished with a brilliant French polish, slightly rubbed off. Cupboards flanking the speaker accommodate batteries, and the cabinet measures 2 ft. 2 in. wide by 4 ft. high.

The other design, of eighteenth century inspiration, is in walnut. The door panels are veneered with quartered figured walnut and the stiles have oyster shell walnut veneers. The moulds and beads are cross-banded, and the fret is backed with old gold silk. A shelf is provided at the top of the cupboard for batteries. Measurements are 1 ft. 10 in. wide by 4 ft. 9 in. high.



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The Geometrical Aspect of Lorentz's Contraction. J. B. Pomey. ("Annales des Postes Télégraphes et Telephones," May, pp. 452–457.)

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NEWS IN BRIEF.

Whale Killing by Electricity—The 26th Ack Acks and Camp—The Marking of Imported Wireless Sets—The Opening of Hams Hall Station.

DERBY Town Council has decided to heat the Queen Street Baths electrically at a cost of £2 055.

Hull Electricity Committee has allocated £25 000 from surplus revenue for the purchase of apparatus for hire.

The Sidcup and Chislehurst Telephone Exchange was damaged by fire last week and put temporarily out of action and some plant was destroyed.

The City of London Corporation is about to spend a sum not exceeding £500 on the provision of a stand-by supply of electricity for the Guildhall.

London County Council invites applications for the position of electrical engineer in its Tramway Department.

Glasgow Corporation is taking a stand at the Housing and Health Exhibition, to be held in the Kelvin Hall in September.

Imports of electrical goods and apparatus into the Irish Free State during June last amounted to £49 626, as compared with £35 068 during the corresponding month last year.

Probationary assistant engineers are required in the Engineering Department of the Post Office. Forms of application, etc., from the Secretary, Civil Service Commission, Burlington Gardens, London, W.1.

A probationary engineer is required in the Federated Malay States Posts and Telegraphs Department. Further particulars from the Crown Agents for the Colonies, 4, Millbank, London, S.W.1. (Reference M./1 658.)

Eastbourne Electricity Committee has further considered the possibility of establishing a scheme for the wiring of premises and the sale of fittings on a hire purchase system, and has decided to ask the borough treasurer and electrical engineer to submit a report on the matter.

The Borough Engineer of Ilford has submitted to the Electricity Committee sketch plans, prepared in collaboration with the Borough Electrical Engineer, of the proposed new offices and central show and store rooms on the Clark's Road site. Further detailed plans and estimates are to be prepared.

A Norwegian civil engineer, M. Holm Hansen, is reported to have invented a harpoon through which is transmitted electricity at a pressure of 76 V. The invention has been tried successfully for killing whales off the Faeroe Islands. This new method is said to be more economical than the older methods.

It is stated that Canadian firms are likely to be awarded most of the contracts for the construction of the new $7 500 000 power plant of the British Columbia Electric Railway Co. on the Stave River, near Ruskin, B.C. Contracts for the first unit to develop 42 500 H.P. at a total outlay of $680 000 have all been let to Canadian firms.

Siemens Lamp Works Staff entertained members of the Preston Electricity Department at Ashton Park on July 25th. Matches at golf and bowls provided some very close games and resulted in wins for Siemens by 4½ matches to 2½ at golf and 5 matches to 3 at bowls. An impromptu smoking concert which followed completed the evening.

Arrangements for the Düsseldorf meeting of the Institute of Metals are now complete. Over 200 persons from ten different countries will attend the proceedings, which will open on September 9th. The annual autumn lecture will be given by Dr. A. G. C. Gwyer, on "Aluminium and Its Alloys." Tickets may be obtained on application to the Secretary, 36, Victoria Street, London, S.W.1.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated August 16th, 1879:*

We suggested the use of portable lighting plant for harvesting by night.

After a public demonstration of gas and electric lighting in the Picton Reading Room, Liverpool, it was decided to adopt electric lighting.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of August 19th, 1904, stated that:*

The deficit on the year's working of the Pacific cable was over £88 000.

There were 15 632 subscribers to the Post Office London telephone system.

* * *

FIFTEEN years ago it was recorded in THE ELECTRICIAN *dated August 14th, 1914, that:*

Several important German radio stations had already been put out of action.

The virtual disappearance of commercial vehicles and horses led to a phenomenal demand for electric vehicles.

Many electrical manufacturing firms with large orders for Government supplies were hard put to it to carry on owing to the large numbers of workpeople called to the colours.

* * *

TEN years ago THE ELECTRICIAN *for August 15th, 1919, reported that:*

Metal and chemical prices were phenomenally high. Copper was £107 per ton.

Increases in the cost of coal caused many electricity supply undertakings to raise their electricity charges, in some cases by as much as 20%.

There are in York 153 all-electric houses.

The Great Western Railway Co. has decided to convert the steam-driven pumping plant at Bath to electrically-driven plant; and electric clocks are to be installed in the new station buildings at Newport.

Automatic road traffic signalling apparatus was put into operation last week at the junction of Old Town Street and Treville Street, Plymouth. The equipment has been supplied for a month's trial before purchase.

Manchester Corporation requires a resident engineer at Barton power station.

Manchester Corporation will be exhibiting at the Smoke Abatement Exhibition to be held in November.

One of the attractions at the South Shields Carnival being held this week, is an illuminated and decorated tramcar.

An exhibition of electrical domestic appliances was held at Freckleton recently and considerable business was done.

The Hams Hall station of the Birmingham Corporation will be opened by the Duke and Duchess of York on November 6th.

The Standing Committee appointed by the Board of Trade will hold an inquiry at 11.30 a.m. on September 30th, and at 10.30 a.m. on October 1st, as to whether imported wireless receiving sets, components and accessories should bear an indication of origin. The inquiry will be held at the Board of Trade Offices, Great George Street, London, S.W.1. Communications should be sent to the secretary, Mr. E. W. Reardon, at that address.

The 26th Anti-Aircraft Battalion, R.E. (London Electrical Engineers) T.A., which is under the command of Lt.-Col. M. G. Bland, will on Sunday go into camp at Manston, near Ramsgate, for the annual summer training.

Improvements are being carried out at the premises of the North Western Electrical Development Association in Fountain Street, Manchester, and when these are completed will considerably facilitate the work which is undertaken by Mr. R. C. Hawkins to amplify by local endeavour the work of the national E.D.A.

London County Council Mental Hospitals Committee recommends the installation of electrical equipment at Hanwell Mental Hospital, at a cost of £23 000. The institution is at present supplied with gas manufactured at the hospital, but the Committee thinks it advisable to have electricity for the purposes of electrical treatment of patients, and for refrigeration, etc. It is proposed to take the supply from the Metropolitan Electric Supply Co.

A competition promoted by the Metropolitan Railway among its staff for the best display of flowers and shrubs on station platforms and adjacent banks has resulted in some exceptionally attractive displays. The stations awarded prizes are: Hammersmith, Northwick Park, and Chesham (first); Dollis Hill, Kilburn, and Stoke Mandeville (second); Neasden, West Hampstead, and Croxley Green (third); Ruislip Manor, Wembley Park, and Whaddesdon (fourth).

The Institute of Marine Engineers' annual examination for student graduateship and the accompanying diploma, open to graduates or others not yet associated with the Institute, will be held on April 7th—10th next, at centres arranged to suit candidates. The examination for the Lloyd's Register Scholarship, value £100 per annum and tenable for three years at an approved university, will be held on May 12th—13th next, at various centres.

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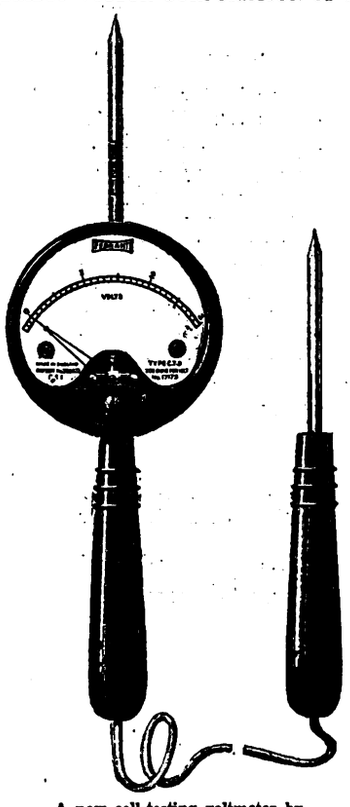
DOMESTIC ELECTRICAL APPLIANCES.

Special Cooking Utensils for Hotplates—A Portable Receiver of American Design—New Measuring Instruments—Illuminating Glassware and Pendants.

A NEW receiver, employing an improved a.c. superheterodyne circuit, and enclosed in a console cabinet with an electro-dynamic loud speaker, has been introduced by the RADIO-VICTOR CORPORATION OF AMERICA. The circuit used in the new receiver includes a tuned aerial coupling circuit, one stage of h.f. amplification, oscillator, first detector, two stages of intermediate frequency amplification, second (power) detector, and one stage of audio frequency amplification. The single tuning control operates a new type of stencil cut selector dial by means of which illuminated scale markings from 0 to 100, as well as approximate kilocycle markings, are projected on a translucent composition screen and magnified for easy reading. The cabinet is of two-tone walnut veneer, with burled maple overlays. The loud speaker opening and control panel are covered with cut velours. The pattern of the material has been arranged so that the controls appear to form a part of the design.



A new cell-testing voltmeter by Ferranti Ltd.

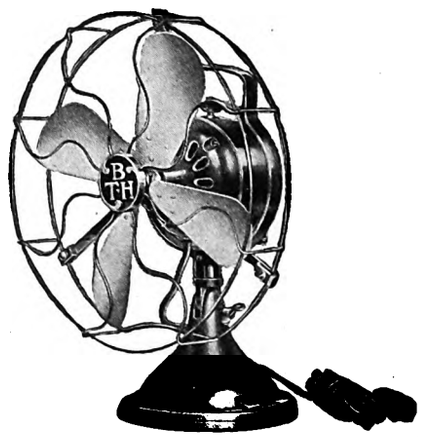
FERRANTI LTD., has introduced a new cell testing voltmeter. The instrument consists of a 2½ in. dial 2½ in. scale moving coil voltmeter mounted on a special base and fitted with handles and spikes for the convenient testing of battery cells. The instrument is of B.S.S. first grade accuracy and consumes only five milliamperes for full scale deflection. It can be supplied with a reading of 0—3 or 3—0—3 V. On the 0—3 V scale provision is made for a negative reading of 0—0·3 V (marked in red on the dial) to enable cadmium tests to be made in addition to ordinary tests. Robustness is an outstanding feature of the instrument and it has been designed to withstand unusually heavy overloads without injury. The instrument case is of non-corrodible insulating material, as also the two handles to each of which is fitted a rustless, non-corrodible spike, the handles being connected by a two-foot length of acid-proof flexible cable. If required, barbed-type spikes can be supplied instead of the single spike pattern illustrated.

One solution of the problem of obtaining the right kind of electric cooking utensils for use on modern hotplates is suggested by SIGG, LTD., of 469, Holloway Road, London, N. This firm manufactures a range of stewpans, kettles, frying pans, casseroles, porringers, etc., all of which are about ⅛ in. thick at the bottom, and which are machined perfectly flat. It is claimed that these utensils, being made in sizes which exactly cover the hotplates, absorb and retain the heat much more rapidly than the ordinary utensils such as are used for gas or open fires. The manufacturers point out that a pan with a thick bottom will—taking the mean throughout its life—boil quicker than a similar vessel with a thin bottom, because the latter will quickly warp and thus seriously decrease the thermal efficiency. The following is given by the firm as an example of the boiling rate of one of their kettles. "At a recent test 2 pints of water was boiled in an ordinary 16 gauge kettle and took 14 min. 7 sec. to boil, but the same quantity of water boiled in one of Sigg's "Inflexible" (¼ plate) "Leicester" machined flat kettles took only 11 min. 3 sec."

HAILWOOD AND ACKROYD, LTD., Beacon Works, Morley, near Leeds, and 32, Shaftesbury Avenue, London, W.1, have in their showrooms a good selection of glassware applied to electric fittings and advertising devices. Their products may be classified in two sections—artistic glassware in choice and costly designs, and mass-produced articles priced low enough to compete with similar foreign glass. There are many extremely attractive fittings falling in the first division, and also a good variety of cheaper models. The makers believe in imparting as cheery a tone as possible to their designs, so that the occupants of a room decorated with "Hailglass" illuminants may feel at their best at all hours of the day, in addition to being free from eye strain during the night season. Much of the glass produced by this firm is painted with ceramic colours, fired in; this decorated glass is washable. A speciality is making up fittings to the customer's own registered designs, the moulds being kept solely for the owners. Coats of arms, views of historic buildings, scenic gems, etc., can be reproduced on standard lamps or illuminated vases in accordance with the wishes of the consumer. A special department is devoted to advertisement glassware. In this field are included such familiar things as the globes surmounting petrol pumps and decorative entrance and exit signs for theatres. Flesh-coloured glass legs for shops selling stockings are another typical item. Some of the advertising fittings are constructed of three-ply glass, which consists of a thin layer of opal glass between two layers of clear. This method is claimed to eliminate glare without lessening intensity to the extent often experienced when other diffusive constructions are used. Three-ply glass can also be supplied with the inside and outside surfaces satin-polished; or, to give further variation, the inner layer may be yellow, rose or any other tint. Other forms of glass manufactured are etched and engraved, opaline, opalescent, matt frosted (produced by acid or sand blasting according to circumstances) and "Hailuxo," a clear, hard glass with good heat-resisting properties.

Among the newest additions to the range of lighting pendants manufactured by the GENERAL ELECTRIC CO., LTD., (Magnet House, Kingsway, London, W.C.2) are a number of fittings incorporating bakelite accessories. Bakelite ceiling roses, galleries and lampholders take the place of the more common porcelain roses and metal galleries and holders. They are supplied in lustrous oak finish, and should harmonise with most surroundings. A special feature of bakelite for these applications is that it will always remain clean and fresh looking. It is suggested that the fittings are very suitable for hospitals and institutions as well as for use in the home.

A useful device, which costs only a few shillings and is described as an aerial discharger, has been placed on the market by PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2. Many listeners earth their aerial every night during the summer, so as to reduce any possible danger during a thunder storm. It should, however, be remembered that during a rain or hail storm it is again possible for the aerial to become charged, and it is advisable to provide an easy means for this to escape to earth, without passing through the receiver. The discharger under review is designed to automatically prevent lightning or other atmospheric discharges from damaging a receiving set, and consists of a tube, full of a rare gas, and a spark gap, protected by a glass tube and a porcelain cowl. A galvanised iron bracket is attached, so that it is easy to fix it to the wall of the house, near the aerial lead-in. The device needs no attention, and the makers state that during unsettled weather it can sometimes be seen to function by the momentary glow in the tube of gas.



A popular electric fan model by the British Thomson-Houston Co., Ltd.

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PERSONAL.

MR. Richard L. Brown has been appointed deputy managing director of Hopkinsons, Ltd.

Gillingham (Kent) Town Council has appointed Mr. E. T. Howell, of Fulham, as mains engineer.

Sir Arthur Dorman, chairman of Dorman, Long and Co., celebrated his eighty-first birthday on August 8th.

Among those injured in a motor smash at Le Creusot on Monday was Mr. Mark Van Os, a director of M.S.L., Ltd.

Mr. Wilbur B. Huston has won the scholarship which Mr. Edison offered to an American undergraduate who gave the best answers to 50 questions drawn up by the inventor.

The marriage of Mr. C. F. J. Morgan, of the research department of Metropolitan-Vickers Electrical Co., Ltd., and Miss Winifred Allen was solemnised at St. Paul's Church, Crewe, on August 5th.

Mr. Frederick Giles, of St. Albans, on completing 20 years' service with the North Metropolitan Electric Power Supply Co., at their works at St. Albans, has been presented with a wallet containing £20.

Mr. E. W. Dickinson, private technical assistant to Sir John Snell, chairman of the Electricity Commission, has been appointed to act as technical officer in connection with the development of electricity in rural areas.

Mr. R. W. Smith, for some years engineer at the Bedale electricity works, has been appointed engineer of the electricity works at Bedale, Masham, and Thirsk, which are now controlled by the Cleveland and South Durham Electric Light and Power Co.

Sir Ernest Benn, chairman of Benn Brothers, Ltd., proprietors of THE ELECTRICIAN, presided at Tuesday's public session of the International Advertising Congress in Berlin. Mr. R. D. Savage, manager of THE ELECTRICIAN, is one of the English delegates.

Mr. J. S. Highfield's "Dorina" was the winner in a handicap race in the Royal Yacht Squadron's Regatta at Cowes last Thursday. A cutter-rigged boat of 50 tons, the "Dorina" won two events during the week, and she also won the Ryde Town Cup in a handicap for yachts between 35 and 70 tons at the Royal Thames Yacht Club's Solent Regatta on Monday.

The "Revue Générale de l'Electricité," of August 3rd, contains an appreciation by M. André E. Blondel, of M. Edouard Labour, the eminent French electrical experimentalist and inventor, who died in November, 1928. M. Labour was the originator of the scheme for the high-tension network which was organised by the Minister of Public Works after the war.

Obituary.

MR. J. C. WARD, on August 8th. He was a director of Edgar Allen and Co.

MRS. E. M. BARNETT, on July 31st after an illness of a few days duration. She was senior cooking and heating demonstrator for Metro-Vick Supplies.

MR. JAMES JEFFERY, on August 6th, chairman of the Ross Electric Light and Power Co., Ltd., and formerly a director of the Dumfries Electricity Supply Co.

PROF. E. M. TERRY, on May 1st, aged 50 years. He was associate professor of physics in the University for Wisconsin and was known for his work on the effect of temperature on the magnetic properties of iron, cobalt and nickel. He also did valuable work in the development of radio telephony.

MR. SAMUEL M. KENNEDY, on July 18th, aged 66 years, retired vice-president of the Southern California Edison Co., who did much towards the development of the electrical industry on the Pacific Coast. He was at one time resident manager in London for a Canadian wholesale importing business.

MR. THOMAS E. MURRAY, on July 21st, aged 69 years. He was largely concerned with the growth of the New York Edison Co. and the United Electric Light and Power Co. To his skill as a builder of power plants are due in a measure not only the plants of Greater New York—Waterside No. 1 and No. 2, Sherman Creek, Hell Gate, Gold Street, Hudson Avenue, East River and the Williamsburg street-railway power stations—but also steam plants in Albany, Utica, Rochester and elsewhere in New York and in Dayton, Ohio, and hydro-electric plants at Chattanooga, Tenn., and Cohoes and Trenton Falls, N.Y. Over the design of all these and various smaller generating stations he had supervision. His total installation being in the neighbourhood of 2 168 380 kW. It is said that he was granted more patents than any other man save Edison.

BUSINESS ITEMS.

THE MARCONIPHONE Co., LTD., 210/212, Tottenham Court Road, London, W.1, has received a letter from Mr. T. J. Ridgway reporting that using a Model 55 portable receiver the broadcasting of the arrival of the "Graf Zeppelin" at Lakehurst was successfully heard near Liverpool.

ONE of the new showcards which have been published in connection with the "Mazda" 1929-30 Lighting Season Advertising Campaign. We have received a number of illustrations of the new literature which has been compiled for the campaign, and details will be published in full in a later issue.

Included in a number of orders received recently by the HART ACCUMULATOR Co., LTD., Stratford, London, E.15, is one from H.M. Office of Works for a battery consisting of 120 "STC.17" type cells having a capacity of 800 Ah, to be installed in the Admiralty Research Laboratory at Teddington.

The Royal Sanitary Institute had an exhibition in connection with its annual congress held at Sheffield recently, and offered medals for those exhibits that reached a prescribed standard of excellence. The names of firms entitled to awards have just been announced by the chairman of the judges, Dr. Charles Porter, and these include the ACME ENGINEERING Co., LTD., Stocks Hill, Holbeck, Leeds, for an electrically heated fish-frying range, and HOOVER, LTD., 229–233, Regent Street, London, W.1.

Croydon Corporation has awarded to the ENGLISH ELECTRIC Co., LTD., a contract for the complete equipment of a new switch house. The installation, which is to the design and specification of Mr. A. C. Cramb, the borough electrical engineer, will be of the most modern type, and will include electrically-operated compound-filled switchgear of high-rupturing capacity, with a special arrangement of duplicate busbars. It will form the main control for the turbo-alternator plant, including a new 25 000 kW set, and for group feeders to the existing feeder switchgear. The contract is valued at £44 300.

The GENERAL ELECTRIC Co., LTD. has supplied to the Edinburgh education authority, two "Magnet" double deck baking ovens, designed and manufactured by the G.E.C. Birmingham works. These ovens have been installed in two well-known educational centres in Edinburgh, and they follow a similar installation completed some months ago at the Astley Ainslie Institute, Edinburgh. Large "Magnet" baking ovens are a prominent feature in the equipment of the National Schools of Bakery in London and Leeds, and have also been installed in the Colleges of Technology at West Ham, Manchester, Leicester, Glasgow and Doncaster.

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OVERSEAS TRADE.

Electrical Exports for Seven Months Exceed Imports by over £7 000 000.

EXPORTS of electrical machinery, apparatus and material shipped from the United Kingdom during July were valued at £1 703 316, as against £1 410 980 for the corresponding month last year, an increase of £592 336. Electrical exports for the seven months of the year totalled £11 060 903, compared with £10 788 489 for the same period of 1928. The increase by comparison being £272 414.

Imports of electrical goods during July, 1929, amounted to £589 069, as against £485 605 during the same month last year, while for the seven months of 1929 imports totalled £4 052 074, or £601 065 more than for the same period of 1928.

The figures show that July exports were in excess of imports by £1 114 247, and during the seven months January to July electrical exports exceeded similar imports by £7 008 829.

With the exception of switchboards other than telegraph and telephone, various motors and generators other than railway and tramway motors, and batteries and accumulators, every export item showed an improvement, the largest being telegraph and telephone instruments, excluding wireless valves, which showed an increase of £100 749 when compared with last year's return of the same goods for July.

On the import side electrical machinery declined during the month under review by £12 205, switchboards other than telegraph and telephone by £3, and parts of arc lamps and searchlights, excluding carbon rods, by £2 292. With these exceptions every import item showed an increase. The following are detailed figures.

	Month of July.		Seven Months.	
Imports.	1928	1929	1928	1929
	£	£	£	£
Electrical Machinery	150 251	138 046	1 026 742	1 032 293
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	18 831	21 038	94 578	137 953
Insulation other than rubber (not being Telegraph or Telephone Wires or Cables)	51 971	55 006	330 026	350 672
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	1 988	5 002	48 772	32 595
Submarine Telegraph and Telephone Cables	—	—	—	—
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	44 816	90 810	336 206	723 333
Carbons, Electric	7 105	10 222	77 135	100 882
Electric Lamps and Parts thereof—				
Electric Glow Lamps	33 482	34 227	279 463	185 437
Arc Lamps and Electric Searchlights	147	497	4 302	4 802
Parts thereof (except Carbon Rods)	2 660	368	14 381	4 611
Batteries and Accumulators (including parts)	40 333	62 872	293 763	356 409
Electrical instruments (other than Telegraphic and Telephonic): Commercial (excluding Ammeters, Voltmeters, etc.), House Service Meters, and Scientific	25 572	26 263	164 198	201 152
Switchboards, other than Telegraph and Telephone	3	—	780	1 578
Electrical Goods and Apparatus, all other sorts	108 446	144 718	780 663	920 357
Total of Electrical Goods and Apparatus	485 605	589 069	3 451 009	4 052 074
Exports.	£	£	£	£
Electrical Machinery—				
Railway and Tramway Motors	25 523	33 224	325 582	199 442
Other Motors and Generators	200 559	170 378	1 456 084	1 307 368
All Other Sorts	320 535	312 712	2 221 742	2 239 573
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	114 347	182 945	821 269	950 590
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	119 701	135 376	892 939	927 80
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	58 840	93 455	561 993	659 161
Submarine Telegraph and Telephone Cables	8 211	32 176	117 732	93 659
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	164 965	265 714	1 711 896	1 676 157
Carbons, electric	267	337	9 069	5 280
Electric Lamps and Parts—				
Electric Glow Lamps	42 457	59 957	298 101	358 468
Arc Lamps and Electric Searchlights	1 128	1 233	8 686	5 887
Parts thereof (except Carbon Rods)	245	4 109	5 472	7 685
Batteries and Accumulators (including parts)	98 331	87 689	629 469	572 946
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	31,843	40,317	233 416	231 995
Switchboards, other than Telegraph and Telephone	5 834	4 675	45 716	36 250
Electrical Goods and Apparatus, all other Sorts	218 194	279 019	1 449 323	1 788 635
Total of Electrical Goods and Apparatus	1 410 980	1 703 316	10 7884 89	11 060 903

S.E. LANCS ELECTRICITY.

Annual Report of the South East Lancashire Electricity Advisory Board.

AT the last meeting of the South East Lancashire Electricity Advisory Board, held in Manchester, with Ald. W. T. Dagnall in the chair, the annual report for the year ended March 31st was adopted. The report deals with work carried out and says that it is interesting to review the development which has taken place since the creation of the Board in 1923. At that date there were 32 authorised undertakers operating in the district as compared with 40 at present. The increase by eight in the number of the authorised undertakers does not adequately express the extensions or development, because many undertakers have added to their area of electricity supply by taking in adjoining local government areas. The extent of the development is more appreciated from the fact that since 1923, Special Orders have been taken out by the then existing or new authorised undertaker affecting 16 local government areas, many of which are of a rural character covering wide areas. Having regard to the competition which exists in relation to the areas included in the Mid-Cheshire Company's proposal it appears to be reasonably certain that the whole of such area will be included in a Special Order or Orders at a comparatively early date. If these proposals mature, the position of the district will then be that 99·6% of the population of the district will be within the areas covered by Distribution Orders, and 92% of the acreage of the district will also be situate within areas covered by Distribution Orders; the main bulk of the undeveloped acreage being the easterly end of Cheshire and the northerly end of Derbyshire adjoining the Pennine Range, which areas are very sparsely populated. The Board consider that it is no exaggeration to say that such development has been, to a large extent, fostered by the activities of the Board, and particularly by the close investigation of all such proposals and assistance in relation thereto which has been given by the Engineering Advisory Committee.

The Board have given further consideration to the problems which may arise due to (1) the inability of a company to make a bulk supply contract for a period beyond the company's tenure, which would bind the purchasing authority, and (2) the inability of the purchasing authority to become party to such a bulk supply contract so as to bind themselves if and when they purchase the undertaking. The Board have been satisfied by legal opinion that the disability exists, and have suggested to the Electricity Commissioners that statutory powers should be conferred upon a purchasing authority to obviate the difficulties which might otherwise arise.

The increasing consumption of electricity in the district is shown by the following figures for units sold during the past seven years :—

	Units sold.
Year ending December 31st, 1922	479 076 857
,, ,, 1923	551 251 843
,, ,, 1924	632 369 490
,, ,, 1925	708 069 467
,, ,, 1926	729 617 774
,, ,, 1927	837 206 978
,, ,, 1928	891 290 039

The units sold per head of population in 1928, based upon the estimated population for that year, 3 100 000, amounted to 288 per head, as compared with :—

Year 1926	242 units per head.
,, 1927	273 ,,

The cost of administration for the year ending March 31st, 1929, amounted to £2 295 3s. 11d., which, when distributed over the units sold during the year, i.e., 891 290 039, yields a figure of 0·00062d. per unit.

At a recent meeting of Taunton T.C. the Electricity Committee's report, which shows a net profit of £5 086 on the past year's working, was adopted. It was decided to transfer £2 871 to reserve and £1 000 to the rate fund. It was announced that the Committee would reconsider the scale of charges at an early date. Ald. Kingsbury, chairman of the Committee, said they were somewhat disappointed that the public had not taken advantage of the concession with regard to assisted wiring to the extent which was hoped. Free wiring was something which the Committee could not promise. He congratulated Mr. A. J. Howard (the engineer) and the staff upon the successful result of the year's working.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BINGLEY GRAMMAR SCHOOLS.—Installation of electric lighting. Plans and specifications from Mr. W. M. Platts, clerk, 1, Park Road, Bingley.

DEVIZES RURAL DISTRICT COUNCIL.—Electric light installation at 36 houses in Lavington district.

FARNWORTH URBAN DISTRICT COUNCIL, August 16th.—Supply of l.t. cables. Specifications, etc., from Mr. A. J. Hutchinson, engineer and manager, Electricity Department, Albert Road, Farnworth, Lancs.

LYMM URBAN DISTRICT COUNCIL, August 16th.—Supply and erection of vertical electrically-driven pump. Specifications from Mr. N. Holt, clerk, Council Offices, Lymm; deposit £2 2s., returnable.

UNITED METHODIST CHURCH, THEAKER LANE, ARMLEY, August 16th.—Electric light installation in church and Sunday School. Particulars from the Trustees' Secretary.

GLAMORGAN COUNTY COUNCIL, August 17th.—Additional electric lighting at Glamorgan Farm School, Ty, Segur, Neath. Plans, etc., can be seen at the schools or the County Architect's Office, Neath.

HULL CORPORATION, August 19th.—Electric light installation and fittings for portion of elementary school. Specifications, etc., from the City Architect, Guildhall, Hull; deposit £1 1s.

DUNDEE HARBOUR TRUST, August 20th.—Supply and erection of electric passenger lift at Harbour Chambers, Dock Street, Dundee. Specification, etc., from Mr. J. Hannay Thompson, general manager and engineer.

MANCHESTER CORPORATION, August 23rd.—Supply of steel tramway poles. Specifications, etc., from the General Manager, 55, Piccadilly, Manchester.

CENTRAL ELECTRICITY BOARD, August 24th.—Supply, delivery, and erection of metering equipment for certain stations in the area of the South-East England Electricity Scheme, 1927. Specification No. S.E.E.-G.M.1 from Mr. Richard H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit, £2 2s. for first copy, £1 1s. for each subsequent copy.

NEWCASTLE ENDOWED SCHOOLS, August 24th.—Electric light installation in a new wing to be erected at each of two schools, viz.: Newcastle-under-Lyme High School, and Newcastle-under-Lyme Orme Girls' School. Specifications, etc., from Messrs. Cramp and Frith, 1, Dickinson Street, Manchester; deposit £3 3s. in respect of one contract, or £6 6s. in respect of both contracts. Tenders are invited only from firms on the National Register of Electrical Installation Contractors.

COMMITTEE OF VISITORS OF GLOUCESTERSHIRE MENTAL HOSPITALS, August 26th.—Electric wiring of Wotton and Coney Hill Mental Hospitals, on "Stannos" earthed concentric system. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

POPLAR (LONDON) BOARD OF GUARDIANS, August 28th.—Supply and installation of e.h.t. switchgear, a 75 kW mercury arc rectifier, and l.t. d.c. switchboard at the Institution. Specification, etc., from Mr. G. Butler, clerk, 45, Upper North Street, Poplar, London, E.14; deposit £2 2s. returnable.

WESTMINSTER GUARDIANS, August 28th.—Electric lamps, fittings, etc. Forms of tender from the Clerk, Princes Row, London, S.W.1; stamped, addressed envelope to be sent.

STAPLEFORD RURAL DISTRICT COUNCIL, August 29th.—Electrical pumping stations, etc. in connection with Chilwell and District sewerage works. Specifications from Elliott and Brown, Burton Buildings, Parliament Street, Nottingham; deposit £3 3s.

MANCHESTER CORPORATION, August 30th.—Supply and delivery of one water-tube boiler superheater for Barton power station. Continuous actual evaporation of boiler, 130 000 lb. of water per hour. Specification, etc., from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester.

WEST RIDING EDUCATION COMMITTEE, August 30th.—Electric light installation at Highfields School, Doncaster. Particulars from the divisional clerk, Mr. A. J. Dempster, 20, Christ Church Road, Doncaster.

BURY AND DISTRICT JOINT HOSPITAL BOARD, August 31st.—Supply, delivery and installation of electric refrigerator at (1) Florence Nightingale Hospital, Bury; and (2) Aitken

ONE of the departments at the Nottingham factory of Messrs. Wm. Hollins and Co., Ltd., spinners. This workroom, which measures 178 ft. by 60 ft., was originally illuminated by a system of local lighting units, suspended low down over the machine troughs. One reflector served two machines and was equipped with a 60 W lamp, giving an average illumination throughout of 2 ft.-candles for a total current consumption of 12·6 kW. Wm. Hollins and Co., Ltd., enlisted the advice of the General Electric Co., Ltd. with a view to improvement. The scheme, when submitted to actual test, proved so successful that arrangements were made to light the whole of the department with 14 in. "Geco" enamelled steel reflectors, fitted with 200 W gasfilled lamps. Only eighty-five reflectors have been installed, in lieu of 247 under the old system, with a resultant average illumination over the whole of the working plane and gangways of 10 ft.-candles. The current consumption is now 16·85, as against 18·2 kW.

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Sanatorium, Holcombe. Specifications, etc., from Mr. F. Wild, clerk, 2, Cross Street, Bury.

WARRINGTON WATER COMMITTEE, August 31st.—Supply of electrically-driven centrifugal pumping plant. Forms of tender, etc., from Mr. J. Gray, water engineer, Warrington; deposit £2 2s., returnable.

HARROGATE CORPORATION, September 7th.—Supply and erection of overhead 11 000 V lines and 346/200 V lines. Specification, etc., from Mr. Neil McLean, borough electrical engineer, 33, Swan Road, Harrogate.

LONDON COUNTY COUNCIL, September 9th.—Supply and erection of e.h.t. switchgear, etc., for tramway sub-stations. Specifications, etc., from the General Manager of Tramways, 23, Belvedere Road, S.E.1; deposit £2.

LIVERPOOL CORPORATION, September 10th.—Electric power and lighting installation for new abattoir, Stanley, Liverpool. Specification, etc., from Land Steward and Surveyor, Municipal Buildings, Liverpool; deposit £3 3s.

CENTRAL ELECTRICITY BOARD, September 11th.—Supply, delivery and erection of 132 kV overhead transmission lines (approach to Clarence Dock, Liverpool). Specification No. N.W.E.-P.L.3, from Mr. R. H. Fox, secretary, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s., for first copy, and £1 1s. for each subsequent copy, returnable.

EAST LOTHIAN EDUCATION AUTHORITY, September 27th.—Electrical work in connection with erection of public schools at Longniddry and Aberlady. Forms of tender, etc., from Messrs. Morham and Brotchie, 29, Hanover Street, Edinburgh, on and after August 21st.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SMYRNA MUNICIPALITY.—Construction and equipment of modern electric bakehouse. (Reference B. 5 572.)

YUGOSLAVIA.—Supply and delivery of two electric lifts for a local company. Reference A.X. 8 315.

CHILEAN STATE RAILWAYS, August 16th.—Material for overhead lines, underground cable and cable boxes (Group 41); and material for lighting of locomotives and carriages (Group 43). (Reference C. 3 069*.)

CHILEAN STATE RAILWAYS, August 16th.—Telegraph and telephone materials, including copper wire and cable, switches, table telephones (Ericsson type), telephone cords, etc. (Reference C. 3 072*.)

CHILEAN STATE RAILWAYS, August 16th.—Supply of instruments of staff or tablet type, for installation at 36 stations between Alameda and Talca, locking apparatus for switches, batteries and telephone combinations. Specification C. 3 070*.)

URUGUAY POSTS, TELEGRAPHS AND TELEPHONES, August 17th.—Supply of telegraph wire. (Reference A.X. 8 229.)

AUCKLAND ELECTRIC POWER BOARD, August 19th.—Single-phase transformers. (Reference B.X. 5 324.)

INDIA STORE DEPARTMENT, SIMLA, August 20th.—Supply and delivery of one 80 kW, 2-wire d.c. generating set for the Military Engineering Services, Razmak. (Reference B.X. 5 522.)

BELGIAN TELEGRAPH AND TELEPHONE DEPARTMENT, August 21st.—Supply of 250 tons of annealed bronze wire and six tons of annealed copper wire. (Cahier des Charges Special No. 3/424.) (Reference A.X. 8 346.)

JOHANNESBURG CORPORATION, August 22nd.—Supply and delivery of automatic traffic signals. (Reference B.X. 5 547.)

PORT ELIZABETH MUNICIPALITY, August 22nd.—One 10 000 kW turbo generator, and condenser, boiler, steam and feed water pipes, etc. (Reference B.X. 5 430.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 22nd.—Telegraph material. (Reference A.X. 8 335.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, August 22nd.—Extension magneto bells, bell sets, condensers, magneto generators, central battery switchboard tumbler switches, wall and table telephones, etc. (Reference B.X. 5 415.)

BELGIAN POSTS AND TELEGRAPHS, August 26th.—Telephone cables between Ghent and Antwerp, Liege and Combain-au-Pont, Verviers and Francorchamps, and Charleroi and Liege. Cahier des Charges (fr. 6¼) from the Post and Telegraph Department, Brussels.

INDIAN STORES DEPARTMENT, August 28th.—One 30 kW two-wire d.c. generating set. (Reference B.X. 5 522.)

JOHANNESBURG MUNICIPALITY, August 29th.—Copper weatherproof wire for overhead lines. (Contract No. 234.) (Reference B.X. 5 565.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 29th.—Supply of 3 000 lamp fittings. (Reference B.X. 5 534.)

COMPAGNIE DES CHEMINS DE FER PORTUGAIS, August 31st.—Mechanical or electrical apparatus for operating points and signals. (Reference A.X. 8 367.)

WATERFORD HARBOUR COMMISSIONERS, August 31st.—Light standards, poles, cables, lamps, etc. Specification, etc., from the Harbour Engineer; deposit, £2 2s.

PRETORIA CORPORATION, September 2nd.—Columns, fittings, lanterns, etc., for street lighting, and master clock for frequency regulation. (Reference A.X. 8 322.)

MAFEKING MUNICIPALITY, September 9th.—Steam raising plant, engines, alternators, switchgear, etc. (Contract "A.") (Reference A.X. 8 352.)

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Supply of electric goods, locomotives and battery tenders, in connection with electrification of Madras suburban services. Specifications, etc. (£1) from the company's offices, 91, Petty France, Westminster, S.W.1.

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 23rd.—Crude oil engine-driven 150 kW electric generating plant. (Tender No. 1 528.) (Reference B.X. 5 566.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 26th.—Two 100 kVA motor-alternators (tender No. 1 521). (Reference B.X. 5 564.)

DURBAN CORPORATION, September 27th.—Supply of three-phase ironclad, compound filled switch panels (specification S. 778). (Reference B.X. 5 505.)

MARLBOROUGH (N.Z.) ELECTRIC POWER BOARD, September 28th.—Supply and erection of 600 B.H.P. Diesel driven generating plant and switchgear. (Reference B.X. 5 556.)

STATE ELECTRICITY COMMISSION, VICTORIA, September 30th.—Supply and delivery of three 3 000 kVA 50 cycle, oil immersed, self-cooled, outdoor type single phase transformers and spare coils and bushings. (Reference B.X. 5 523.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Three 3 000 kVA transformers and spares. (Reference B.X. 5 523.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £2 2s.

Tenders Accepted.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Siemens Bros. and Co., Ltd., supply of cable, £7 934 6s. 2d.

CAPE TOWN CORPORATION.—Measurement, Ltd., supply of 500 meters, £2 9s. 6d. each. (Recommended.)

POPLAR (LONDON) BOROUGH COUNCIL.—Electroflo Meters Ltd., supply of instrument equipment, £1 236.

LEICESTER CORPORATION.—Aiton and Co. for steam and feed pipe connections at the power station, £1 936, amended.

CAPE TOWN CORPORATION.—South African General Electric Co., Ltd., supply of brackets, fittings, etc., in connection with street lighting extensions, £1 782 17s.

WORTHING CORPORATION.—Callender's Cable and Construction Co., Ltd., cable work and supply and fixing of network and joint boxes, etc., for the supply to the Findon Valley estate, £1 212.

CROYDON CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., turbo-alternator, with condensing plant, pipework, auxiliaries, etc., £76 851. English Electric Co., Ltd., switchgear, £44 227 10s. Babcock and Wilcox, Ltd., steam raising plant, £101 712.

BIRMINGHAM CORPORATION.—The Harland Engineering Co., Ltd., for switchgear at five sub-stations. J. H. Payne and Co., installation of apparatus for electric lighting at Deykin Avenue school. The General Electric Co., Ltd., provision of frequency changer equipment and switchgear. The General Vehicle Co., Ltd., supply of three electric vehicles for the salvage department.

HULL CORPORATION.—Electrical wiring for cookers and wash boilers at 12 houses each on the North Hall and the Willerby Estates:—Messrs. H. M. Nowell, £40 5s. at North Hall and Messrs. Holliday and Barker, £56 at Willerby. Keighley Electrical Engineering Co., Ltd., provision of an electric lift at the central library, £2 410. W. F. Dennis and Co. for bronze for telephone use at £80 12s. 6d.; T. Bolton and Sons, Ltd., for lead-in cable at £329 1s. 7d. Clarke, Chapman and Co., Ltd., supply of five seats of soot hoppers, £1 263.

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ELECTRICITY SUPPLY.

Public Lighting at Witham—Ballymena Supply Scheme—New Plant for London County Council and Stalybridge, &c., Board—Central Electricity Board's Accounts.

TORQUAY Electricity Committee is to extend overhead lines at a cost of £560.

Hastings Electricity Committee is to extend mains to supply the Beckley district.

THE decision of the Otley Council to light all their streets electrically has presented an opportunity to all householders where the mains are being laid to have electric light facilities, and where houses are not wired to have the wiring done without any initial payment on the system which is now so popular in Leeds and other places. The interest taken in this development by the inhabitants is illustrated by the above photograph, sent to us by Mr. W. B. Woodhouse, engineer and manager of Electrical Distribution of Yorkshire, Ltd., of people reading about the scheme on leaving their work at a local factory.

Hull Electricity Committee is to extend the meter and mains depot in Argylle Street.

Kendal T.C. has received sanction to a loan of £4 142 for feeder and distribution mains.

Plymouth Electricity Committee has authorised mains extensions at a cost of £1 100.

Sheffield Electricity Committee has acquired a site at Dore for the erection of a sub-station.

Merrington (co. Durham) Parish Council is to provide electric street lamps at a cost of £900.

Ripon Electricity Committee is to obtain tenders for carrying out distribution works at Bishop Monkton.

Colchester Electricity Committee is arranging for street lighting in the districts of Wivenhoe and Thorpe.

Leeds Electricity Committee is to purchase land for sub-stations in Queen's Road and in Mosley Wood Lane.

The Slough and Datchet Electric Supply Co. is to erect a transformer chamber at North Lodge, Stoke Poges.

Berkhamsted R.D.C. has decided to offer no objection to the proposed overhead line from Luton to Aylesbury.

York Corporation has obtained sanction to borrow £1 460, for rectifying plant for Groves electricity sub-station.

Ashford (Kent) Urban Council has applied for a loan of £2 084 for extensions to the East Ashford rural district.

Winchester City Council has applied for a loan of £3 780 for a new feeder cable from the power station to the Guildhall.

Walsall Electricity Committee has authorised the extension of mains to supply Corporation housing schemes at a cost of £2 600.

Durham County Mental Hospital Committee is to instal a new feed pump at the generating station of the mental hospital.

Sheffield Electricity Committee has authorised the carrying out of mains extensions at a cost of £19 670 in one case and £1 575 in another.

Haslingden T.C. has appointed a special committee to deal with future applications in connection with the assisted wiring scheme.

West Lancashire R.D.C. has obtained sanction for the borrowing of £11 508 in connection with the Aughton electricity scheme.

Gloucester City Council has applied for a loan of £7 000 to meet the estimated cost of laying a.c. mains in place of d.c. in a portion of the city.

Hull Electricity Committee is to arrange for a bulk supply to the whiting works of Messrs. Storry, Witty and Co., Ltd., near Beverley, at a cost of £6 370.

The Wessex Electricity Co. is extending its supply from Yarnton to Bicester. The company also proposes to give a supply to Kidlington by next Christmas.

Witham Urban Council has accepted the offer of the East Anglian Electric Supply Co. for public lighting at £7 15s. 6d. per 300 watt lamp, lighted from sunset until 11 p.m.

Ballymena U.D.C. has decided to lodge the necessary documents with the Electricity Commissioners with a view to a Provisional Order being obtained for an electricity scheme.

Glasgow Electricity Committee has authorised mains extensions at a cost of £6 600. The installation in various sub-stations of Reyrolle switchgear, at a cost of £3 000, is approved.

Brighton Electricity Committee is to extend cable at a cost of £1 500 to meet increased demand by the Southern Railway.

Croydon Electricity Committee is to extend mains at a cost of £1 435.

Chatham T.C. has received notice from the Kent Electric Power Co. of its intention to lay cables at Dale End, Dale Street, Rochester Street, Maidstone Road, Cornwallis Road and Wallace Road.

Stone (Staffs) Urban Council has decided to give a supply to Tittensor at an estimated cost of £800, subject to the applicants giving the required guarantee for three years of 20 % of the capital cost.

Formby Urban Council has adopted a free wiring of houses scheme, under which the flat rate will be ½d. per kWh above the rate for ordinary meters. Motors, radiators, kettles, and small cookers are to be let out on hire.

The L.C.C. Highways Committee recommends an expenditure of £47 000 on the provision of three 1 000 kW rotary converters in the sub-stations at Limehouse, Tooting and New Cross, and e.h.t. switchgear at New Cross.

Guildford T.C. has decided to extend the mains to a new estate at Ganghill, London Road, for 25 new houses, on condition that Mr. A. C. Burlingham guarantees a return of not less than £97 for a period of not less than three years.

Eastbourne Electricity Committee has received sanction to borrow £9 496 in connection with the supply to Willingdon and Wannock. The Committee is to lay an 11 000 V feeder to a new sub-station to complete the ring main, at a cost of £13 550.

Two 12 000 kW sets, to supersede two 8 500 kW sets, are to be installed at the Hartshead generating station by the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board. Districts hitherto untouched are to be provided with a distribution system.

Keswick U.D.C. recently decided to accept the offer of the Society for Safeguarding the Natural Beauties of the Lake District to provide counsel and pay the costs of the inquiry which it is proposed should be held into the question of the erection of overhead cables in the district.

Alterations to the electric lighting at Desford School, at a cost of £350, are to be made by Leicester Education Committee, so that, instead of renewing the battery installation, current can be obtained from the Leicestershire and Warwickshire Power Co. at a fixed annual charge of £75, plus 1½d. per kWh.

The accounts of the Central Electricity Board for the period from March 1st, 1927, to December 31st, 1928, show that the Board's borrowing powers are limited, under the Electricity (Supply) Act, 1926, to £33 500 000, and the amounts for which the Electricity Commissioners have given consent are £5 000 000 for general purposes and £5 000 000 for standardisation of frequency. Capital expenditure amounts to £300 279, in addition to £61 563 advanced to undertakers for carrying out alterations required in the frequency employed. There were outstanding commitments as at December, 1928, in respect of contracts for the construction and acquisition of main transmission lines, amounting to £2 893 000.

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ELECTRIC TRACTION.

Electric Vehicles for Refuse Collection—Plant for Glasgow Tramways Power Station.

EAST Ham Corporation is to construct a new tramway route to Becontree.

Blackpool Tramways Committee has given notice to Lytham St. Annes Corporation terminating the present through running agreement over the Blackpool Corporation tramways.

Bradford Electricity Committee has agreed to a scheme for the erection and equipment of a traction sub-station in Norman Lane, Eccleshill, at an estimated cost of £21 580, including mains.

Hackney (London) Works Committee recommends the purchase of seven electric vehicles for refuse collection, at a cost of £4 172. The electricity department has facilities for charging such vehicles.

The General Manager of Reading Corporation Tramways is to submit a report upon the question of extending the tramway service to Tilehurst station and upon the substitution of trackless trolley vehicles for tramcars.

Glasgow Corporation has adopted the recommendation of the Tramway Committee that a new 18 750 kW turbo-alternator be installed at the Pinkston generating station, in replacement of existing plant, at an estimated cost of £218 500.

It is intended to begin the work of enlarging the London County Council tramway tunnel between the Victoria Embankment and Southampton Row in November. The work is to cost £326 500, including £76 400 for the conversion of 50 single-deck cars into double-deckers.

Cardiff Finance Committee has approved a proposal to scrap the single-deck tramcars on the Cathays route, and recommends that the £46 421 involved be met by the transfer of £8 000 from the car renewal fund to the sinking fund, and the redemption of the remaining £39 000 over a period of five years.

Exeter Corporation has received an offer for its tramway system from the Devon General Omnibus Co. The company proposes, should the offer be accepted, to scrap the trams and replace them by motor buses. It is said that the terms of the offer include the paying off of the £36 000 debt remaining on the tramways, the reimbursement to the Council of the money expended on the existing motor-bus system and an annual contribution in consideration of the right to run the city's omnibuses.

TRADE PUBLICATIONS.

MESSRS. S. G. LEACH AND CO., LTD., 26-30, Artillery Lane, E.1, have published list No. N.S. 108 dealing with H.B. drink-mixers.

The WESTINGHOUSE MORSE CHAIN CO., LTD., Letchworth, has issued a special folder relative to "Chainoleum W.M." grease.

A. H. HUNT, LTD., of Croydon, Surrey, have published a new catalogue of accessories and small electrical appliances. The reference number is 61.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester, has published a postcard indicating the various current publications on "Brookhirst" electric control gear.

The 1929/30 catalogue of the ELECTRIC HEATING CO., George Street, Croydon, has been received, and its size has been increased from 32 to 48 pages. The catalogue includes particulars of 14 new lines.

No. 42 of the Heat Treatment bulletin issued by WILD BARFIELD ELECTRIC FURNACES, LTD., of Elecfurn Works, North Road, London, N.7, contains an article entitled "The Heat Treatment of High Tensile Aluminium Alloys."

ASCOG, LTD., 44, Theobalds Road, London, W.C.1, have sent us copies of list No. 101, dealing with the "Altrax" flashing lamp; list No. 109, describing new fittings for "Altrax Allglass" transparent lighting units of outside type; list No. 110, dealing with similar units for window display and illumination; and list No. 111, giving particulars of "Saturn" electric decorative letters for display purposes. Lists 101, 110 and 111 are coloured.

In a new illustrated brochure on church lighting, the GENERAL ELECTRIC CO., LTD., expresses the hope that it will prove of service to those interested in the lighting of places of worship of all denominations. The aim of this publication is to show how effectively all kinds of structures—either ancient or modern—large or small—can be illuminated on lines that permit of the retention of any required atmosphere, and which, at the same time, will reveal the architectural beauties of these buildings.

COMPANY NEWS.

Big Rise in G.E.C. shares — Companies' Meetings and Reports.

THE feature of the past week in the electrical share markets has been the buying of General Electrics, and the price has advanced 12s. 6d., from 53s. 9d. to 66s. 3d., which compares with under 44s. a month ago. Johnson and Phillips shares during the week have risen from 36s. 3d. to 40s. Marconi's International Marine shares are unchanged on the week, but, at 66s. 3d., are 6s. 3d. higher than when our price list last appeared, three weeks ago. County of London Supply shares, which have been bought during the past week, are 3s. 6d. higher than last week, and 1s. higher than three weeks ago. Hydro-Electric "B" Five per Cent. preference shares are quoted about 9. Siemens Brothers and Co. ordinary shares have risen during the week from 26s. 10½d. to 30s. and Cables and Wireless "B" shares from 76 to 79, while Eastern Telegraph preference and ordinary have dropped 2 and 7 points respectively.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
(d)	Brompton & Kensington Ord. ..	26/–	26/–	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95⅝	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/–	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/6	26/–	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	,, ,, ,, ,, 6% C.P.	23/–	23/–	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	57/–	53/6	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	23/–	23/–	24/–	21/3
(e)	Kensington & K'bridge Ord. (£1)	26/–	26/–*	27/6	23/9
1/9⅝	Lon. Elec. Sup. Ord. (£1).. ..	28/–	28/–	37/6	23/–
1/9⅝	Metro. Elec. Sup. Ord.	44/4½	43/9	53/–	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2⅝	N'castle-upon-Tyne Elec. Sup. Ord.	26/10½	26/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P.	23/–	23/–	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(c)	St. James & P.M. Ord. (£1) ..	26/6*	26/6*	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	—	—
1/9⅞	W'minster Elec. Sup. Ord. (£1) ..	26/–	26/–	52/9	24/–
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/–*	36/–	38/9	24/6
6	,, ,, ,, 6% C.P. ..	23/6*	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	128½	128½	152	117
7·67	,, ,, ,, 6% Pf. Stk.	126½	126½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4	,, ,, ,, 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½*	71½*	75½	42½
4	,, ,, ,, ,, 4% pf. Stk.	71*	71*	77	68
4	,, ,, ,, ,, 4% Deb. ..	77½	77½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	59	59	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	71	71	73½	62
5	,, ,, ,, 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	56½	56½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	63	63	67	60½
3½	,, ,, ,, 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	72½	72½	77½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	79½	79½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	70	64½
7	Underground Electric Rlys. Ord.	22/–*	22/–*	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	,, ,, ,, 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	13/9	13/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/–	75/–	86/3	56/–
6	,, ,, ,, 6% C.P. ..	22/6*	22/6*	23/10	21/–
7	British Thomson-Houston Pref. ..	22/6	22/6	24/9	19/7
7	,, ,, ,, 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	131½	131½	153½	120
15	Callender's Cable Ord.	75/–	75/–	91/3	66/–
6½	,, ,, 6½% C.P. ..	25/–	25/–	25/9	22/–
7½	,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	,, ,, 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/–	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/–	15/–	32/6	23/6
7	,, ,, 7% C.P. ..	21/3	21/3	22/9	21/–
—	English Elec. Ord.	6/3	6/3	15/9	5/–
—	,, ,, 6% C.P.	7/6	7/6	18/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	21/3	20/6	92/3	18/1
6	Ferranti 6% Pref.	18/–	18/–	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord...	66/3	53/9	46/0	20/0
25	W. T. Henley's Ord.	127/6	127/6	120/–	69/3
10	Johnson & Phillips Ord.	40/–	36/3	67/11	34/–
7½	Lon. Elec. Wire. & Smith's Pref.	23/9	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	30/–	26/10½	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23½	23½	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	60½	60½	63½	56½
—	Cables and Wireless 5½% Pref. ..	94	94½	—	—
—	,, ,, ,, "B" Shares	76	79	—	—
3½	Eastern 3½% Pref. Stk.	60½	62½	70½	59
4	,, 4% Deb.	76	77	81½	74
4	Eastern Extension 4% Deb. Stk.	77	78½	80	74½
22	Gt. Northern Telegraph (£10) ..	31	31	43½	20
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	66/3	66/3	90/–	10/6
4	Western Tel. 4% Deb. Stk. ..	77½	77½	82	76

(a) 19⅞d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share.
(d) 1s. 8 706d. per share. (e) 1s. 7·181d. per share. * Ex. Dividend.

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ROYCE, LTD.—Loss for year ended March 31, 1929, was £7 151, increasg. debit blce. to £34 452.

HALESOWEN LIGHTING AND TRACTION CO., LTD.—The Co.'s name has been changed to Shropshire, Worcestershire and Staffordshire Electric Power Development Co., Ltd.

LANCASHIRE ELECTRIC LIGHT AND POWER CO., LTD.—It was announced last Saturday that the sh. certificates in respect of the issue of ord. shs. were ready to be exchanged for letters of allotmt.

WEST INDIA AND PANAMA TELEGRAPH CO., LTD.—Receipts for 1928 amtd. to £58 417 and workg. exes. to £75 243, leavg. debit blce. £16 825. After providg. £4 455 int. on debs. and £3 587 for deprecn. and renewals of s.s. "Henry Holmes," debit. to rev. is £24 868, raisg. debit blce. brt. in to £152 401.

TYNESIDE TRAMWAYS AND TRAMROADS CO.—Report for half year ended June 30 states exes. exceed rcpts. by £534, to which must be added int. on mortgages, etc., less int. on investments, making total deficit for half-year £2 062. Amt. of £2 100 has been transferred from gen. res., and, after bringing in blce. of £30 from previous half-year, £68 remains to be carried fwd.

ORMSKIRK ELECTRIC SUPPLY CO., LTD.—It is announced that the pref. and ord. sh. cap. of the Ormskirk Electric Supply Co. has been purchased by the Lancashire Electric Light and Power Co., Ltd. During the past financial year the Central Electricity Board adopted a scheme for North-West England and North Wales, embracing the whole of the Lancashire Electric Power Co.'s area of supply.

ELECTRIC FURNACE CO., LTD.—It is announced that the company has acquired from the German firm Hirsch Kupfer und Messingwerkegesellschaft the English and French patent rights for the manufacture of electric resistance furnaces, according to the latter firm's process. Under the agreement with the German firm the Electric Furnace Co.'s territory will include, besides England and France, Belgium and the English Crown Colonies.

WILLIAM BEARDMORE AND CO., LTD.—At an extraordinary general meeting on Tuesday, resolutions approving the reorganisation of the loan and share capital were confirmed. Mr. L. C. Ord, who presided, said, as the shareholders were aware, the resolutions as appearing in the notice were amended to provide for an increase in the rate of interest on the 2nd preference shares to be issued to the noteholders and a further alteration of the articles of association precluding the company from issuing any further preference shares ranking in priority to or *pari passu* with the 1st and 2nd preference shares issued pursuant to the scheme.

Company Meetings.

BENN BROTHERS, LTD.—The 33rd annual general meeting of the shareholders of Benn Brothers, Ltd. (the proprietors of THE ELECTRICIAN), was held on August 9th, Sir Ernest Benn, chairman, presiding. The Chairman, in moving the adoption of the report and balance sheet for the year ended June 30th, stated that about £4 000 more was being distributed to shareholders, as the dividend was up to 20%. In that respect he would like to correct an impression which had been created on the part of the vulgar and misinformed public press that a sudden accession of wealth had come to the company. If they had had some wonderful luck or unexpected bit of profit he would be the last man on earth to recommend it for dividend. The increase in the dividend on the ordinary shares was long overdue. For, he thought, about nine years the shareholders had received 17½%, during which period the management had acquired three or four important journals; set on their feet two associated companies, and had built Bouverie House; but the shareholders had not criticised the directors in the last two or three years, and to add 2½% to the dividend was felt to be a safe thing to do. The bank loan in the balance sheet had gone down to £20 000, so that a 20% dividend was but a small step to, it was hoped, a still more adequate dividend in the future. It had been the custom at similar meetings in the past to say something about the state of trade as a whole. The company claimed, as the largest trade and technical paper publishers outside America, to know something about the real state of trade in this country; and as a result of that very intimate touch which their trade papers had with literally hundreds of thousands of business men, the company knew more about the conditions of trade and industry than politicians who had so much help and said so much about it from time to time. The present-day British business man was a very marvellous creature; he not only provided a thousand million a year in rates and taxes, but he accomplished this astounding feat in face of unprecedented difficulties. He had to work inside a ring fence of bureaucratic trade union and other officials of various kinds, whose aim and object it was to see that his standards, whether in buildings, equipment, output, or in any other way, were carefully kept down to the mediocre level of the mass. He had somehow to rise above the pessimistic atmosphere created by the politicians. He succeeded in spite of a weight of political discouragement and despair. The British business man to-day not only delivered the goods, but employed more people at better real wages than ever before in our history. He (Sir Ernest) knew of no higher achievement in the story of human endeavour, and pleaded for a reversal of our attitude towards our daily work and our business triumphs. While we must avoid anything in the nature of American boost, the time had arrived for a properly modest recognition of the wonderful way the business classes were handling a situation still full of enormous difficulties. The skill, wisdom, energy and enterprise of the modern business man had never been approached by any other class or any other nation at any other time. Returning to the sphere of Bouverie House, the company's policy was one of optimism and cheerful encouragement, for it took pride in the fact that British trade was really doing better. The company, he remarked, had a greater heart than that of mere money making. During the year he (Sir Ernest) had been President of the National Advertising Benevolent Society; Mr. Gordon Robbins was Chairman of the Council of the Newspaper Press Fund; Mr. E. E. Starke was the life and soul of the Royal Metal Trades' Pension and Benevolent Society, being on the Board of Management; while Mr. Crole-Rees was a member of the Executive Council of the Furnishing Trades' Benevolent Association. Some of their 14 editors likewise played an important part in public affairs. The report and balance sheet were adopted, and the following dividends were approved: 3% on the preference shares, making 6% for the year; 13¾% on the ordinary shares, making 20% for the year; and 2s. 9d. per share on the deferred shares, making 4s. for the year.

DOMINION TRACTION AND LIGHTING CO., LTD.—A mtg. of holders of the 1st mtge. 35-year gold bonds will be held at Cannon Street Hotel, London, E.C.4, on Sept. 2 to consider resolutns. to sanctn. the release of $750 000 of bonds, with all unpaid coupons of the Windsor, Essex and Lake Shore Rapid Railway Co., in exchange for an assignment of the whole consideratn. which may be payable to the Railway Co. by the Windsor, Essex and Lake Shore Railway Association for the assets of the Railway Co. and for incidental purposes. Forms of proxy can be obtained from Messrs. Price, Waterhouse and Co., 3, Frederick's Place, Old Jewry, London, E.C.2.

METAL AND CHEMICAL PRICES.

TUESDAY, August 13th.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£77 10 0	10s. 0d.	—
Electro Wirebars .. .. „	£84 15 0	—	—
H.C. Wires, basis .. .. per lb.	11 11/16d.	—	—
Sheet .. .. „	11 11/16d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2 11/16d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet „ .. .. .. „	10¼d.	—	—
Wire „ .. .. .. „	11⅛d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£24 10 0	—	5s. 0d.
Foreign or Colonial .. .. „	£23 2 6	—	2s. 6d.
Tin—			
Ingot .. .. per ton	£209 5 0	—	£4 2 6
Wire, basis .. .. .. per lb.	2s. 9d.	—	¼d.
Aluminium Ingots .. .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£24 10 0	—	12s. 6d.
Mercury .. .. per bottle	£22 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
Sodium Bichromate—Per lb. 3½d.
Rubber—Para fine, 11½d.; plantation, 1st latex, 10¾d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

The market maintained a very firm tone last week, according to James Forster and Co., until all metals were upset by the raising of the Bank Rate in New York. Copper fell 10s., tin £2, spelter 7s. 6d., and lead 5s. per ton. Closing prices on August 9th were £23 2s. 6d., for August and September and £23 1s. 3d. for October and November, 3s. 9d. per ton down on the week.

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NEW COMPANIES.

LONDON STEEL WORKS, LTD.—Cap., £100. Mechanical and electrical engineers, etc. Reg. Office: Wellington Street, Slough.

TEXA ELECTRICAL CO., LTD.—Cap., £1 000. To carry on the business of electricians, electrical and mechanical engineers, etc. Reg. office: Chandos House, Buckingham Gate, S.W.

G. M. PATERSON AND LOGAN, LTD.—Cap., £600. To carry on the business of distributors of all kinds of wireless and electrical goods. Reg. office: 122, West Campbell Street, Glasgow, C.2.

ELECTRAFONT, LTD.—Cap., £100. Electric water heater manufacturers, electrical engineers, etc. Solicitors: Jennings, Son and Ash, 69, Leadenhall Street, London, E.C.3.

COVENTRY MACHINE TOOL WORKS, LTD.—Cap. £20 000. To carry on the business of mechanical, electrical and general engineers and manufacturers. Reg. office: St. George's Road, Coventry, Warwickshire.

ELLISON INSULATIONS, LTD.—Cap., £15 000. Manufacturers and producers of or dealers in electrical and thermal insulating materials, organic and inorganic plastic materials or mixtures, etc. Reg. Office: Wellhead Lane, Perry Barr, Birmingham.

A. H. ALLEN AND CO. (ENGINEERS), LTD.—Cap., £4 000. To acquire business of engineer, etc., carried on by A. H. Allen at Northampton, and to carry on same and business of electricians, etc. Reg. Office: 38, St. Andrew's Street, Northampton.

WOOD FITTINGS AND STANDARDS, LTD.—Cap., £5 000. To acquire business of manufacturers of electric light fittings carried on at 66, Charlotte Street, and 3, Bedford Passage, Charlotte Street, London, W., under the respective titles of Wood Fittings Co. and Wood Standards Co.

BRITISH AUTOMATIC TRAIN CONTROL SYSTEM, LTD.—Cap., £5 000. To obtain and undertake contract for power and automatic signalling to carry on the business of railway signal and interlocking apparatus makers and contractors, etc. Solicitors: Elwell and Binford Hole, 65, Coleman Street, London, E.C.2.

SHOCK PROOF CO., LTD.—Cap., £2 000. To acquire from R. Lomax the benefit of certain existing inventions in relation to the production of electric service boxes, to carry on business as manufacturers of and dealers in lampholders, etc. Solicitor: A. E. Grundy, 2, John Dalton Street, Manchester.

LUSTRE ELECTRIC LAMPS, LTD.—Cap., £600. Manufacturers of and dealers in wireless, telegraphic and telephonic apparatus, electric lamps and holders for same, manufacture of glass and moulders of the same into bulbs, tubing, rods or other designs, etc. Reg. Office: Walter House, 418-422, Strand, London, W.C.

DUNHAMS, LTD.—Cap., £15 000. To acquire business of wireless manufacturer carried on by C. S. Dunham, at Elm Works, Elm Park, Brixton Hill, London, S.W.2, and to carry on business of manufacturers of or dealers in wireless, radio or gramophone apparatus, etc. Reg. Office: Elm Works, Elm Park, Brixton, London, S.W.2.

ROZALEX, LTD.—Cap., £100. To adopt an agreement with the Chloride Electrical Storage Co., Ltd., for the acquisition (inter alia) of the registered trade mark "Rozalex," and to carry on so much of the business carried on by the Chloride Electrical Storage Co., Ltd., as is comprised in the said agreement. Reg. office: 26, Cooper Street, Manchester.

STEWART AND MCDONNELL, LTD.—Cap., £200 000. To acquire business formerly carried on by Stewart and McDonnell at 52, Coleman Street, E.C., constructors of public and other works, including electric light, telephonic, telegraphic and power supply works, etc. Solicitors: Messrs. Slaughter and May, 18, Austin Friars, E.C., and Tamplin, Joseph, Ponsonby and Ryde, 165, Fenchurch Street, E.C.

VOCAFILMS, LTD.—Cap., £10 000. To adopt an agreement with R. Yorke and N. Sharples, to acquire any patents relating to manufacture of combined television and sound producing instrument for transmission of pictorial representations simultaneously with oral expressions and the making of a film and sound record at or about the time of such transmission, etc. Qualification: £1. Solicitors: Woosnam and Callis, Blackpool.

THE UNITED DOMINIONS TRUST (ELECTRIC), LTD.—Cap., £250 000. To carry on the business of banking in all its branches, and to grant special facilities to municipalities, municipal supply companies, private supply companies, electrical contractors, undertakers and manufacturers covering the sale, hire, hire purchase or any other method of disposing of all kinds of electrical equipment, etc. Solicitors: Simmons and Simmons, 1, Threadneedle Street, E.C.2.

BRITISH ITALIAN POWER AND IRRIGATION TRUST, LTD.—Cap., £75 000. To adopt agreement with French, British and Foreign Trust, Ltd., to enter into or acquire and carry out contracts, concessions or grants in any part of the world for the construction, repair, maintenance, operation or control of electric, hydraulic and other works, electric or other lighting, railways, tramways, etc. Reg. Office: Dashwood House, 69, Old Broad Street, London, E.C.2. (Public Co.)

SIR W. G. ARMSTRONG WHITWORTH AND CO. (ENGINEERS), LTD.—Cap., £1 500 000. To acquire businesses of general engineers now carried on by Sir W. G. Armstrong Whitworth and Co., Ltd. (whose name is about to be changed to the Armstrong Whitworth Securities Co., Ltd.) at Scotswood Works, Scotswood, and Close Works, Gateshead, and to carry on the business of engineers, boiler makers, manufacturers of and dealers in railway carriages, tramcars, railway and tramway plant, etc., electricians, electrical engineers, constructors of railways, tramways, etc.

COMMERCIAL INFORMATION

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BERRY, Robert, Coventry House, 15, Denbigh Street, Llanrwst, wireless dealer. £12 2s. 8d. June 27th.

EXHIBITION FITTERS, LTD., 11/12, Portsea Mews, Portsea Place, Connaught Street, W., electrical engineers. £17 15s. 3d. July 11th; £16 4s. 4d. July 8th.

FENNEMARE, William, Market Square, Sandy, wireless agent. £19 17s. 2d. July 2nd.

FLEET ELECTRIC SERVICE, 6/8, Ivy Lane, E.C., electrical engineers. £12 6s. 1d. June 27th.

HOLBROOK AND TATTERSALL, LTD., 6, Cheapside, E.C., electrical engineers. £21 10s. 11d. July 11th.

HURST, Mr. T. R., 1, Glasshouse Lane, Mexborough, electrical engineer. £18 9s. 9d. June 21st.

NANKIVELL, Mr. T. E. (trading as STEWART AND CO.), 95, Sutton Road, Southend, electrical engineer. £29 14s. 9d. June 26th.

OFFER (JAMES R.) AND SONS, LTD., 8, Church Street, Kingston-on-Thames, wireless dealers. £21 10s. 10d. June 7th.

RADIO HOUSE, 510, Stockport Road, Longsight, wireless dealers. £19 17s. June 11th.

SANDS, Mr. C. W., High Street, Kings Langley, electrical engineer. £14 18s. 1d. June 17th.

SOUTH ESSEX ELECTRICAL CO., 30, London Road, Romford, electrical engineers. £64 8s. 8d. July 8th.

SUMMERS, E., Parade, Perranporth, electrical engineer. £10 17s. 2d. July 3rd.

Bill of Sale.

WALKER, Herbert Faulkner, 41, Dorothy Road, Lavender Hill, S.W., wireless, gramophone and electrical goods dealer. Dated August 1st, filed August 7th, £50.

Deeds of Arrangement.

FRANCE, Clarence, trading as RADIO EQUIPMENTS, 180, King Cross Road, Halifax, wireless engineer. Dated August 6th, filed August 9th. Trustee, A. N. Buckley, 45 and 47, Commercial Street, Halifax, I.A. Liabilities unsecured, £566; less secured claims, £268.

WAKELING, Arthur Beverley, 558, Beverley Road, Hull, electrical engineer. Dated August 7th, filed August 8th. Trustee, W. B. Hall, Silver Street, Hull, C.A. Liabilities unsecured, £347; assets, less secured claims, £125.

London Gazette, etc.

Bankruptcy Information.

WHITTLE, Frank, 41, Mawdsley Street, Bolton, Lancs, electrician. First meeting, August 16, 10.45 a.m., Bolton, and public examination, September 17th, 10.45 a.m., the Court House, Mawdsley Street, Bolton.

Partnerships Dissolved.

BROWN AND JESSIMAN (George BROWN and Alexander Hogg JESSIMAN), makers of electrical fittings, etc., at 4, Newton Terrace Lane, Glasgow, as at May 28th, 1929, by mutual consent. G. Brown will carry on business on his own account and in his own name at the same address. A. H. Jessiman will carry on business on his own account and under the style of A. H. JESSIMAN AND CO., at 11 Berkeley Terrace, Glasgow.

VECTOR ELECTRICAL COMPANY (Ernest Edwin WALKER, Annie WALKER and John WESTBY, electrical engineers, 40, Broadfield Road, Sheffield, by mutual consent as from July 31st, 1929. Debts received and paid by E. E. Walker, who will continue the business.

Notices of Dividends.

DAWSON, Joseph Edward, High Street, Boston, wireless engineer. First and final dividend, 4s. 0½d. per £, payable, August 26th, Office of Trustee, 5, Church Close, Boston, Lincs.

MARSDEN, Charles Bertie, 60, Pisgah Street, Kenfig Hill, Glamorgan. First and final dividend, 5s. 10d. per £, payable August 21st, Official Receiver's Office, 34, Park Place, Cardiff.

SEWELL, Sidney James, BROWN, William Lewis, carrying on business in co-partnership as SEWELL AND BROWN, at 6A, The Exchange, Muswell Hill, electrical and radio engineers. First and final dividend, 2s. per £, payable any day (except Saturday), between the hours of 11 and 2, Bankruptcy Buildings, Carey Street, London, W.C.2.

Application for Discharge.

HILTON, Reginald, 81, Blackburn Street, Radcliffe, electrical engineer. Hearing, September 11th, 10 a.m., Court House, Mawdsley Street, Bolton.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

313 063 W. S. Smith and N. W. McLachlan. Thermionic and like amplifying systems. (1/3/28.)
312 962 W. S. Smith and N. W. McLachlan. Electro-acoustic transmission and the like systems. (1/3/28.)
313 193 Y. Noishiki. Induction-cufrent generating apparatus for medical treatment. (1/3/28.)
290 653 Siemens and Halske Akt.-Ges. Apparatus for indicating electrically the position of adjustable units. (20/5/27.) (Addition to 280 562.)
313 025 General Electric Co., Ltd. and R. J. Kaula. Containers of moulded or cast material. (2/3/28.)
312 971 J. Allen. Electric discharge tubes. (3/3/28.)
312 974 A. G. Kershaw, R. S. Griffiths and Westinghouse Brake and Saxby Signal Co., Ltd. Railway signalling and the like apparatus. (3/3/28.)
286 318 Quarzlampen-Ges. Quartz lamps. (4/3/27.)
313 030 Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). Electrical power distribution systems. (5/3/28.)
286 628 Allgemeine Elektricitats-Ges. Automatic prepayment-meter for electricity, gas, water, and the like. (5/3/27.)
313 069 A. G. Westmoreland. Adjustable brackets or supports for telephones. (6/3/28.)
313 107 A. G. Westmoreland. Adjustable brackets or supports for telephones. (6/3/28.)
313 111 E. Green. Circuit arrangements for use with high-frequency currents. (7/3/28.)
313 113 Automatic Telephone Manufacturing Co., Ltd. and C. E. Beale. Telephone systems. (7/3/28.)
286 659 Associated Telephone and Telegraph Co. Telephone systems. (7/3/27.)
313 200 Siemens Bros. and Co., Ltd., W. G. Patterson and J. E. Tees. Telephone systems. (8/3/28.)
313 208 W. Phillips and Elliott Bros. (London), Ltd. Electrical indicating and/or recording apparatus. (9/3/28.)
313 211 R. Brooks and Associated Electrical Industries, Ltd. Electric relays applicable more especially in electric motor control systems. (9/3/28.)
286 733 Engineering Products Corporation, Inc. Insulation of high-tension cables and high-tension cable joints. (11/3/27.)
298 461 Siemens and Halske Akt.-Ges. Process and an apparatus for carrying out the oxidation or reduction of electrolytes. (8/10/27.)
313 223 British Thomson-Houston Co., Ltd., F. H. Harris, L. R. Nixon and J. V. Peacock. Control systems for dynamo-electric machines. (16/3/28.)
313 224 H. Baron (Electroacustic Ges.). Electrically-operated sound transmitters. (17/3/28.)
287 467 British Thomson-Houston Co., Ltd. Electric heaters. (19/3/27.)
313 227 R. Brooks and Associated Electrical Industries, Ltd. Electrica l circuit-breakers. (19/3/28.)
313 229 S. G. S. Dicker. (N.V. Philips' Gloeilampenfabrieken). Amplification of electrical oscillations. (20/3/28.)
313 230 General Electric Co., Ltd. and W. Wilson. Thermostatically-controlled electric switches. (20/3/28.)
313 247 J. E. Pollak (Hermsdorf-Schomburg-Isolatoren Ges.). Circuit arrangement and apparatus for measuring high voltages. (3/4/28.)
313 248 Chloride Electrical Storage Co., Ltd. and R. E. Sanderson. Electric lighting, heating, or power systems. (4/4/28.)
313 256 C. Holt and Economic Electric, Ltd. Method of control for wireless reception apparatus. (12/4/28.)
313 267 G. A. Juhlin, R. Townend and Associated Electrical Industries, Ltd. Brush-holders for dynamo-electric machines. (30/4/28.)
313 268 English Electric Co., Ltd. and F. Morris. Controlling-gear for electrically-propelled vehicles. (2/5/28.)
289 818 Marconi's Wireless Telegraph Co., Ltd. Automatic speed-control mechanisms and the like. (2/5/27.)
291 026 Siemens and Halske Akt.-Ges. Electric rectifiers. (24/5/27.)
313 282 Radio and Electric Services, Ltd. and B. Groom. Loud speakers. (14/5/28.)
313 289 R. Edmondson and Associated Electrical Industries, Ltd. Commutators for dynamo-electric machines. (19/5/28.)
313 292 P. Freedman. Metallic vapour lamps and gaseous discharge devices. (23/5/28.)
313 297 H. A. H. Nijland. Electric contacting devices for accomplishing a temporary connection, for making measurements to, or for short-circuiting or earthing conductors. (29/5/28.)
312 141 Langendorf Watch Co. Electric contact pin or plug. (21/5/28.)
313 318 E. Y. Robinson and Associated Electrical Industries, Ltd. Vacuum electric-tube devices. (19/9/28.)
313 319 H. Crowther. Switches for overhead runways. (20/6/28.)
293 747 Siemens and Halske Akt.-Ges. Circuit arrangement for the transmission of messages over telephone lines. (11/7/27.)
292 521 Akt.-Ges. Brown, Boveri et Cie. Quick-acting regulator of the vibrating type for keeping the current or voltage of generators constant. (20/6/27.)
295 374 Siemens and Halske Akt.-Ges. Telephone switching cabinets. (12/8/27.)
313 323 Coventry Automatic Telephones, Ltd. and H. G. Menage. Impulse-senders for automatic telephone systems. (23/6/28.)
313 329 Walker, Hunter and Co., Ltd. and J. Walker. Electric irons. (2/7/28.)
313 342 General Electric Co., Ltd. and W. M. Cranston. Brush holders for dynamo-electric machines. (9/7/28.)
304 584 C. Lorenz, Akt.-Ges. Microphones. (21/1/28.)
313 356 G. H. Ide and H. L. Bentley. Electric switches. (27/7/28.)
299 716 International General Electric Co., Inc. Electric conductors. (29/10/27.)
299 884 Telefunken Ges. Fur Drahtlose Telegraphie. Light-control devices suitable for use in recording sounds or in picture telegraphy and for like purposes. (3/11/27.)
299 893 International General Electric Co., Inc. Switches for use with transformers. (3/11/27.)

Applications for Patents.

May 15th.

15 180 W. E. Fischer. Devices for switching on lamps at predetermined times.
15 186 Landis and Gyr Soc. Anon. Self starting synchronous motor. (16/6/28, Switzerland.)
15 156 R. Lomax and A. Mugeli. Bayonet lampholders.
15 244 Oldham and Son, Ltd., and W. D. Wilde. Galvanic batteries.
15 181 F. Renyard. Cable connecting sleeve.
15 159 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.) Electrodynamic devices.

May 16th.

15 359 Allmanna Svenska Elektriska Aktiebolaget. Current carrying coils. (16/7/28, Sweden.)
15 375 Associated Electrical Industries, Ltd. Dynamo electric machines. (17/5/28, U.S.)
15 376 Associated Electrical Industries, Ltd., and E. Y. Robinson. Vacuum electric tube devices.
15 361 Automatic Telephone Manufacturing Co., Ltd., R. Haworth, and S. R. Smith. Electromagnetic counting devices.
15 262 S. F. Bickell, F. H. Reeves, and Revo Electric Co., Ltd. Plug and socket connections.
15 263 S. F. Bickell, F. H. Reeves, and Revo Electric Co., Ltd. Electric boiling plates, etc.
15 287 S. Brierley. Detector heald for electric warp-stop motions.
15 377 British Thomson-Houston Co., Ltd. Motor control systems. (16/5/28, U.S.)
15 265 S. O. Cowper-Coles. Making copper wire.
15 349 Dubilier Condenser Co. (1925), Ltd. Electrical condensers. (16/5/28, U.S.)
15 329 Electrolux, Ltd. Refrigerating apparatus. (25/5/28, Germany.)
15 315 E. N. Elford, Graham-Amplion, Ltd., and C. F. Phillips. Controlling means for power amplifying apparatus.
15 317 E. N. Elford and Graham-Amplion, Ltd. Electrical means for control of monitoring, etc., telephone apparatus.
15 308 Elin Akt. Ges. fur Elektrische Industrie. Device for switching over windings in dynamos. (25/5/28, Austria.)
15 371 H. Fekkes. Electric lamps. (11/6/28, Belgium.)
15 401 Felten and Guilleaume Fabrik Elektrische Kabel, Stahl and Kupferwerke Akt.-Ges. Stranded electric cables. (19/4/29, Austria.)
15 335 E. W. B. Gill. Electrolytic treatment of gas.
15 316 Graham Amplion, Ltd., and C. F. Phillips. Controlling means for power amplifying apparatus.
15 318 Graham Amplion, Ltd. Amplifying apparatus.
15 374 H. Guillou. Quartz insulating mounting. (24/5/28, Luxembourg.)
15 363 L. Mellersh-Jackson (Siemens and Halske A.-G.). Electrolytic production or separation of tin.
15 302 A. G. Sant. Leads or connections for electrical instruments.
15 303 D. N. Sharma. Television, etc., systems.

May 17th.

15 436, 15 437 Appareillage Gardy Soc. Anon. V. Kunz. Cut-out devices.
15 508 Associated Electrical Industries, Ltd. Dynamo-electric machines. (17/5/28, U.S.)
15 510 Associated Electrical Industries, Ltd. Motor speed regulation systems. (19/5/28, U.S.)
15 523 H. H. Berry and C. A. Painton. Thermostatic control of electrical apparatus.
15 488 British Thomson-Houston Co., Ltd. Signalling systems. (17/5/28, U.S.)
15 489 British Thomson-Houston Co., Ltd. Electric switches. (17/5/28, U.S.)
15 490 British Thomson-Houston Co., Ltd. Oil filled, lead covered cables. (18/5/28, U.S.)
15 493 British Thomson-Houston Co., Ltd. Electric circuit controlling systems. (19/5/28, U.S.)
15 494 British Thomson-Houston Co., Ltd. Circuit interrupting systems. (19/5/28, U.S.)
15 495 British Thomson-Houston Co., Ltd., and F. H. Harris. Generator control systems.
15 487 R. Crittall and Co., Ltd., and J. L. Musgrave. Magnetically operated valves.
15 481 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). X-ray tubes.
15 520 Electrical Research Products, Inc. Zero wander correcting circuits for cable signalling. (19/7/28, U.S.)
15 517 Electroacustic Ges. Acoustic direction determining device. (8/9/28, Germany.)
15 527 General Electric Co., Ltd. Electric lamps. (23/5/28, Germany.)
15 476 Graham Amplion, Ltd., A. D. Hodgson, and J. S. Murray. Electrical oscillation generator.
15 478 R. M. Hamilton. Electrical indicators, relays, etc.
15 483 R. M. Hamilton. Totalisators.
15 442 J. W. Howard and Lancashire Dynamo and Motor Co., Ltd. Dynamo-electric machinery.
15 448 R. Lomax and A. Mugeli. Switch lampholders for electric lamps.
15 552 M. E. MacGregor. Electrolytic cells.
15 544 L. M. Myers and Universal and General Radio Co., Ltd. Television apparatus.
15 505 N. Porter and Watson-Norie, Ltd. Electric heating apparatus for liquids.
15 450 Siemens-Schuckertwerke A.-G. Signalling cables. (23/5/28, Germany.)
15 463 W. H. Storey. Telephones.
15 558 R. Viesi. Apparatus for simultaneous control of wireless oscillatory circuits, etc.

May 18th.

15 577 C. Andrews and F. Chambers. Electric switches.
15 639 T. A. Biddington and R. Field. Wireless receiving apparatus.
15 636 H. F. Biggs. Electric terminals.
15 589 L. P. Laker. Radio receiving, etc., apparatus.
15 637 Soc. Francaise Radio Electrique. Electric selective arrangements for alarms. (22/5/28, France.)
15 635 Standard Telephones and Cables, Ltd. Stepping mechanisms.
15 590 C. Vinegrad. Time switches for electric lighting circuits.

May 21st.

15 681 Associated Electrical Industries, Ltd. Electric motor regulation systems. (19/5/28, U.S.)
15 701 Batteries, Ltd., and M. Dybeck. Vent pegs for electric cells, etc.
15 755 British Thomson-Houston Co., Ltd., and P. P. Whitaker. Starting and synchronising electrical machines.
15 794 British Thomson-Houston Co., Ltd. Electric switches (18/5/28, France.)
15 658 G. P. Dennis. Contacts for electric fuses, etc.
15 677 Dunlop Rubber Co., Ltd., and J. Maudslay. Electric railways.
15 774 J. Fischer de Tovaros. Lubrication of current collectors of electric vehicles.
15 696 General Electric Co., Ltd., O. W. Humphreys, and C. W. Stopford. Manufacture of electric immersion heaters.
15 761 J. A. Hanson. Radio apparatus.
15 707 W. Hasse. Primary batteries.
15 657 V. Hope. Electric fuse boxes.
15 733 I. G. Farbenindustrie A.G. and F. Stiefenhofer. Electric connecting device for kinematograph projectors.
15 752 International General Electric Co., Inc. Production of bodies from fibrous materials. (21/5/28, Germany.)
15 753 International General Electric Co., Inc. Electrically propelled vehicles. (21/5/28, Germany.)
15 754 International General Electric Co., Inc. Arc welding machines. (22/5/28, Germany.)
15 787, 15 788, 15 789, 15 790 Kolster-Brandes, Ltd. Radio signalling. (21/5/28, U.S.)
15 728 Lissen, Ltd., and R. P. Richardson. Electrical pick-ups.
15 718 Osterreichische Telephon-Fabrik A.G. vorm J. Berliner. Relays for telephone plants. (19/5/28, Austria.)
15 783 A. Rona. X-ray apparatus. (12/6/28, Hungary.)
15 762, 15 763 Symphony Gramophone and Radio Co., Ltd. Vibratory members for telephone instruments, etc.
15 692 W. W. Triggs (Flodinjern Aktiebolag). Regulating electrodes in reversible furnaces.
15 757 W. W. Triggs (Krauss and Reichert Spezialmaschinenfabrik und Apparatebau Ges.). Electric cutting machine for woven fabrics.
15 671 H. G. Westlake. Introduction of electrical conductors into tubes.

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THE ELECTRICIAN

Vol. CIII.—No. 2673. Friday, August 23, 1929. [Registered at the General Post Office.] Sixpence

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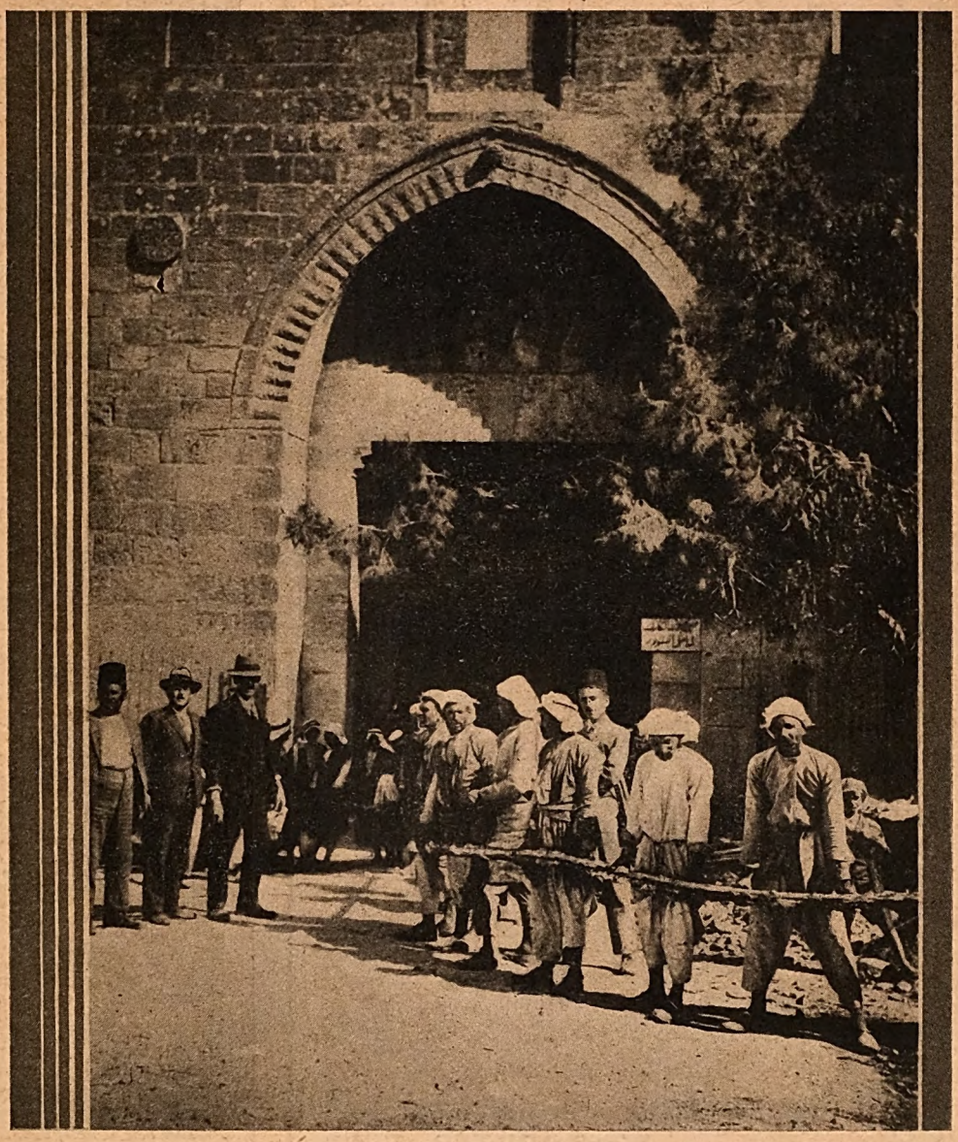

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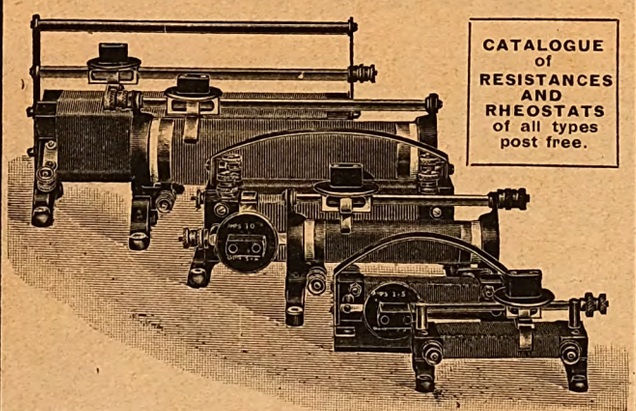

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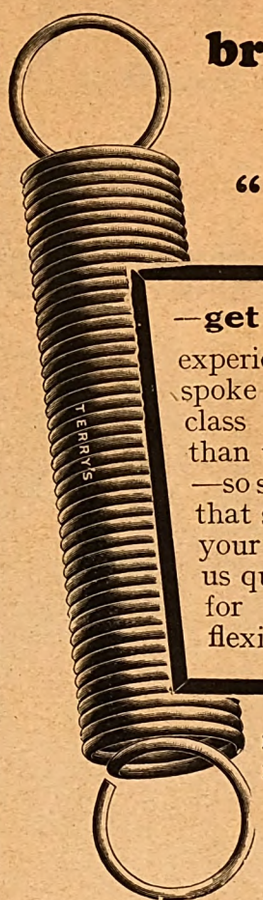

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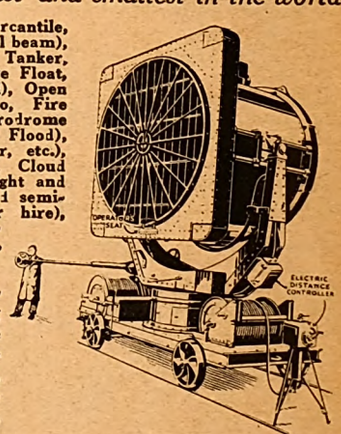

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No. 2673. [No. 8. Vol. CIII.] Friday, August 23, 1929. Annual Subscription, 25s. Overseas, 30s.

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Current Topics.

Trouble in Lakeland.

ONCE again the public Press is agog with indignation over the Central Electricity Board's proposed overhead transmission line through parts of the Lake District, which, to judge from some of the letters that have been printed in the papers, is about to be completely and irreparably disfigured unless something is done to scotch the advance of the desecrators. Our views on the matter have so often been expressed that it is hardly necessary for us to point out at this stage that no public utility service can afford to flout public opinion, especially in matters concerning the amenities of a district. At first glance it seems hard that a beneficent engineering service should be held up at the whim of objectors, many of whom have not even a rudimentary idea either of the actual appearance of the structures which arouse their ire, or of the consequences which would follow a successful accomplishment of their reactionary efforts. But if there is unjust bias it must be admitted that the fault is largely ours; not in proceeding with schemes of definite and far-reaching public advantage but in failing to overcome the obstructionist objections by educational means. The public—and especially that section of it which is concerned in preventing the imagined spoliation of the beauties of Lakeland—needs something more than the mere assurance that an eminent Academician is keeping an eye on the æsthetic aspects of the matter. They need to be met half—and more than—halfway with facts and photographs, and even specimen stretches of overhead line, and when, as a result, they understand what the electrical invasion really implies, protests of the kind which have been so frequent of late will disappear. One has only to look at the terminology which has grown up in the anti-overhead line camp to see how ill-informed is most of the criticism that has been put forward. We read, for instance, of "rows of Eiffel Towers," "towering pylons" and such-like descriptive extravagances, and we wonder at the criticism that is aroused. If the schemes involved the erection of replicas of the unsightly Parisian landmark, or of "low towers having a truncated pyramidal form, and flanking an ancient Egyptian gateway" (our dictionary's definition of a pylon) the critics would be justified, and we would be the first to agree with them. As it is, the structures which it is proposed to erect are, at close quarters, far from unpleasing to the eye, and when viewed from a distance blend uncommonly well with the surrounding scenery. They are of incomparably better appearance than any of the overhead line supports we have ever seen abroad. They compare still more favourably with the communication lines of the Post Office, which, however useful, are definitely disfiguring, but are nevertheless tolerated, almost unnoticed, in many of our beauty spots, and along many hundreds of miles of our rural roads. In view of the wide publicity which has been secured by the opposition in the Keswick case, the Minister of Transport will be well advised to grant to the Keswick Council the public inquiry they ask for. It would provide an excellent starting-point for the introduction of a few of the educational features referred to above.

Hydro-Electric or Steam?

THE dependence of hydro-electric plants upon steam stations for the maintenance of regular and uninterrupted service during the ordinary course of Nature's vagaries is emphasised in an American report showing that the production of electricity by water power during June was only 40 per cent. of the total produced in the U.S.A., as compared with 43 per cent. in May, and 44 per cent. in June of the previous year. The decline due to the drought looks small expressed in percentages, but its extent is better appreciated from looking at the analyses of the various sections of the country. In Massachusetts, for example, the output of hydro-electric power decreased from 70 648 000 kWh in May to 46 896 000 in June, a drop of one-third. This deficiency was offset by an increased output from the steam plants of the interconnected systems, those of Rhode Island in particular rising from 30 776 000 to 46 990 000 kWh, or by more than 50 per cent. A similar situation took place at Conowingo, on the Susquehanna. Here the output of water power in Maryland decreased from 179 176 000 kWh in May, to 97 141 000 in June—a drop of almost one-half. On the other hand, the steam power production in Pennsylvania increased from 492 004 000 to 575 027 000 kWh, thus largely compensating for the deficiency of water-power in the interconnected lines. For the first six months of 1929 the average amount of electricity generated by water power in the U.S.A. was 38⅛ % of the total, compared with 41 % for the corresponding period last year, and 39½ % for the whole of 1928. In England the small percentage of hydro-electric to steam

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stations makes this matter of little more than academic interest. But the big hydro-electric enterprises abroad in which British electrical engineers are interested, such as the great new £4 000 000 water-power project on the Perak River in Malaya, bring the matter into the practical arena.

The New I.E.E. President.

In electing the distinguished engineer-in-chief of the General Post Office as its President for the year 1929–30, the Institution of Electrical Engineers has effectively emphasised its approval of the knighthood recently conferred upon Col. Sir T. F. Purves. The choice is also of interest as indicating a continuance of the policy of drawing succeeding Presidents from different fields of electrical work, thus putting the leadership of the Institution on as wide and representative a basis as possible. Last year the Institution made the uncommon choice of what Lt. Col. K. Edgcumbe himself delights to call "a mere manufacturer," and well has its prescience been rewarded. While the selection of an engineer who has distinguished himself in the realm of electrical communication is not so rare an event, it is seven years since this important side last found direct representation in Mr. Frank Gill. At a time when so many of us are engrossed in the problems of the heavy side of the industry, this appointment serves to remind us that the problems and progress of what used to be called "weak current engineering" are every bit as fascinating and important.

Double-Edged Reparations.

We are not concerned with the political issues involved in the reparations problem which has been so publicly discussed at the Hague, but one aspect of it is, if correctly reported, of distinct interest to the British electrical industry. As part of its reparations in kind to France, Germany has been instructed to erect a great cinema film producing centre, designed to rival Hollywood, on a site between Marseilles and Nice. This work, which will probably cost some thirty million gold marks, will include the provision by German electrical firms of the very extensive electrical equipment needed for studios equipped for the production of sound films. This not only gives Germany a splendid opportunity to demonstrate the efficiency of her studio electrical equipment and practically ensures a continuity of orders—*not* on reparations account—for repairs, replacements and enlargements of the plant, but also deprives British manufacturers of the chance of meeting French requirements in this field, either now or in the future. Other examples of this double-edged competition in the electrical field are not difficult to find, and the irony of the situation only increases with appreciation of the fact that these reparations deliveries are getting German goods into markets which, in the past, have received the bulk of their import requirements from Britain.

Municipalities and Power Companies.

In making comparisons between electricity supply in this country and in the U.S.A. we tend to overlook the fact that the conditions vary in many respects. Here, municipally-owned power stations are in a decided majority, and very rarely do we hear of a municipality selling its undertaking to a company. In the States, however, there are, according to the N.E.L.A., actual records of 1 440 towns with a total population of 2 999 615, where municipal operation has disappeared in favour of company undertakings. It is also stated that a further 498 municipal systems, serving a total population of 1 603 864, which at one time operated their own plants have now sold or scrapped their generating plant, and are now buying bulk supplies from companies.

Marine Speeds.

The intense public interest shown in the recent performances of the "Bremen" and the "Mauretania" in further reducing the time necessary for crossing the Atlantic suggests that the big electric liners now building here will, when completed, command a sufficiently widespread interest to afford a great stimulus to the development of electricity for propulsive as well as auxiliary purposes. Whether we can look to one of these electrically propelled ships to establish a new time record for the crossing remains to be seen, especially as the White Star Line, whose 60 000 ton electric liner is now building at Belfast, has in the past aimed at comfort for passengers rather than high speed. It is more than likely, however, that an electrically propelled vessel will surpass the feat of the German liner.

London's Telephone Jubilee.

Exactly fifty years ago, the first telephone exchange in London was opened by the Telephone Co., Ltd. It was established with about half-a-dozen subscribers, and was housed at 36, Coleman Street, the first authentic home of the public telephone service in London. To-day, the number of London subscribers is nearly 650 000, and the total number of subscribers in Great Britain was, on May 31st last, 1 775 879. Several private lines were already in existence in 1879, one of the first being installed at Chislehurst. The switchboard used at Coleman Street was of what was known as the "Williams'" type. It consisted of an upright connecting board with two separate tables in front for the operators. The venture soon attained popularity, and before the end of the year two further exchanges, one at Leadenhall House, and the other at Palace Chambers, Westminster, were opened. In the following January there were some 200 subscribers to the Company's system. Actually, the honour of possessing the first telephone exchange opened in Great Britain—though not strictly a public one—goes to Scotland. The "Glasgow Medical Telephone Exchange" confined, as the name implies, to doctors, chemists, hospitals and similar interests, was opened in March of the same year. It was quickly followed, in Glasgow, by "Legal," "Stockbrokers," and "Commercial" Exchanges, at the outset independent of each other, though ultimately means were afforded for intercommunication between the four groups. Manchester, Liverpool and Edinburgh all opened telephone exchanges in October, 1879, and Birmingham followed in December of the same year.

Rural Automatic Telephones.

A feature which is likely to encourage electrical development in the rural areas is the extension of the telephone service, which is now going ahead satisfactorily since the introduction of the special type of automatic telephone designed to meet the needs of rural districts. Already this year fifty automatic rural exchanges have been put into operation, and a further hundred have been authorised and will shortly be opened. The smaller maintenance costs of the automatic exchanges make it economic to serve areas which would have been unremunerative with the old manual exchanges, and, as in these comparatively sparsely-populated areas the whole district is given the automatic system at the same time, the difficulties arising out of a simultaneous working of the old and the new systems are avoided.

The Electrical Apple Cart.

There have been strong and persistent rumours current this week that Sir Austen Chamberlain and Sir Laming Worthington-Evans have been invited by Lord Birkenhead to join the board of the Greater London and Counties Trust, of which he is chairman. At present we are unable either to confirm or to deny the report, but if it is true, one of the forecasts in Mr. Bernard Shaw's latest play—that in the near future politics will be left to those who are not clever enough for anything else—will be practically realised. Whether or not it is, as a general rule, good for the electrical apple cart to have its load increased by the addition of ex-politicians and ex-Cabinet Ministers is a question which Mr. Shaw, with his Power-mistress-General, does not answer. Perhaps he thinks that time alone will decide this point.

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OVERHEAD LINE PROBLEMS.

Factors Affecting the Painting of Transmission Line Steelwork—Influence of Flexibility of Supports on Mechanical Strength of Lines.

By THEODORE RICH, A.M.I.E.E.

CONTINUING my selection of overhead line constructional, maintenance, and operating problems discussed at the recent Paris Conference on Large Electric Systems, attention may be drawn to a report on the painting of transmission line steelwork which was presented by Mr. Orsero. In this report the author develops a formula by which if P is the price of paint per kg., C its covering power in square metres per kg., N the number of years of protection that can be expected, and T the cost of painting per square metre, then the cost per square metre will be

$$E=\frac{P}{C\times N}+\frac{I}{N}=\frac{I}{N}\left(\frac{P}{C}+T\right)$$

As C and N are denominators, the ideal paint will be the one that will last the longest with the thinnest coating. These factors are contradictory, and the best paint to use seems to be a type which will last twelve years; very thick paint will cost more to put on, as it tires the painters.

Consideration of the formula shows that long life for the paint is a much more important factor than price per kg. In practice, with three coatings on new ironwork, or two coats on well-cleaned old paint, a life of twelve years can be anticipated.

Rust develops on ironwork when in contact with moist air, and once begun, it continues, even when the iron is kept away from air. It is, therefore, most important for ironwork to be well cleaned before being painted. New ironwork is usually painted at the factory with iron oxide or red lead paint. Oil of good quality is not always used, and difficulty sometimes ensues after final painting, owing to such priming coats coming away.

Electrically-prepared lead gives paint a greater covering power than that of normal lead paint to the extent of 7 to 4. Crystallised iron oxide paints made of a very fine volcanic spangly ore are good rust resisters. Their composition is 90 to 92% Fe_2O_3, their covering power is 10 to 12 sq. metres per kg., and their colour is dark grey; they are being much used in France. Bituminous products often contain free acids; they are acted on by the sun, they are dirty to use, their price is low, but their life is short, and their black colour is not decorative, and it cannot be covered with light paint.

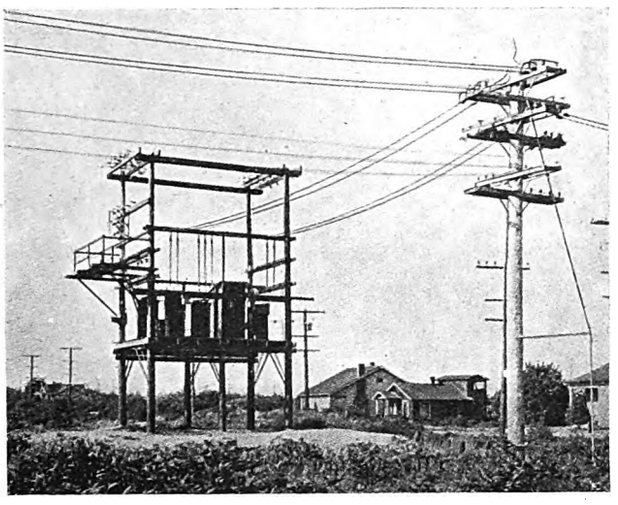
When arranging a specification for a contract for paint work, duration guarantees should be asked for; repainting should not usually be necessary before three years for one coat, six years for two, and ten years for three. Tests for covering power should be made on clean smooth iron sheets, each of at least 1 sq. metre surface; the brush and paint can should be weighed before and after use.

A 120 kV tower usually has 25 to 35 sq. metres of paint work per ton of steelwork.

Mr. Bornquist (Sweden) said that good paint work should last about twelve years inland and eight years near the coast. They had found in Sweden that first-class galvanising gave better results than the most careful painting. Structures made up with broad flange beams took paint much better than light angle or trellis work, and cost less to paint.

Posts and Towers.

Mr. Paul Ferrier presented a report on "The Influence of Flexibility of Supports on the Mechanical Strength of Lines." According to the author, most of the mechanical accidents to lines are due, not to insufficiently severe regulations or to lack of compliance with them, but to fortuitous circumstances which cannot be provided for within economic limits of cost, such as the falling of a tree or of a rock, a sliding of foundations on a hill side, the flooding of foundations, the breakage of a post from a blow from a lorry or from damage to the conductor made during erection.



A RURAL automatic sub-station used in the U.S.A. The two 13 kV pole-top switches connecting to either of two supply lines are equipped with selector control for automatic transfer of the load in case of failure on the normal supply. The outgoing 2 300 V feeders are equipped with voltage regulators and cross-arm mounted. The oil circuit breakers have an automatic re-closing device.

Regarding the influence of ice, the French regulations make no allowance for it except in mountainous regions, where in some cases a radius of 10 cm. (4 in.) has been met with, giving rise to much trouble. In matters relating to security, it is important to study the effect on the supports in case of the breakage of a conductor.

Examples are given showing that supports with a certain amount of flexibility are relieved of a material amount of strain in the case of a conductor breakage, whereas posts on each side designed for rigidity may be damaged, if not broken, by the strain, one alternative being to have the arms with less resistance than the support. It is pointed out that if no movement is allowed for, the cost of the support may become prohibitive.

Where long spans and chain insulators are concerned, the difficulties in the calculation of torsion and other stresses are discussed, the nature of the accident leading to the breakage of a conductor having a very material bearing on the stresses to be carried. Besides static stresses, supports can be subject to shocks due to the speed of movement of the conductor masses concerned when a breakage takes place. The effect of the insulator chains is to modify this. The shock is the greatest when the chain is very long and the tower very heavy and rigid. The effect, however, is diminished according to the inertia of interposing bodies.

Examples of Breakages.

An example was given of an accident on a line of 30 000 V with 6 conductors of 8 mm. dia. and 50 metres span, with rigid posts of small resistance. A rock of 2 cwt. fell on the line; the posts on each side were broken, but the conductor was not.

On a light line with three conductors of 3 mm. dia. and flexible centrifugally cast concrete posts, a tree fell, breaking a conductor in the next span; the pole between the tree and the broken conductor slightly exceeded its elastic limit and continued to carry the load.

Among means designed for the purpose of limiting stresses on supports are rotatable arms, or arms which will bend under excessive stresses.

It was also pointed out during the discussion on the paper that where Post Office lines or low tension lines are close up to secondary distribution lines at high tension, any material amount of flexibility of supports might give rise to highly dangerous contacts between the high tension and other circuits.

Mr. Darreus said that the question of articulated posts was still being studied. The foundations were the important point, as it did not matter much what happened to a bridge if the foundations had given way.

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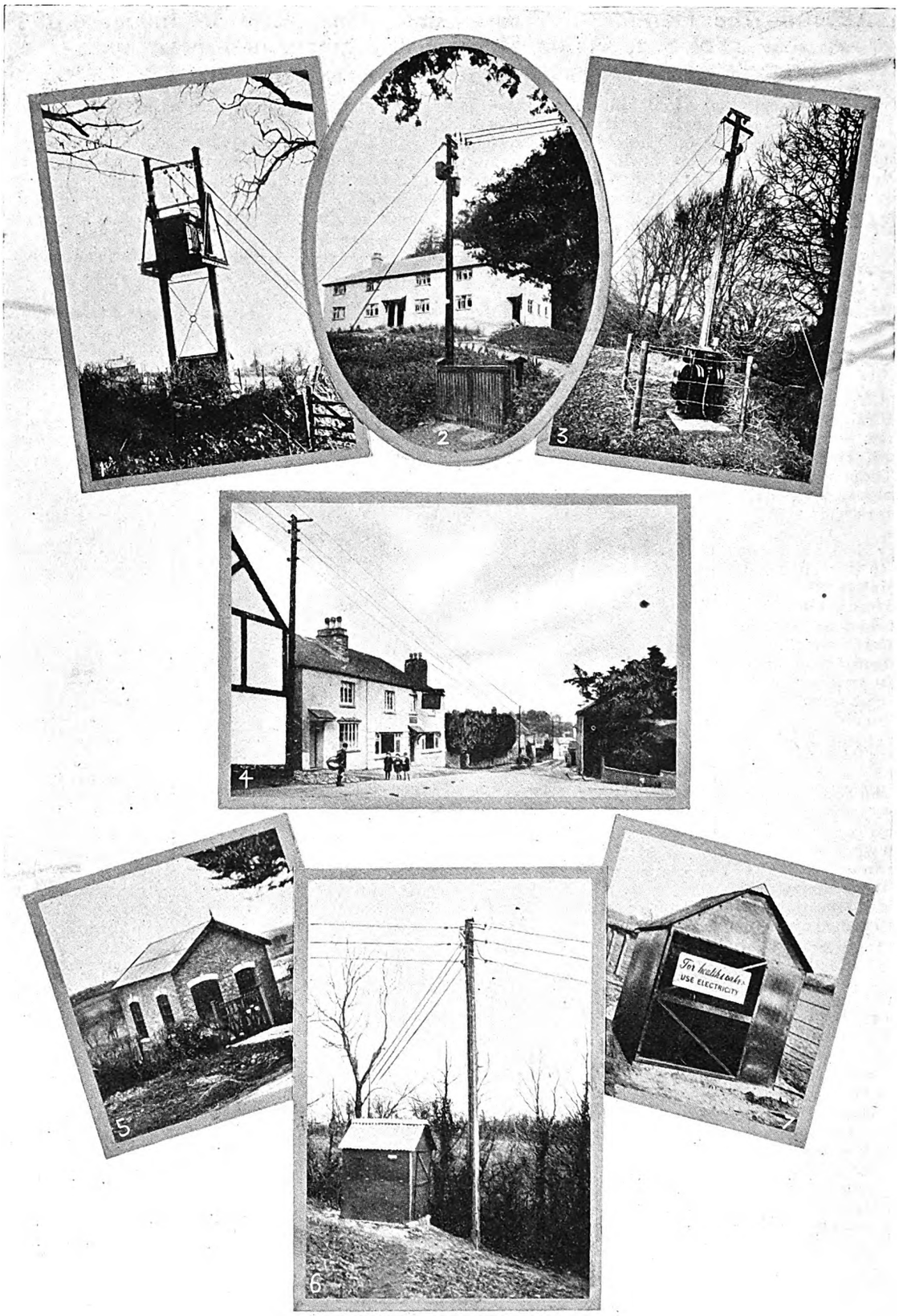

ELECTRICAL DISTRIBUTION IN RURAL AREAS.

THESE pictures, illustrating aspects of electrical development in the Torquay district, and reproduced by courtesy of the Torquay Electricity Department, show: (1) *A 75 kVA transformer bank at Highweek Village. The line is of steel-cored aluminium, 3-phase, 2 200 V;* (2) *Two 5 kVA pole-mounted transformers for supplying a group of four newly-erected labourers' cottages at Stoneycombe;* (3) *A 100 kVA transformer for the Shiphay Village supply;* (4) *Low tension distribution in a village street at Ipplepen;* (5) *The main distributing centre for rural supplies;* (6) *A 100 kVA transformer "sub-station" in Barton Village; and* (7) *A rural sub-station of the portable type at Milber.*

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ELECTRIC POWER SYSTEM DEVELOPMENT.

Providing for Future Expansion—European and American Practice Contrasted—Positive Safety for the Public—A System with True Neutral Point.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E., Fel.A.I.E.E.

ONE of the most important problems of transmission and distribution system design and installation is to avoid limiting the maximum possible development of the whole; in other words, to instal that transformer system allowing of the absolute maximum development and most economical expansion of the system and lines connected thereto without making any of the existing transformers obsolete, and without changing line insulators.

It is very rare for any system to require more than 100% increase in line voltage, but, a vast number of systems would, at the present time and in the near future, welcome such a relief and opening for expansion and future electrical development, provided the 100% increase in line voltage did not increase the voltage stress on insulation more than 15% above the ordinary change from delta to star, which latter system permits of only 73% increase in line voltage. As such a system is not actually in being, and is the subject of a forthcoming article, it is evident that we are not following out the principles referred to here.

Designing for the Future.

As a result of the present-day impetus in electrical development we are likely to record an unprecedented electrical expansion in the next few years sufficient to bring about serious reaction and unwarranted expenses, etc., if we have not been, and are not now, specially careful in our designs and installations. A careful consideration of the transformer system and line insulation to put in, may avoid many future complications as well as heavy expenditures and losses. It is, of course, customary for engineers to design for future loads with an eye to the future development, but, have we installed and are we installing that system capable (at some future date) of being converted to an equally reliable and safe system offering the least possible losses and expenditures, as also a minimum of interruptions to service?

In this country and in Europe, the general practice up to the present time has been the installation of polyphase core type transformers and the star-connected system. In other parts of the world, especially on the American Continent (U.S.A. and Canada in particular), the general practice has been the installation of single-phase transformers and the delta-connected system. A careful study of these two distinct practices, which revolve around other questions inter-related with each system, will reveal some of the reasons why one country enforces (by strict laws based on sound judgment and experience) *multiple earthing* of the neutral point or wire, and, why the other old-established practice asks for a perfectly insulated system throughout, or a system with *one* earth connection at the supply end only. In this country we are prone to blame the P.M.-G. for certain past and present unreasonable restrictions, but, can we claim to be entirely free from originating the major causes of interferences and troubles and so forth?

Our first duty is to instal and operate a system that not only best meets the requirements referred to above, but also provides *real* and truly positive safety for the public. The so-called "cure" as provided at present does not cure. With

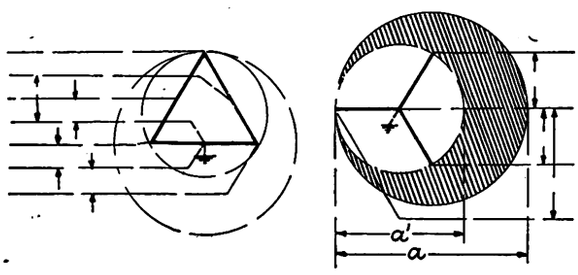

Fig. 1.—The star-connected four-wire system compared with the commonly used delta-connected 4, 6 or 7-wire system for general distribution.

the present law and methods of installation, the real cure is largely left to the consumer who knows nothing at all about the laws or the installation. That is to say, safety to life largely depends upon the consumer, yet specially trained engineers knowingly expose and leave the layman to a hazard and danger *they can positively cure*.

In view of the fact that the consumer is not allowed any say in the choice of system, or the minimum operating secondary voltage of 230 V, why levy higher costs, heavier losses, greater dangers, and shorter life of lamps, etc., against him or her, simply for the purpose of satisfying the requirements of the electricity supply authorities in the matter of initial reduced copper costs and circuit operating losses on load, which do not concern nor apply to the consumer? If the consumer knew, and it is our duty to have him know, that the 115 V lamp circuit is better for him than the 230 V circuit, the authorised

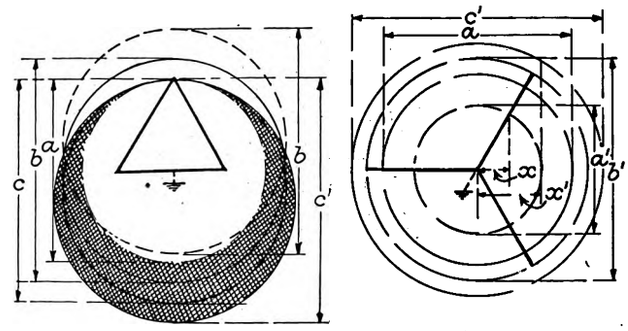

Fig. 2.—Showing the relative positions of maximum voltage to earth and the magnitude of maximum voltage to earth from one earthed point, respectively, for the different systems. References :—

(*a*) Relative maximum voltage to earth for the *delta* system; (*b*) Relative maximum voltage to earth for the *star* system converted from the delta system; the line voltage is now 73 per cent. higher (the same as *b'*); (*c'*) Relative maximum voltage to earth for the system proposed† by the writer, converted from the delta system; the line voltage is now 100% higher, but the maximum voltage to earth is no higher than 11·5% that of the higher voltage *b* and *b'* star system, and a true neutral point is provided.

(*a'*) Relative maximum voltage to earth for the star system where the line voltage is that of the delta system of (*a*). In this case the maximum voltage to earth is *x* volts lower than the delta.

(*b'*) Relative maximum voltage to earth for the delta system (*a*) converted to the higher voltage star-connected system.

† Patents pending.

government department should provide for his protection in all its aspects. For instance, in general, the *higher* voltage installation costs more, the lamps cost more, the life of lamps is shorter, the danger to life is greater, and the energy consumption per gasfilled lamp is much higher than that of the 115 V lamp. All these are against the consumer's interests, etc., because of the system installed, the law, restricted practices, and the consumer's lack of knowledge.

The least of the several possible dangers is from direct contact with the (230 V) non-current carrying part of a fitting, which said part should always be effectively and properly earthed. This hazard can never be overcome until a law is passed to the effect that the neutral wire of every installation be *effectively and properly earthed*. To have one independent earth-connection for each fitting, and isolate it entirely from the earthed neutral wire, is asking for trouble. To have one earth connection at the supply end only, and then independently earth each fitting on consumer's premises is not much short of laying a danger trap for the consumer to fall into at some time or other. These practices are not cures.* Are we to blame the consumer, the P.M.-G., the installation, the system, the law, or ourselves?

Third Harmonics.

It is common knowledge that a three-phase core-type transformer has the advantage of third harmonics, and that such a transformer is rarely connected in delta-delta; on the other hand, the delta connection eliminates third harmonics from the line and it is the connection and system admirably suited to secondary distribution. The delta connection allows of the most flexible and adaptable system, balanced currents, widest use of single-phase units, and a system offering the greatest future expansion for the least future cost and losses, etc. Perhaps the chief objection to the delta system is that it is without a true neutral point; the proposed system has overcome this and other objections.

With a three-wire star-connection thirdha rmonic voltages may exist between the line phase-conductors and the neutral

* Discussed at greater length in the writer's forthcoming book, "Electricity Supply Transformer Systems," now in the press.

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or between the line conductors and earth, but not between the line phase-conductors; on the other hand, third harmonic currents do not exist in symmetrical three-phase three-wire transformer systems, i.e., in the magnetic and electric circuit of the transformer system with the common three-phase transformer operation. However, with a four-wire star-connection the third harmonic voltages from line phase-conductors and the neutral or between the line conductors and earth are partly (perhaps completely) suppressed, and third harmonic currents may flow through the line phase-conductors and the neutral conductor from the neutral point.

With a three-wire delta-connection third harmonic voltages in the line phase-conductors and between them are completely suppressed, and the third harmonic current cannot flow in the line phase-conductors and between them, but will circulate around the regular closed polygon (around the closed delta). With the three-phase four-wire symmetrical system proposed by the writer, the fourth wire and neutral point is in the main circuit of the closed delta. This is important and advantageous in view of the fact that the four-wire star-connected system provides that a connection be taken from the neutral point in such a manner as to allow third harmonic current to flow, and third harmonic voltages to neutral may not be completely expended in forcing the currents around the circuits.

The star-star system has no further expansion reserve, and usually requires a delta-tertiary winding. A conversion from delta to star at any one or more points of a system will change the phase relations, and, depending on the circuit or system and its extent and magnitude, may cripple parallel operation of all other parts of the same system. Due to reaching the full carrying capacity of the connecting lines of a transformer system, a decision on the conversion of a delta to a star-connection depends on whether the existing system is a delta-delta, a delta-star or a star-delta; in any one case the existing conditions will be improved and the future requirements more economically met than in the case of an existing star-star system change to a higher voltage.

For future economical development of the distribution system and for other reasons it is fortunate that many existing systems possess a delta, or are connected in delta-delta. The extra investment for delta-connected transformers has in every case proved the greater adaptability, flexibility, etc., of that system, and, now that many connecting lines are operating at their full current-carrying capacity for an absolute minimum amount of expenditure, the delta system possesses the advantage of economic future development. The initial first cost of the star system is, of course, cheaper than the delta. For equal carrying capacity of the connecting lines, the star-star system cannot be compared with the star-delta or delta-delta, which two latter (especially the delta-delta) allow of the maximum possible *carrying capacity of the whole* and not a part of the whole, which the star-star system provides for. There should never arise a necessity to convert a delta-star or star-delta system to star-star.

From the time a transformer is bought, the endeavour is to make it pay for itself as soon as possible; hence, the most adaptable unit should prove the most valuable. The carrying capacity of connecting lines (the primary and the secondary lines) are relatively more important than the particular size of the transformers connected thereto because their duplication is usually simpler and cheaper than the duplication of lines. Almost without exception, transmission and primary distribution lines should be so designed and constructed that they, and the existing transformer system connected thereto, are not limited in their expansion to "*full development.*" The most adaptable transformer is the single-phase unit, and the transformer connections allowing of full development of the whole system are the delta-delta—delta-star or star-delta coming second. In the writer's proposed system the delta connection (the closed polygon), shown in Fig. 1, is never broken for a 50% or a 100% increase in line voltage.

The Delta-Delta System.

When the connecting lines of the star-star system attain their full carrying capacity, the whole transformer system and line insulation have as a general rule attained their full development, the next in order is the delta-star, and the system with a maximum of reserve and flexibility and adaptability and so forth, is the delta-delta. In a further article it will be shown that the delta-delta system allows of a plurality of future changes to a higher (standard) line voltage and permits of the full use of all existing transformers whether they be delta or star connected, and use of the same line insulators, whereas, the star-star system will permit of one change to a higher line voltage, but, in so doing, all existing transformers become obsolete and all line insulators must be changed, etc.

Several reasons exist for changing from one standard voltage to another standard, but the main reason often given is that of increasing the kVA carrying capacity of the connecting lines (primary and/or secondary). Obviously, whether we change from delta to star or from star to delta or star we must increase the kVA capacity of the existing transformers if we desire to make use of the increased kVA carrying capacity of the lines connected thereto. The star system is worse off than the delta system because the increase in line voltage makes all existing star-connected transformers obsolete. If the existing system is a delta-star or a star-delta, a conversion of the system to star-star will usually require additional transformer capacity in the form of delta-tertiary windings, as well as additional transformer kVA capacity for taking care of any greater load; moreover, three additional phase-units are required for the star conversion, whereas for the writer's proposed system only the half windings of two single-phase-units are required for a 50% increase in line voltage.

Increasing Line Voltage.

The change in voltage from delta to star is usually not from one standard to another standard. Secondary distribution will usually allow of 100% increase in line voltage without considering changes in line insulation, and a 100% increase in line voltage usually meets the change from one standard to the next, but not so when changing from delta to star, which offers a 73% increase in line voltage; this same reasoning also applies to the primary distribution voltage up to about 3 300 V. However, for the higher voltages up to about 33 000 V the line insulation must be considered. For still higher line voltages, up to 200 000 V or higher, the best standard change is 50% increase and not 57·7% increase. The 50% increase in line voltage is better for existing line insulators, better meets the next higher voltage *standard*, sufficiently serves the needs for increased line carrying capacity, necessary voltage regulation, etc. The following table serves to illustrate the odd change in voltage when converting from delta to star, also, when changing to the system proposed by the writer, which offers a 100% increase in line voltage for less than 12% increase in voltage to earth compared with the conversion from delta to star, which also has 100−73=27% higher line voltage as compared with the star.

Voltage of the delta and "V" system.		Conversion from delta to star.		Writer's proposed system.		
SECONDARY DISTRIBUTION—	100	100—	173	100—	115—	200
(These voltages will always	105	105—	182	105—	120—	210
allow of a 100% increase,	110	110—	190	110—	125—	220
and, the increase gives a	115	115—	200	115—	130—	230
better standard than the	120	120—	208	120—	138—	240
star conversion from delta.)	200	200—	346	200—	230—	400
	210	210—	364	210—	240—	420
	220	220—	380	220—	250—	440
	230	230—	400	230—	260—	460
	240	240—	416	240—	275—	480
	250	250—	430	250—	280—	500

(Converting the delta system to the writer's proposed system to provide for a 100% increase in line voltage will create a small percentage increase in the maximum voltage to earth above that of the delta shown in Fig. 1, and will require two additional single-phase units whence the kVA capacity is automatically increased to answer this cause of line voltage increase. This increase in voltage to earth is not objectionable and increased kVA capacity is absolutely necessary for all systems.)

PRIMARY DISTRIBUTION—	2 000	2 000—	3 460	2 000—	2 300—	4 000
(These voltages will gener-	2 200	2 200—	3 640	2 200—	2 500—	4 400
ally allow of a 100% in-	2 300	2 300—	4 000	2 300—	2 600—	4 600
crease provided the increase	3 000	3 000—	5 200	3 000—	3 450—	6 000
in maximum voltage to	3 300	3 300—	5 700	3 300—	3 800—	6 600
earth is not greater than	5 500	5 500—	9 500	5 500—	4 600—	11 000
15% that of the conversion	6 600	6 600—	11 400	6 600—	7 600—	13 200
from delta to star—this	11 000	11 000—	19 000	11 000—	13 200—	22 000
increase gives a better standard than the star conversion from delta.)						

(A common practice of the primary distribution line is to over-insulate by 20% or even 50%; this, therefore, permits general use of the writer's proposed system without change of line insulators.)

HIGHER VOLTAGE, TRANSMISSION—	22 000	38 000	33 000
(These voltages will always	33 000	57 000	50 000
allow of a 50% increase,	44 000	76 000	66 000
provided the maximum	66 000	114 000	100 000
voltage to earth has not	88 000	152 000	132 000
been increased: this in-	100 000	173 000	150 000
crease gives a better	110 000	190 000	165 000
standard than the star con-	132 000	228 000	200 000
version from delta.)			

(Converting the delta system to the writer's proposed system to provide a 50% increase in line voltage will not increase the maximum voltage to earth above that of the delta shown in Fig. 1. None of the existing transformer connections need be disturbed, and three or four of the six or seven wires can be dispensed with. Only two additional half single-phase windings are required, hence the change-over of e.h.t. systems can do with less, or no more additional, windings than the star conversion required to satisfy the increased kVA capacity of the connecting lines.)

The common delta-connected distribution system for combined light and power service conforms, as a general rule, to that shown in diagram on the left of Fig. 1. This earthed-return method (requiring from four to seven wires) is the best practice so far employed in any country.

(*Continued on page* 224.)

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LIGHTNING TESTS ON FULL SIZED INSULATOR STRINGS AND TOWERS.

The Equipment Used at a Novel Outdoor Laboratory—Cause of Low Flashover Voltages—Staying Wooden Structures.

AN interesting account of an outdoor laboratory designed and equipped to carry out tests on insulator strings and line-supporting structures was given by Mr. A. O. Austin, engineer of the Ohio Brass Co., Akron, Ohio, at the recent Paris Conference on Large Electric Systems.

The space allotted for testing is an area about 1 100 ft. by 500 ft. Structures of various types are placed on trucks on rail tracks and can be run into any position required, and anchored if necessary. The main transformers are placed at one end of an alleyway, down the centre of which run the connections.

The plant used includes 3 transformers, each of 750 kV, of the same type, a 400 kV transformer, a portable 10 000 kVA 1 200 kV oscillator, two 5 000 kVA 850 kV oscillators, one of which is arranged for super-imposing high frequency on normal frequency, a series of 11 generators from 125 to 1 000 kVA to

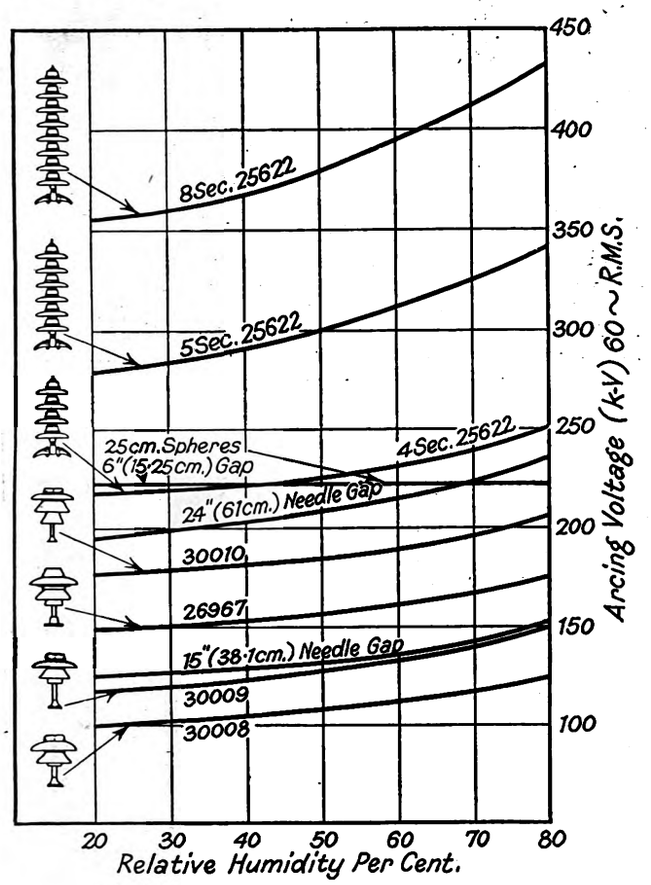

Fig. 1.—Tests on insulators with variations in humidity.

give from 12½ to 500 cycles per sec., a Poulsen arc set and loading coil for generating continuous wave energy, a series of sphere gaps, the largest having spheres of 150 cm. dia., a Dufour oscillograph, and two Klydonographs.

There is a large variable air condenser for storing energy for impulse tests, and more than 50 different transmission line structures of steel and wood as used on many important lines, with a collection of auxiliary apparatus. Tests can be made on individual structures at normal frequency under a damped wave or under an impulse, either singly, or with several structures in multiple.

Arrangement of Transformer Bank.

The transformer bank is arranged in a special way. Instead of exciting the low tension coils off a common system each transformer is insulated and excited by an insulated generator, driven through an insulated shaft by a synchronous motor.

By this means the full output of each 750 kVA transformer is obtainable, the combined kVA being the sum of all the transformers in series. When the transformers are in chain connection the kVA combined output is that of the smallest transformer of the group, the regulation being exceedingly good with the new arrangement; Fig. 5 shows the transformers; Fig. 2 the system of multiple excitation.

The system of synchronous motors can be phase-operated

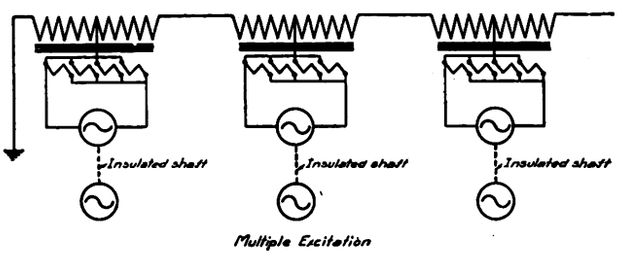

Fig. 2.—System of multiple excitation.

independently. Relay problems can therefore be studied. Various transformer connections can be used—Delta, open or closed Y, grounded or ungrounded, T-connected or quarter-phase. As the generators are insulated excitation is provided by storage batteries placed on balconies around the main transformers.

The transformers are of the shell type with the centre of the windings grounded to the tanks. The bank has been operated to develop a crest voltage of over 3 300 000 V to earth. At voltages over 2 000 000 to earth it is difficult to prevent flashovers from leads or other equipment. The transformers are mounted on tile piers of insulating porcelain (being like generators on the Thury system in this respect).

Field Regulation.

Fig. 4 shows the condenser cage, two impulse gaps and the transformers in the background. Fig. 3 is a diagram of equipment used in running impulse or artificial lightning tests. The transformer bank is used to charge the large air condenser. By means of a master control switch the generator fields are regulated so that the transformer voltage builds up until a flashover of the impulse gap takes place. A synchronous switch operated by the generator shorts an impedance a few per cent below the flashover voltage of the impulse sphere gap, so the gap discharges on this alternation. This makes it possible to determine the polarity of the impact and to operate synchronous switches for the taking of the cathode ray oscillographs for photographing and making other measurements. By means of this arrangement photographs can be taken in the strongest daylight, and working hours are greatly extended, and inconveniences of night testing avoided. It is possible not merely to control the polarity of the firing wave, but also to synchronise the operation of the cameras, etc.

From theoretical and from available information there is

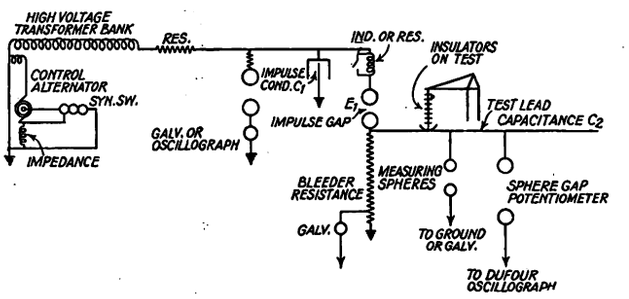

Fig. 3.—Equipment for impulse tests.

good reason to believe that while wave points may vary to a considerable extent, the tail of the wave on the transmission line will be rather long. The potential operating for a longer time on the tail of a wave will to a large extent determine the flashover of the insulator.

Tests tend to show that it is a mistake to arrange strings

(*Continued at foot of page* 219.)

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TESTING FULL-SIZED INSULATOR STRINGS AND TOWERS.

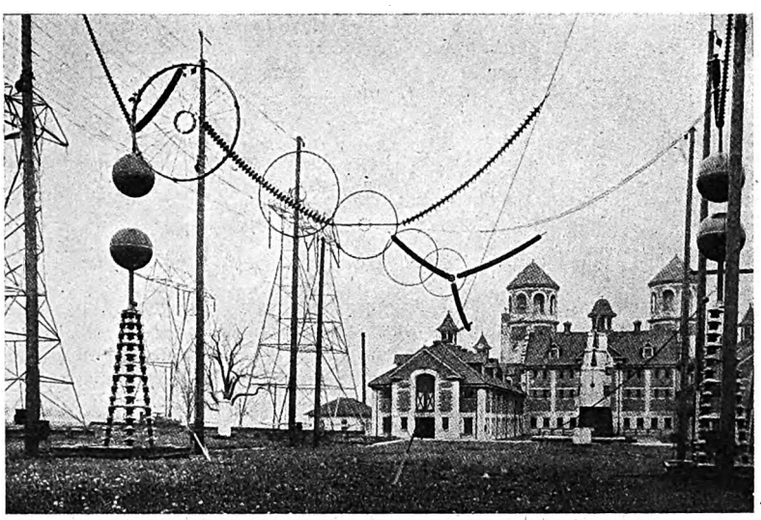

Fig. 4.—A view from the test field looking into the transformer court (shown in greater detail in Fig. 5), and showing the condenser cage and two of the large impulse gaps. On the left are the 220 kV towers for the Conowingo, Hydro-Gatineau and Public Service of New Jersey lines.

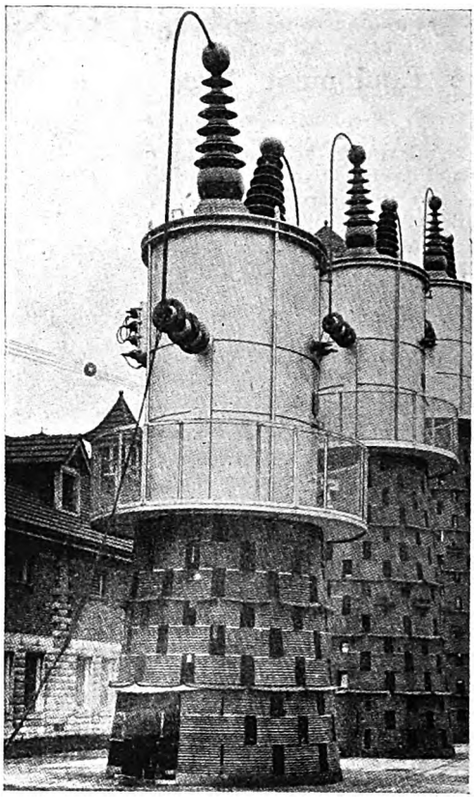

Fig. 5.—The main transformer banks are arranged for multiple excitation and full voltage to earth. They are built on porcelain tile piers. The Allis-Chalmers shell-type transformers are tested to 900 kV each.

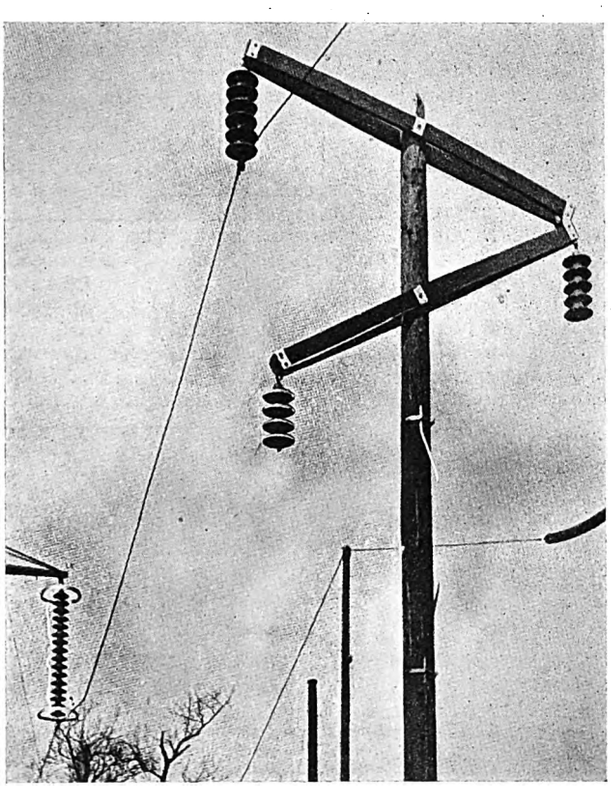

Fig. 6.—A flash-over under positive impact during a comparative test of a 6-section insulator mounted on a wood pole and a 16-section string equipped with 24 in. by 30 in. rings. The distance between the rings was 74 in.

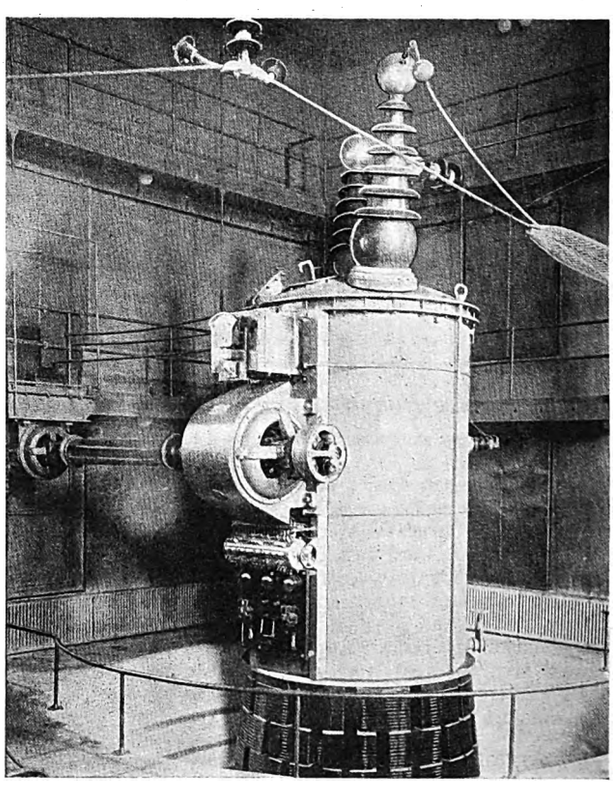

Fig. 7.—A view of the large transformer employed for normal frequency tests up to 800 kV to earth. The equipment comprises an Allis-Chalmers transformer and General Electric sine wave generator operated through an insulated driving shaft.

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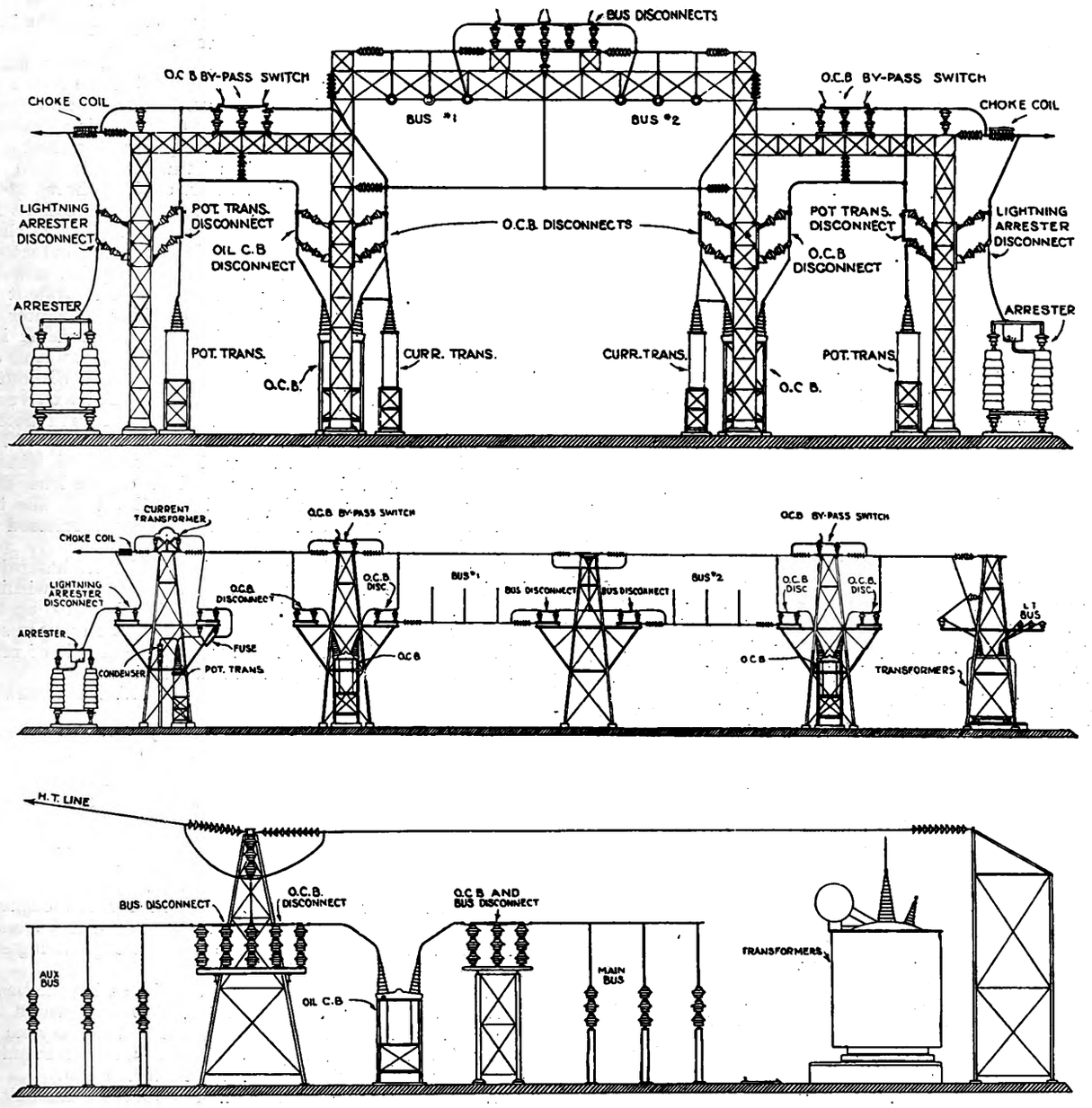

H.T. OUTDOOR SUB-STATIONS.

THE advantages of building outdoor sub-stations in standardised sections are illustrated in the above drawings. By suitable arrangements framework members can be standardised on which apparatus of various types can be mounted. Three styles of sub-station arrangement are shown above. The first is what might be termed a built-up type ; the second the sectional ; and the third the flat or low-level type. The Star-Delta Co., of Chicago, who have developed this type of equipment, can, by the use of a rotating bus selector switch, reduce the amount of dead conductor. The number of insulators can also be reduced. With the aid of standardised frames sub-station structures can be ordered from stock and erected with great rapidity.

LIGHTNING TESTS ON INSULATORS.

(*Continued from page 217*)

with a section length too long for the insulation in the disc, as a very low flashover voltage may follow. Increased tower clearance is necessary, and increased reactance from increased spacing results.

Fig. 6 shows the flashing over of a 16 section string on a steel structure while a 6 section string on a wood post remains intact, positive impact with 1 230 000 V crest. The wood post is fitted with a protective gap.

It is often necessary to stay wooden structures. Where the stay is not insulated the increase in flashover of wood as compared with steel is lost ; wood stays have therefore been developed. The author gives data regarding the operation of impulse tests. Oscillator tests show that a structure that will give good results under them will give even better results under an impact. Tests have shown that an insulator string that flashes over at 665 kV with steel hanger arms, has stood 1 015 kV with wood cross arms.

Many interesting tests have been made at the laboratory, not merely regarding research, but also with the object of increasing the flashover voltage of existing lines.

The Ohio Brass Co. also operates two indoor laboratories, one adjoining the test field, the other at the insulator works. Fig. 7 shows the transformer at the latter. It is also insulated by porcelain slabs. The generator is of the General Electric Co.'s (U.S.A.) type, to produce sine waves, it is driven by an insulated shaft. The low voltage side is provided with a number of coils and a drum controller, so that but little variation is necessary in the generator voltage. Fig. 1 shows tests on insulators with variations in humidity.

In the new laboratories an attempt has been made to carry on a class of work very desirable for transmission line operation, but which cannot be carried out with advantage in other laboratories.

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BOOK REVIEWS.

Operational Circuit Analysis. By VANNEVAR BUSH, with an Appendix by Norbert Wiener. (London: Chapman and Hall.) Pp. x+392. 22s. 6d. net.

As a definite attempt to bridge the chasm so often separating the engineer from the pure scientist, this book is deserving of high praise. The mere mention of mathematics to many present-day electrical engineers is so often sufficient to produce a distinct air of boredom that an effort to deal with problems involving mathematics in a way that will be intelligible and interesting to the non-mathematical reader is distinctly desirable. As the author—who is Professor of Electric Power Transmission at the Massachusetts Institute of Technology—is careful to explain, he writes as an engineer without any pretence of being a mathematician, though, as he also points out, he has received help from mathematical friends.

Whilst acknowledging the value of the "shorthand" processes such as are used to perform the algebraic work necessary for the symbolic solution of alternating current networks in the steady state, the author maintains that this is computation, and not analysis, and that in order to extend the operational method to apply it with freedom and safety, and to save time by the employment of its directness and simplicity on new problems, it is necessary to have at least some grasp of the classic mathematics of which it is the working tool.

As this entails a grasp of Fourier analysis and of its treatment in terms of the complex variable, Prof. Bush regards the operational scheme as a good line of approach, and therefore includes a brief survey of certain essential parts of the classic treatment. While there is no claim for completeness in this survey an attempt is made to include all the essential features of the Heaviside type of operational analysis, and to show their dependence upon the classic processes which constitute their background. It is appreciated that this may make the reading difficult for students unfamiliar with certain branches of mathematics, but if it demonstrates the desirability of extending their mathematical equipment along the lines indicated it will serve a useful purpose.

B. L. C.

Electromagnetic Problems in Electrical Engineering. By B. HAGUE, D.Sc., Ph.D. (Oxford: University Press; and London: Humphrey Milford.) Pp. xiv.+359. 30s.

Electrical engineering is a powerful complex of physics, mathematics and engineering science. No branch of engineering practice is closer to basic principles, and in none has the rapid advance in the size of machines brought out the need for still closer investigation of the deeper problems of the subject. These fall into two groups, dealing with the distribution and influence of magnetic or electric fields respectively.

Dr. Hague's book is a practical study of the former, but much of it is applicable with slight modifications to problems of flux distribution in insulation. It strikes a new note in the technical literature of magnetism by its range, the elegance of the methods, and the results obtained. It deals only with the fields due to current-carrying wires in the presence of magnetic masses, and to the mechanical forces caused by their reaction, but it will be recognised that this covers most of the problems of the electromagnetic machine except those of voltage generation. There is certainly no book in technical electromagnetism which deals so fully with the first principles of the subject in their bearing on practical problems. It is, as the author says, "an attempt to develop the theory of dynamo electric machinery and allied apparatus as a branch of electromagnetic theory" to the same extent that the theory of, for example, wireless telegraphy has been developed from the same elemental laws.

In the early chapters these laws are clearly stated and the definitions carefully set out. The general theory of the magnetic field of a current is given, and a note made on boundary conditions at an interface. This is carried further in Chapter IV, using the method of images in surfaces of infinite and finite permeability, the method being that of Dr. Searle, from which, in a sense, the book began. Simple cases of electromagnetic images in circular cylindrical surfaces with finite permeability are considered, and the boundary effects of fields due to wires embedded in concentric circular cylinders are treated at length by the use of Fourier's Series. The theory of the mechanical forces on linear conductors near iron and the general theory of mechanical stresses in magnetised media and conductors embedded in a plane-faced iron mass complete the first part of the book.

The second part deals with applications, all of great interest. One after another of what have been considered until recently almost insoluble problems of the magnetic fields of currents in the presence of iron boundaries are treated by the methods of Part I, and the mathematics are not difficult.

Chapter VII, on the forces on conductors near plane iron boundaries, is valuable in connection with the forces on the end windings of machines. The next important chapter is on the case of fields in the gap between concentric cylinders, and is that of the induction motor or of the non-salient dynamo electric machine in its simpliest form. This is again treated by Fourier's Series for single wires, current sheets, coils and groups of coils, leading to the well-known expressions for the distribution factor due to such a group. Following the same logical analysis the electromagnetic forces or conductors in a concentric air gap are given. From this point onward the problems grow in difficulty and fulness of treatment of the previous cases but with finite permeability. Chapter XII is an extremely interesting examination of the fields in conductors of various shapes of sections. These problems cannot be solved by the Hele Shaw liquid flow method without much difficulty, but they yield to the analysis and give curves which are as useful as the analogous de Venant's curves of mechanical strain in similar sections. Rogowski's treatment of leakage fields in transformers with various groups of winding is summarised, and important practical expressions derived. Roth's analysis by Fourier's Series of the fields due to conductors in slots, and of transformer leakage, is referred to and examples given.

The book closes with a discussion of the mechanical forces in simple practical cases between currents and within conductors. It should be in the hands of every up-to-date designer of electrical machinery, and to the advanced student of electrical engineering it is a valuable example of precision of method, clear writing and lucid solutions.

W. M. THORNTON.

Groundwork of Calculus. By WILLIAM HUNTER. (London: University Tutorial Press.) Pp. 220. 5s. 6d.

The elements of the calculus are being taught at a much earlier age than previously, and questions thereon are now included in the more advanced mathematics papers of the London Matriculation and similar examinations. This and similar books are the direct result.

The ground covered is considerable, and the applications mentioned cover all that is required for the elements of mechanics and physics. In fact, the ground covers most of what will be required by the average engineering student for the greater part of his studies.

Since the proof of the pudding is in the eating the book was lent to a beginner in the calculus, who commented that it laboured too long on elementary facts which everyone should know (at any rate, anyone of matriculation standard in elementary mathematics) and was therefore dull.

When reading the book through one finds it difficult to see the wood for the trees. The slow progression through elementary examples in the earlier parts causes a certain haziness and apparent lack of direction, though the individual paragraphs are quite lucid. The latter parts are more concise; in fact, they seem too advanced for the opening.

There are one or two rather doubtful statements. For example, without in any way defining a tangent, the author bluntly states that "The gradient of a graph at a point is the gradient of the tangent at that point," and leaves it at that. The definition of a tangent as the limiting position of a chord does not appear until 17 pages later.

However, a "class" book can only properly be judged by its use with a class, and this book should be judged from the point of view of a class or a correspondence course, and no doubt Mr. Hunter has found an abundance of detailed illustration essential in teaching the calculus to beginners.

There is a bad misprint on page 41—six lines from the bottom—*dy* being substituted for *dx* at a crucial point of the argument.

W. F. C.

BOOKS RECEIVED.

"Proceedings of the Rugby Engineering Society." Vol. XXIII. Part I. Pp. xii+73. 10s. 6d. net.

"Ubertragungstechnik." By Rudolf Winzheimer. (Berlin: R. Oldenbourg.) Pp. vii+233. 12 marks.

"Income Tax Up to Date." By H. J. Gully. (London: "The Financial News.") Pp. 20. 9d. net.

"Die Wissenschaftlichen Grundlagen der Preisbildung für die Elektrische Arbeit." By Dr. W. Kummer. (Braunschweig: F. Vieweg and Son). Pp. 52. 4 marks.

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ADVERTISING AND THE STANDARD OF LIVING.*

Publicity as an Important Raw Material of Modern Industry—The Vital Problems of Distribution and Consumption—Importance of Making it Easy to Buy.

By SIR ERNEST BENN, Bt.

THIS is a business convention and it would, therefore, be out of place to make any reference to political matters. In England, and I believe to some extent in other countries, politicians are very prone to talk nonsense about business, but business men with a Christian humility which, if not completely wise is at least thoroughly characteristic, impose upon themselves a self-denying ordinance, and refrain from talking politics.

There are, however, two observations of a semi-political nature which an Englishman, having the honour to address a Berlin audience, is in duty bound to make. The first is with regard to political arrangements, peace treaties and such like things, existing between these two great nations. It should be recognised that in England as in Germany we are by no means unanimous in thinking that all that has been done since 1918 is the embodiment of perfect wisdom. There is, I believe, a growing consciousness of failure to serve to the full, either the ends of justice or the sacred cause of international peace.

It would be improper to go beyond vague generalities such as these at an advertising convention, but in my second observation I am on safer and less controversial ground. The cause of peace and international goodwill can be furthered in no surer or better way than by business meetings such as the one in which we are all taking part this week. Business men or advertising men of different nations can meet on common ground, find common interests, develop understandings and render mutual aid far more readily than is possible in the meetings of statesmen and politicians. This is not because business men are necessarily better than statesmen or politicians (although I have my own views upon that) but because of the very nature of the matters upon which they are severally engaged. Trouble is the life-blood of politics, while the absence of it is the very breath of business.

Widespread Demand.

The healthy fashion of the age is to discuss the social well-being of the people. If only words were deeds the world is full of the possibilities of a better, happier, more plentiful life for the masses of the people who inhabit it. From China to Peru, and from Iceland to the Southern Seas, people everywhere are clamouring for the fruits of the earth and the products of the work of man; and there is no good reason why a large proportion, if not most, of these very reasonable desires should not be realised.

But the business man, with the possible exception of the American business man, has failed to make it clear to the common people that he, and he alone, is capable of satisfying these very proper desires. The people are making the mistake of looking to the politician instead of to the business man, and it is unnecessary for me to tell you that they are looking in vain.

I am anxious that this great International Convention should make it clear to the world that advertising has a definite place in any sane scheme for raising the standard of life of the people. Advertising is not, as some people still seem to think, a luxurious superfluity which can be added to a business that is rich enough to carry it. Advertising must be recognised and classified as one of the most important of the raw materials of industry. Our political economy needs to be brought up to date, and this Convention can do something to help along that long overdue process. The standard of life of the people depends upon two things, first the production and secondly the distribution of wealth, things, goods and commodities.

The economic situation of the world as a whole can be stated in the very simplest terms. Great problems are always simple when considered in a large way; it is chiefly in the details that the difficulties are to be found. If therefore you look at the world as a whole you will notice that we succeed fairly well in the making of things, but have yet a lot to learn about the distribution of them.

I want this great conference to rank above all the political conferences with which Europe is littered, and to impress upon the minds of the people of the world that the raising of the standard of life of the whole people is a matter of selling and distribution. In other words, a matter of advertising. The political economy of the immediate past has devoted far too much attention to production and far too little thought to consumption. The politicians of the world have done far too much pampering and spoiling and ruining the so-called workers, and have forgotten that the buyer, the customer, the consumer, is, of necessity, the predominant partner in industry and commerce. You can devise machines to take the place of labour, you can evolve substitutes for almost every raw material, but the one and only thing that you cannot do without, that is absolutely indispensable to any industrial system, is your consumer.

The sales managers and the advertising men of the world are the only people who appear to appreciate that basic truth. In my opinion, if it were possible, for, say a decade, to forget altogether the worker, to wipe him out of our minds, and to give all our thoughts to distribution and consumption, we could fill the world with wealth.

Advertising and Economics.

I do not remember in England the case of a single advertising man who has made much mark in politics, and this is natural when one remembers that advertising is based on sound practical economics. Modern politics makes the mistake of filling the whole picture with the worker. Advertising is wiser and recognises that the buyer is the all-important factor in the economic problem.

The same sort of criticism may be made in a more moderate way of the world of finance. The development of banking and credit machinery in the last 100 years is one of the miracles in human history, but that machinery is not yet complete. Our bankers and financiers have provided all the facilities that the world can want for the purpose of production. They have yet to recognise the enormous possibilities of the finance of consumption and consumer credit.

We must create a world in which it is as easy to buy as it is to make, and advertising in all its forms is the basis on which this great object will be accomplished.

When the economic conversation of the common man is not nonsense, it concerns itself too much with questions of minor importance. Think of all the breath that is wasted in discussing what are called basic industries and of all the money and political effort that is expended in the endeavour to bolster up these basic industries with artificial aids.

The Consumer's Viewpoint.

Iron and steel are of no interest to the ordinary man and woman until long after they have left the furnaces, of which we hear so much, and have been sold, by advertising, as kettles or motor bicycles. I have never seen, and have no desire to see, an ingot of steel or a mass of pig iron, but I am deeply interested in the nib of my pen or the pattern of my garden gate.

Coal, so far as I am concerned, need not exist but for my need of the products of the furnace that it feeds.

Shipping, on which we set such store, is an empty, seasick affair but for the advertising which teaches each country of the products of the others.

Take again the nonsense that is talked about the simple life; the absurd people who work themselves into a semi-sane condition and distort all their artistic and poetic values. People who, while pretending to see evil in the desire of a youth for a wrist watch, or a maiden for a new pochette, will find an exaggerated beauty in the gluttonous, vomiting, bestial life of the bumble bee.

It is argued that advertising creates desires for unnecessary and useless things, that it promotes unproductive expenditure, that it fosters a taste for luxury, and that it leads to extravagance.

People who talk this way have never bothered to think,

*An address delivered at the International Advertising Congress at Berlin on August 14th.

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they simply do not know the meaning of the words they use. They have never troubled to define economy or extravagance. They don't understand civilisation and have no real conception of progress. Civilisation is a process of evolution, in which man's desires, and his ability to satisfy them, march forward together. When we cease to create new desires we stop the process of civilising. Every new desire will be thought at first to be unnecessary, extravagant, ostentatious or anti-social. It has always been so. The first man who wore a shirt must certainly have faced the envy and criticism of all his fellows, and I do not doubt that the Chancellor of the Exchequer of the day picked him out for special punitive taxation.

The fact is, of course, that the luxury of yesterday is the comfort of to-day and the necessity of to-morrow, and behind that natural and wonderful process, the process of steadily raising the standard of human life, the main driving force is advertising.

If you do anything to lessen the desire of people for things, trade and industry and civilisation go down. If, on the other hand, you cultivate and strengthen the desire for a greater variety of material amenities, then civilisation goes forward.

True Nature of Wealth.

The universal social problem is the standard of living of the people. The standard of living is governed by the amount of real wealth in the world, and I submit to you that our troubles arise because of the failure of people generally to realise the true nature of wealth. This conference can do something to rectify that error. All over the world you find the puzzling, paradoxical position of poverty caused by over-production; miners in trouble because there is too much coal; shipbuilders in difficulty because there appear to be too many ships, and so on.

John Stuart Mill, still the greatest of all economists, gave us the most perfectly scientific definition, and laid it down that "Wealth is all things useful and agreeable having exchange value." Every boy and girl who hopes to be considered as a civilised being ought to be made to learn that definition by heart.

"Wealth is all things useful and agreeable having exchange value." You will notice that Mill ignores all questions of manufacture and making, says nothing about production or labour or employment, leaves aside even such important matters as science and design. The only factor in the composition of wealth that he deems it worth while to mention is exchange. Wherever a thing comes from; whatever it is made of; whether it merely grows or is the outcome of infinite labour; however much legislation or tariff or trade union power may be mixed up with it, it is not wealth until exchange value has been given to it. And what is the purpose of advertising, except to give exchange value? If people would give one-tenth of the thought which is now given to false issues about labour and production to the consideration of exchange, salesmanship and advertising, the standard of living of the people would go and keep on going from better to better and better still.

Learning to Sell.

I do not fear that anybody here will misunderstand me when I venture to claim that it is appropriate for this sort of thought to be spoken at an international convention by a delegate speaking the English language. Few will be found to deny that it was England who taught the world how to manufacture the things that go to make modern civilisation. And now, quite appropriately and quite properly, it is another branch of the English-speaking people that is going to show the world how to complete the good work. If England taught us how to make, America is teaching us how to sell—how to advertise. We Englishmen are very glad and proud to be here in company with such a large and talented representation of American advertising genius.

In conclusion, my hope is that this great convention may be able to do something, first, to give to advertising men generally a still higher conception of the importance of their great calling, and, secondly, to give to the world at large a truer conception of the part which advertising plays in the provision of a better standard of life for the struggling masses of mankind. We must strive, as Wordsworth puts it:

> "To elevate
> The grovelling mind, the erring to recall,
> And fortify the moral sense of all."

PUBLIC UTILITY LOANS.

The New Development Act and Electrical Undertakings.

By A SPECIAL CORRESPONDENT.

SUFFICIENT attention has not been paid to a very important Act passed at the end of the last session of Parliament. The Act in question is the Development (Loan Guarantees and Grants) Act, 1929, to authorise the Treasury to guarantee certain loans to be raised in connection with public utility undertakings, and to authorise the giving of financial assistance in respect of expenditure incurred or loans raised for development works.

The Act is part of the Government scheme for tackling unemployment, and the public utility undertakings under Part I are undertakings carried on under Statutory powers by any body of persons for providing means of transport or communication, gas, electricity, water or power. Local authorities and statutory bodies who carry on undertakings under statutory powers otherwise than for profit are *not* eligible for assistance under Part I, as they are provided for in Part II of the Act.

Schemes of development, reconstruction or re-equipment in connection with undertakings in Great Britain come within the Act, and assistance may take the form of either a guarantee of the payment of the principal of and the interest on, or of either the principal of or the interest on, any loan to be raised and applied for the purpose of meeting capital expenditure on such scheme, or a grant to assist in defraying, in whole or in part, during a period not exceeding 15 years from the raising of the loan, the interest payable on such loan.

Capital expenditure defrayed after the passing of the Act on such schemes out of revenue or accumulated funds may be regarded as defrayed out of a loan raised at such rate of interest as the Treasury may determine.

In considering applications, whether for guarantees or grants, regard will be paid to:—

(1) The extent to which the capital expenditure in question is calculated to promote employment in the United Kingdom;

(2) The probability or not of the scheme not being proceeded with in the near future if assistance is not given.

Where the application is for a guarantee the applicant will be required to satisfy the Committee that there is security for the due payment of the interest on and for the repayment of the principal of the loan.

The Chairman of the Committee is Sir Arthur Duckham, and electrical interests are represented by Mr. P. J. Pybus.

ELECTRICITY SUPPLY IN NEW ZEALAND.

The revenue during the year ended March 31st, 1928, from the Auckland (N.Z.) Electric Power Board's undertaking was £574 179, against £517 120 for previous year, and the net profit, after provision for working expenses and capital charges, was £60 999, against £63 556. Electricity generated was 83 426 650 kWh, against 65 544 216, purchased 15 505 420 kWh, against 14 077 010, and sold 80 791 776 kWh against 66 207 786. Total cost per kWh generated was 1·52d. against 1·644d., and total revenue 1·705d., against 1·86 The plant capacity was 27 950 kW, against 26 900 kW, the maximum load 25 600 kW, against 22 610 kW, and the load factor 44·11 %, against 40·19 %. The most notable feature in the year's trading can be seen in the sales for domestic supply. The increase under this heading over the previous year was 9 929 643 kWh, representing £40 476 18s. 11d. When the Board took over the undertaking in 1922 there was no record of any electric stoves or water heaters connected to the system. The number now in use and being steadily connected up is sufficient evidence that this phase of the electric supply business is now coming into its own, and much greater development in this direction may be expected. The universal recommendation given to the electric range shows that customers are now realising that the utilisation of electricity for cooking has the same advantage as has long been recognised in its adoption for other purposes. After due consideration, the Board decided to simplify its charges and at the same time encourage the use of electricity. Some time ago meter rent on the domestic supply was eliminated; then followed the introduction of the domestic rate: 5d. per kWh for the first 25 kWh, 3d. per kWh for the next 25, and 1½d. for all over. All work in connection with the change-over to Arapuni power is just about completed.

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MID-CHESHIRE LINES.

Employment of Untreated Larch Poles as Conductor Supports.

REFERENCE has recently been made in THE ELECTRICIAN to the operations of the Mid-Cheshire Electricity Supply Co. We give below a few further details of the overhead line equipment.

The cheap steel tower line which is being erected by the company has normal spans with an average length of 670 ft.; in some instances, where the contour of the land is suitable, spans up to 1 000 ft. are used. The conductor employed is pre-formed 80 ton steel-copper.

We are informed that the residents in the neighbourhood are very pleased with the appearance of the line, and that the company is constantly receiving requests for similar towers to be used for service branches, which, of course, is impossible.

An A-type wooden pole line is also being erected, with spans approaching the lengths used in the steel tower line, and similar conductors, so that the company may readily make comparisons between the relative cost and appearance of the two forms of construction.

By special permission of the Electricity Commissioners this pole line is being constructed of untreated larch poles which are supplied by the Forestry Commissioners. It is well known that larch, alone of the soft timbers, will stand for a considerable number of years without creosoting or other form of treatment. Larch has already been much used for fencing, and also to a small extent for telegraph poles, especially in Scotland.

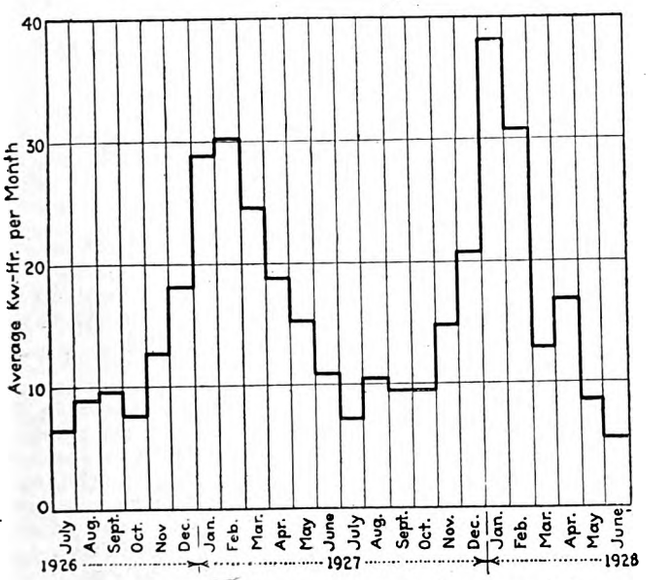
The Mid-Cheshire Electricity Supply Co. is applying for a Special Order to extend its area in a northerly direction beyond its Knutsford development to the vicinity of Altrincham. The approximate area of the extension is 28 sq. miles.

FARM ELECTRICITY.

Iowa Figures Show Low Average Consumption.

AN examination of the electricity consumption on eleven electrified farms in Iowa has disclosed a low average utilisation for most purposes. There was an average of 33 lighting points per farmer, and each outlet averaged 10 kWh per annum. Electric cooking provided the biggest individual load at 1 300 kWh per annum. Milking machines used 330, and water pumps 210, while radio, irons, washing machines and cream separators together took less than 200 kWh per year per farm.

The accompanying chart shows the low average consumption of energy by farm electric motors.



Showing average energy consumption of electric motors on farm.

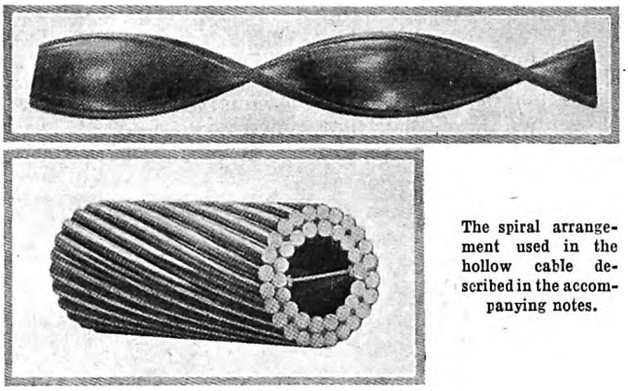
Experience in Iowa suggests that the best sizes of motors general utility use are the ¼ or ½ H.P. for operating hand-machines, and the 3 or 5 H.P. size for operating the formerly worked from a gas engine. The stationary used much less than the portables.

HOLLOW CONDUCTORS.

Their Use on High Tension Lines in the U.S.A.

(FROM A CORRESPONDENT.)

IT is well known that in high tension aerial transmission directly the voltage is taken above the distribution range the effect of corona has to be carefully studied. For instance, at 220 kV, the minimum conductor outside diameter



The spiral arrangement used in the hollow cable described in the accompanying notes.

usually employed is 1 in., and when material currents have to be transmitted skin effect becomes an important consideration.

Various arrangements have been made for dealing with this problem, one being the use of tubular conductors to make up a larger diameter. Cables with aluminium wires with a steel core have certain advantages, having a large diameter and capacity for long spans. In Germany a hollow conductor is being used with a spiral support.

The same problem is being attacked in the United States, where the Anaconda Wire and Cable Co. has tackled the problem by the use of copper conductors arranged as hollow cables. A drawn section of copper in the form of an I beam, with narrow flanges twisted to form a spiral, is placed in the interior, and the individual wires in the inside layer are twisted round in the opposite direction. This form of conductor was described at the Paris High Tension Conference by Mr. T. J. Little.

The ratio between core diameter and cable diameter can be varied within wide limits, so that for a given cross-section the wires may form a thin ring with a large diameter; when necessary for tensile strength for long spans the cable can be reinforced with some non-ferrous high tensile wires; a conductor with a section of 0·4 in. has a core weighing not more than 10% of the total weight of the cable. The cable is more flexible than one of the normal type. It can be strung over erecting sheaves having a diameter ten times that of the cable; for moderate mechanical tensions hanger clamps are used, but for the longest spans a seamless connector is used that is drawn down on to the cable by means of a special tool.

Some Applications.

This type of conductor is being used on a 154 kV line, 118 miles long, in the U.S.A., the cable being 0·769 in. diameter outside, 0·235 sq. in. section, the weight of cable used being about 800 tons. This type of cable is also being used for bus-bars on sub-stations on a 220 kV line.

When the current capacity of a line is high, a large diameter has not merely an advantage regarding skin effect and general efficiency, but also regarding temperature. It is therefore being used for some lower tension lines where corona effects are not to be feared; for example, it has been adopted on a four-mile tie line at 44 kV, where the normal full load is 525 A per circuit, and the maximum 1 050 A. Owing to its flexibility this type of conductor is of advantage for connections between oil circuit breakers, transformers, and so on, as their use reduces strains on bushings. This system of conductor construction has been developed with outside diameters ranging from 0·45 to 3 in., and with sections from 0·08 to nearly 3 sq. in.

Municipal authorities are being asked by Newcastle-on-Tyne Corporation to join in representations urging the Government to introduce legislation requiring the certification and stamping of all electric meters.

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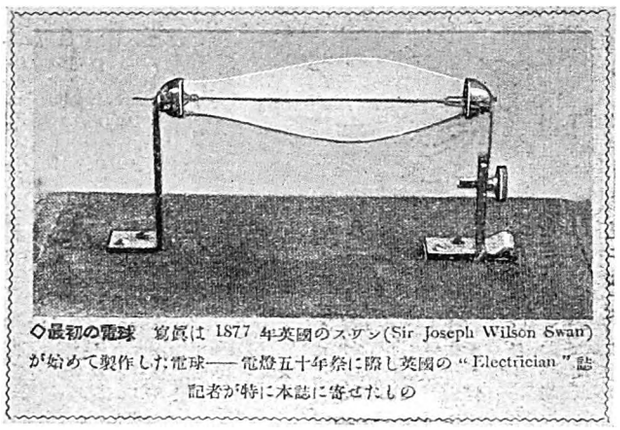
CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Ferro-Concrete Poles.

[To the Editor.]

Sir,—I have read with much interest two articles in your recent issues: (1) by Major Rich (July 26th); (2) by Mr. W. T. Taylor (July 26th and August 9th). Major Rich gives excellent extracts of Mr. Pollack's paper read recently at the Paris Conference—and the discussion. This paper itself is worth reproduction in full in your journal. You also published an abstract of my paper before the Overhead Lines Association on the subject in your issue of May 24th. My verdict was, that ferro-concrete poles—made to the Regulations of the Electricity Commissioners—are uneconomic. Major Rich produces evidence that the Nord Lumiere Co., is convinced that such poles, made to French standards, replace existing wood poles with economy, and have backed that opinion by vigorous action.



◇最初の電球 寫眞は 1877 年英國のスワン(Sir Joseph Wilson Swan)が始めて製作した電球——電燈五十年祭に際し英國の "Electrician" 誌記者が特に本誌に寄せたもの

JAPAN AND THE FIRST ELECTRIC LAMP.

THIS reproduction from "Denkinotomo," the Tokyo electrical journal, of July 15th, 1929, is of particular interest in view of the widespread nature of American propaganda in connection with "Light's Golden Jubilee." Translated, the inscription under the picture reads: "The First Electric Lamp.—The photograph shows the electric lamp bulb made for the first time by Swan (Sir Joseph Wilson Swan) of England in 1877. The photograph was presented to our magazine by courtesy of the Editor of The Electrician, *of England, on the occasion of the 50th anniversary celebration of the first electric lamp.*

Mr. Taylor condemns poles made in a factory, such as those used by the last-named company, and states that the only economic way is to cast the pole, not merely on site but *in situ* vertically. He gives no hint as to whether this is an idea of his, or an accomplished fact. Much of the obscurity in his article would have been avoided if he had compared costs of poles of equal strength, for short, medium and long spans, constructed of the different materials. He gives elaborate tables of costs and comparisons, based upon figures which no one could check—because he does not give the design of pole, nor is it quite clear whether he complies with the Regulations, but in what follows I presume he does so. I challenge his statement that the cost per pole is a wrong basis for comparison. Mr. Taylor cannot claim a monopoly of long span construction for ferro-concrete—or even steel. By using "A" poles one can do it with wood.

Mr. Taylor has introduced so many variables into his comparisons that I feel sure you will excuse me for pointing out that in the absence of full details there would be great possibility of undiscovered error. In any case, I recommend caution in acceptance of the claim made at the end of the paper.

In the first place, the subject of the preservation of timber is not yet closed; the scarcity of good timber suitable for pole work is not so acute as might be thought, owing to the activity in the past half century of the Government Forestry Departments.

On the other hand, all light ferro-concrete work in which any part is subject to tension and vibration is open to suspicion until the effect of time upon it is known. The art of constructing such structures is in its infancy, and I, for one, sympathise with the Electricity Commissioners in their insistence upon a higher factor of safety than for steel structures if the strength of the filling is taken into consideration in the calculation.

In conclusion, I think it only fair to ask whether even one sample pole has been constructed *in situ* vertically, and, if so, have the labour and material costs been kept carefully, and are they available? Moreover, if such pole has been constructed, can we have the figures obtained in tests made upon it, say within three months?

If Mr. Taylor's ideas have not been carried out, and the results are not available, Mr. Taylor's article cannot be said to assist materially in the introduction of ferro-concrete construction for overhead line poles.—I am, etc.,

W. Fennell.

Electricity House, Northwich, Cheshire.
August 10th.

"Light's Golden Jubilee."

[To the Editor.]

Sir,—Col. Morcom's very concise statement of the facts in the Edison *v.* Swan controversy, published in your issue of August 16th, clearly suggests the only graceful way out for our N.E.L.A. friends, viz., to couple with their "Light's Golden Jubilee" celebrations not only the names of Swan and Edison, but also Welsbach, Langmuir and others prominently associated with the development of the electric lamp.

The opportunity presented by a world-wide celebration of one thing—the jubilee of electric light—is too great to be spoiled by disputes of the kind which have so far attended the N.E.L.A.'s efforts. Surely it is not too late, even now, for a modified programme, which will not offend the susceptibilities of other nations, to be devised by those responsible for the American celebration.—I am, etc.,

G. N. Wilsber.

Brighton.
August 19th.

The Electrical Age.

[To the Editor.]

Sir,—We have often talked of the Electrical Age and predicted the date of its arrival. May I suggest, after perusal of the daily papers, that it has now dawned? The first advantage of a certain advertised brand of petrol is its "electric acceleration." A publisher announces a new novel called "Electric Love," and Mr. G. B. Shaw produces a play introducing more officialdom to the electrical industry in the shape of a Powermistress-General. As if that were not enough, the city columns of the popular dailies are full of more or less intelligent and certainly anticipatory forecasts about the attractiveness of electrical shares.—I am, etc.,

"Elecage."

London.
August 20th.

ELECTRIC POWER SYSTEM DEVELOPMENT

(*Concluded from page* 216.)

From this viewpoint it falls short of the star four-wire method, and, the relative maximum voltage to earth for equal line voltage also favours the star method (see *a'* and *a* of Fig. 1). Comparisons are given in this article to show wherein lie the main disadvantages of the delta-connected system.

In a subsequent article, the writer will present a system that: (1) overcomes these and the commonly known disadvantages and, (2) offers those standard system-voltages (shown in the right column of the above table) by means of the common polyphase unit or three single-phase transformers, (3) converts the "Y" and the closed delta systems (respectively) to a symmetrical three-phase four-wire system using one polyphase unit or three single-phase units and providing a true neutral point from the closed delta circuit, (4) converts the delta system without changing any of the existing phase relations.

I see no reason why we should not expect a steady and even growing volume of telegraph traffic, operated telegraphically for the whole or part of its course, provided that we exploit to the full the fundamental advantages of the telegraph as now developed.—*Sir Henry Bunbury.*

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NEWS IN BRIEF.

British Electrical and Allied Manufacturers' Dinner—Telephony to Ships in Dock—Ex-German Submarine Cables—Dublin Tramwaymen's Strike.

THE Council of the University of Reading requires a lecturer in physics.

The Association Française de Télévision has been established. M. E. Belin is president, and the Association has offices at 5, Rue Malakoff, Paris.

The annual dinner of the British Electrical and Allied Manufacturers' Association (Incorporated) will take place at the Connaught Rooms, London, on November 20th. Lord Derby, president of the Association, will be in the chair.

The West Gloucestershire Power Co. has opened a second all-electric house at Ryeford, near Stonehouse.

The Treasury has made an order exempting mercury vapour rectifiers from the key industry duty from August 20, 1929, to December 31, 1930.

Electric lighting will be employed at the Rectory Field, Blackheath, London, during the ensuing winter, to enable the local Rugby club to train in the evenings.

The G.W.R. is to provide improved telephone facilities on the Neath and Brecon section, between Gloucester and Swindon, and between Hereford, Gloucester and Worcester.

The provision of telephone facilities between cargo ships in dock and seaport exchanges is suggested by Mr. A. J. Stewart, district manager of telephones in the Newcastle district. Mr. Stewart suggests the use of a special system of plugs along the dockside and flexible telephone cables, complete with receivers, to the ships. In Newcastle and other trading ports, telephones would facilitate the rapid handling of cargoes by putting the ship in instant communication with the company's offices ashore. A canvass of shipowners and dock authorities in the Newcastle district has met with encouraging results.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated August 23rd, 1879 :—*

A telegraph station established at the Ryffel Hotel, under the Ryffelhorn, in the Valais, was the highest in Europe.

Blackpool Corporation decided to light the promenade with six Siemens' lights, "representing 6 000 candle power," at a cost of £2 500.

A writer mentioned that at a Newcastle Chemical Society meeting in December, 1878, Mr. J. W. Swan exhibited an electric lamp "on the incandescence principle."

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of August 26th, 1904, stated that :*

An electric battery-propelled car made a run of 105 miles on one charge.

Revised Board of Trade Regulations under the Electric Lighting Acts permitted a variation of not more than 2½% from the declared frequency.

In his report for 1903, Mr. Scott Ram referred to a case of shock in which the victim had a thumb severed from his hand and the toes of both feet burnt off through his boots. The man was not killed.

* * *

FIFTEEN years ago, it was stated in THE ELECTRICIAN *dated August 21st, 1914, that :*

Glasgow police were being equipped with electric battery lamps.

The "half-watt" lamp was being introduced on the market, but little was known of its performance.

The I.E.E. received over 1 000 replies from members wishing to enrol on its register of engineers available for war service.

* * *

TEN years ago, THE ELECTRICIAN *dated August 22nd, 1919, reported that :*

Many local authorities were buying electric vehicles for dust collection.

E.T.U. members in the Birmingham area were demanding a minimum weekly wage of £6.

It is reported that the Italian Government is desirous of bringing up the question of the final disposal of the cables formerly belonging to Germany, and intends to call a Conference of Ambassadors to settle the matter. Of the ex-German cables in the North Atlantic, Great Britain is in charge of one and France of another, while in the South Atlantic the cable from Liberia to Pernambuco has never been restored.

The new electricity showrooms of the Oldham Corporation Electricity Department in Union Street were officially opened a few days ago, in the presence of a large company of Corporation officials. Ald. Frith, vice-chairman of the Electricity Committee, performed the opening ceremony. The building has a double window frontage, the ground floor being used as a shop and showroom, where a large selection of electrical fittings and appliances are on view. There is also a large lecture room on the ground level.

At the invitation of the authorities of the Shipping, Engineering and Machinery Exhibition, the Association of Supervising Electrical Engineers will pay an official visit to the Exhibition, at Olympia, on September 21st. The programme will include a conference, at which a paper will be given on "Electricity as Applied to Modern Commercial Shipping," by Mr. E. M. Johnson. The Association, in arranging for this paper, has in mind the important developments which are taking place in this connection, and the need for further publicity and education in regard to the matter.

The Hart Accumulator Co., Ltd., welcomed, a few days ago, a party of boys from the Leyton County High School, who were afforded facilities for inspecting the processes of battery manufacture.

The tramway and omnibus services of the Dublin United Tramway Co. were brought to a standstill on Thursday of last week by a strike of employees against a proposed reduction of 10% in wages. No settlement had been reached up to the time when we went to press.

Public telephones in Japan number 2 166, and these produced a revenue of 1 845 500 yen during the past fiscal year. The number is to be increased by 150 during the present year.

The employees of the Tokyo Electric Light Co. recently presented demands, under 23 heads, for improved conditions of employment. The matter was settled without any inconvenience to consumers.

The Board of Education have issued a new list of the more important institutions of technical and art education and other forms of further education recognised by the Board in England and Wales. An indication is given of the approved schemes in operation for national certificates in mechanical and electrical engineering, etc.

In Taunton Corporation's new swimming and slipper baths, which were opened by the Mayor recently, the lighting is electric, electric motors are used in connection with the Paterson filtration plant, etc., and the heating is done by steam from the electricity generating station. No gas or coal is used. At the opening gala the Team Race Shield, presented by the Traders' Association, was easily won by H. H. Morris, E. K. Williamson, B. P. Short and J. M. Glide, members of the electricity department's generating staff.

The prospectus of the Bradford Technical College for the 1929–30 session has been issued by Bradford Education Committee. It contains plans and exterior and interior views of the College buildings, lists of the examiners and teachers, particulars of the conditions of admission, fees, courses of study, awards, scholarships, the electrical and other engineering laboratories, etc.

It was stated in the Edinburgh Burgh Court last week that there is still some doubt among motorists as to whether they may make a left hand turn when an automatic road signal is against them. The regulations in force at Edinburgh state that drivers shall not pass across the white line barrier marked on the street on the near or approach side of the crossing or place until the green or "go" signal is shown.

Shoreditch B.C. has passed a resolution that the attention of the Council be drawn to an allegation that an electricity distributing company had sold its ordinary shares to a foreign undertaking at a huge profit, the Council emphatically protests against the control of public utility undertakings which enjoy statutory monopolies being removed from this country, as it is apprehended that the endeavour to secure the supply of cheap electricity in this country will thereby be defeated. It was further resolved that a copy of the resolution be forwarded to the Minister of Transport and the Electricity Commissioners.

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BUSINESS ITEMS.

MR. J. P. MOORES, electrical engineer, of Northwich, has removed to larger premises in Castle Street.

LAWSON'S RADIO STORES have opened new premises at 26, Horsemarket Street and Market at Warrington.

THE indicator board of the totalisator used at the recent Carlisle race meeting. Over 8 000 Osram lamps were employed for signalling runners, pools and dividends.

CRYSELCO, LTD., announces that branches have been opened at 172, Bath Street, Glasgow, with Mr. W. J. Stanley in charge, and 22, Sir Thomas Street, Liverpool, with Mr. K. R. Mackley in charge.

MESSRS. F. W. BLANCHARD, electrical contractors, of 77, Boston Road, West Croydon, have opened up offices and stores at 72B, London Road, West Croydon. This firm was formerly known as F. Blanchard and Son.

A firm of manufacturers' agents in Adelaide desires to represent, on a commission basis, British manufacturers of electrical equipment and apparatus, etc. Further particulars from the Department of Overseas Trade. (Reference No. 528.)

A firm of manufacturers' agents in Sydney (N.S.W.) desire to obtain the representation in New South Wales and Victoria of British manufacturers of electric drills and small tools, factory plant, etc. Further particulars from the Department of Overseas Trade. (Reference No. 184.)

SELECTORS, LTD., have transferred their offices from London to 206–207, Bedford Avenue, Slough Trading Estate, Slough, Bucks, and they ask that correspondence be sent to that address. For the convenience of London clients they are keeping a small stock at the London depot, 1, Dover Street, Piccadilly, W.1, where urgent orders can be executed.

Subject to ratification by WIRELESS PICTURES, LTD., AMALGAMATED WIRELESS (AUSTRALASIA), LTD., have concluded with WILLIAM BLOGG AND CO., LTD., the Fultograph agents in Australia, a five years' contract for a still-picture service. Transmissions from Melbourne are expected to begin shortly. Both 3LO and 2FC (Sydney) on 31·28 metres are well heard in this country.

A few years ago the "Bayer" mechanical soot blower was put on this market by the LOVICK JOHNSON CO. The volume of contracts in hand and projected has made a separate organisation essential and the manufacture of the whole of the equipment is now carried out in England, and the business for Great Britain, Europe, India and Africa, will in future be dealt with by the BAYER SOOT BLOWER CO., LTD., of 125, Balham High Road, London, S.W.12. The reorganisation embraces the existing personnel and the management remains under the same direction.

The staffs of Strange and Sons, electrical engineers, Tunbridge Wells, Sevenoaks, Cranbrook, and Heathfield, had their annual outing on August 10th, when they journeyed by road to Margate.

COOKING ON TRAINS.

New Trains with All-electric Restaurant Cars for L.N.E.R. Services.

THE London and North Eastern Railway, which operates sixteen all-electric kitchens, equipped with full cooking ranges and refrigerators, on the east coast services to Scotland and the West Riding, Marylebone-Manchester services, and on the Liverpool Street-Parkeston Quay Continental boat expresses, has introduced electrically operated restaurant cars on its Liverpool Street-Cromer and Liverpool Street-Yarmouth services.

The L.N.E.R. was the first to introduce electric cooking on trains, *i.e.*, on the London-Leeds service in 1921; in 1924, articulated restaurant car sets (whereby three vehicles are carried on four bogies) were added to the "Flying Scotsman" expresses; the weight of these electric restaurant car sets is 83 tons, and they enable 78 passengers to be served simultaneously. A brief description of the cooking apparatus in the electric kitchen is of interest, in view of the novelty of the application, the credit of which is due to the enterprise of the Chief Mechanical Engineer of the L.N.E.R., Mr. H. N. Gresley, under whose personal supervision the work has been carried out.

The whole of the apparatus has been supplied by Messrs. J. Stone and Co., of Deptford, London, whose system of electric lighting is also fitted throughout the train. Current is supplied both by accumulators, which are mainly used when the train is standing still, and by two dynamos carried on the under frame of the car. The latter are each of 7·2 kW capacity, with self-contained automatic pole changers, and are driven by means of belts from the axles of the carriages. The main cooking range is fitted across one end of the kitchen, and on the left are the roasting and steaming ovens and grill, with hot water tank superimposed. On the right are the boiling range, with six hotplates for frying, boiling, heating sauces, etc., and one boiling pan of 7 gallons capacity for cooking vegetables, etc. Between the serving hatches is fitted a heated cupboard which will take the whole of the plates required for the service, and the top forms a convenient table. Two urns and two six-pint kettles are available for boiling water for teas, and to supplement the supply from the boiler on top of the oven range. There are also two 45-gallon tanks for warm water fitted in the roof of the corridor just outside the kitchen. Electrically-heated elements are fastened on the underside of these tanks, which are connected with the boiler on top of the oven range. A continuous supply of boiling water for washing up and other purposes is thus ensured, as the water is partially heated in the roof before it is brought to boiling point in the boiler.

The control of the cooking equipment in the kitchen is arranged as conveniently as possible for the chef. Pilot lamps are set over the switches, illuminating red glasses inscribed with the name of the apparatus in use, so that, at a glance, an indication is obtained of the different operations that are going on.

An experimental "Frigidaire" plant has been installed by the Delco Light Co. on several of the cars, to ensure a constant supply of ice cubes in all weathers. It is operated by a compressor beneath the car.

AUSTRALIAN ELECTRICITY ACCOUNTS.

The accounts of the Sydney (N.S.W.) electricity undertaking for 1928 show that the revenue was £2 249 796, against £2 135 780 in the preceding year, and the net loss after provision for working and general expenses and capital charges, was £33 737, against £22 038. Total cost (including capital charges) per kWh sold was 1·82d., against 1·86d., and the average price received was 1·72d. Electricity generated at the Pyrmont power station was 223 097 700 kWh, and purchased from the Railways and Tramways Department 140 717 100 kWh. Total load connected was equal to 7 482 442 60 W lamps, an increase of 15·57 %. Motors connected amounted to 181 699 H.P. The work of demonstrating and selling electrical appliances for domestic use was continued from a central showroom at headquarters, as well as from motor vehicles visiting the premises of consumers, as was also the work of repairing electrical appliances for consumers free of charge, except in cases in which any material was required, when the cost of the material only was charged. During the year, electrical appliances were sold to the value of £42 500.

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PERSONAL.

MISS Jessie MacLeod has been appointed assistant in the Welfare Department of Siemens Brothers, Ltd.

Mr. S. Hartland, assistant mains engineer at the Gillingham (Kent) municipal electricity works, has resigned.

Mr. C. A. Vandervell secured second prize in the Berkshire clean milk competitions, in respect of Manor Farm, Tidmarsh.

Sir Hugo Hirst was a prize-winner at the Twyford and Ruscombe Horticultural Show last week. He secured five awards.

Shrewsbury T.C. has increased the salary of Mr. C. M. Johnstone, engineer and manager, from £600 to £700 per annum.

Sleaford U.D.C. has granted a sum of £50 to Mr. W. H. Wilson, chief engineer, in consideration of extra services rendered.

Eastbourne Electricity Committee has appointed Mr. D. W. A. Roberts as deputy borough electrical engineer, at a salary of £559 per annum.

Mr. J. T. Jones, of Manchester electricity department, has been appointed electrical engineer and manager to the Gelligaer Council.

Coun. J. Hanson has resigned the chairmanship of Rochdale Electricity Committee, and Coun. L. W. Taylor has been appointed as his successor.

Mr. H. W. Young, president of the Delta-Star Electric Co., of Chicago, has returned to the States, following his tour of Germany, France, and England.

The marriage of Mr. William A. Parker, borough electrical engineer, Workington, and Miss Nellie Cusack, was solemnised on August 12th, at Workington.

Mr. J. B. Feltham, electrical engineer and manager of the Mexborough Electricity Department, was the winner of a £500 prize in a newspaper crossword puzzle competition.

Mr. George Dixon, engineer to the electricity undertaking of the Skelton and Brotton U.D.C., has accepted a position with the Cleveland and Durham Electric Power Co.

Dumfries T.C. has appointed Mr. A. E. Roots, chief assistant engineer at the Worcester electricity works, as manager and engineer of the Dumfries electricity undertaking. There were 64 applicants for the post.

Mr. R. S. Irwin, engineer and manager of the Clones Electricity Co., has been appointed engineer and manager in connection with the electricity scheme of Bangor (Northern Ireland, T.C., at a salary of £350 per annum.

Mr. W. C. Lusk has been appointed chairman of the British Thomson-Houston Co., Ltd., and deputy chairman of Associated Electrical Industries, Ltd. He is resigning the position of managing director of the B.T.H. Co. See page 235.

Mr. A. E. Halliwell, late engineer in the Marine Department of Foster, Wheeler, Ltd., has taken up duties as director and engineer with Phillips and Sons (Chiswick), Ltd., manufacturing electrical and mechanical engineers, 42, Waterford Road, Walham Green.

Mr. V. Dempsey has been transferred, under the Electricity Supply Board, from Bray generating station, where he was assistant engineer, to Carlow station as charge engineer. The occasion of his transfer was marked by a presentation from the Bray station staff.

A marriage has been arranged between Mr. Horace Courtlandt Dawson, younger son of Sir Philip and Lady Dawson, and Miss Ellaline Saunders, daughter of Mr. and Mrs. B. B. Saunders, of Bank House, Ely, and will be solemnised at St. Mary's Church, Ely, on September 14th.

Among those attending a recent conference of manufacturers of canteen equipment, with a view to providing the most effective equipment to meet the needs resulting from the setting up of canteens in large firms was Mr. Assheton Taylor, of the refrigerator department of Electrolux, Ltd.

Mr. H. D. Phelps, who has been resident engineer at Thirsk for the Northern Counties Electricity Supply Co., Ltd., for the Thirsk and Malton districts since 1923, has been presented with an oak chiming clock, on the occasion of his leaving Thirsk to join the headquarters staff at Newcastle.

Douglas Electricity Committee recommends increases of the salaries of Mr. Bertram Kelly, borough electrical engineer, from £600 to £675 per annum. Mr. P. Bregazzi, assistant engineer and mains superintendent, from £320 to £370, and Mr. R. M Clague, station superintendent, from £350 to £370.

Biographical notes on Mr. G. R. Bateman, publicity manager of Standard Telephones and Cables, Ltd., and Mr. J. Taffs, advertising manager of the English Electric Co., Ltd., were included in a recent "Who's Who in the Incorporated Society of British Advertisers," published in the "World's Press News."

The following Post Office appointments are announced: Mr. M. C. Pink, assistant controller of the London Telephone Service, to be deputy controller; Mr. H. Diver, superintendent, to be assistant controller; Mr. G. T. Archibald, Inspector of Telegraph Traffic, to be assistant controller of Central Telegraph Office.

The marriage was solemnised at Sherborne Abbey, on August 14th, of Mr. Joseph Jacob Davis, managing director of the Express Magneto Co., Ltd., of Yeovil, and Miss Muriel Mary Elliott. The bridegroom received from the company's staff an amber cut-glass table centre-piece and trinket set, and from Petters, Ltd., a set of silver candlesticks.

Mrs. J. Tyler is relinquishing her position as honorary secretary of the South Wales and Monmouthshire branch of the Electrical Association for Women, and Mrs. Snow is succeeding her. Mrs. Tyler, who organised the branch about three years ago, will remain a member of the committee. She has returned to her duties with the South Wales Power Co., after a recent illness.

Mr. Bruce Kelly has recently been appointed to the position of manager of the electrical branch of A. S. Patterson and Co., Ltd., of New Zealand. Mr. Kelly received part of his training at the Witton works of the General Electric Co., and subsequently became attached to the London office of Asea Electric, Ltd. In 1927 Mr. Kelly became assistant engineer to the export department of the company, and returned to New Zealand last March.

The Marconiphone Co. announces the appointment of Mr. I. H. Williams as sales manager. Mr. Williams first joined the company in 1922, and acted as assistant branch manager at Manchester. Later, he returned to London as sales representative for the South Eastern Counties, assuming the duties of assistant London manager in 1926. At the end of 1928 he became assistant sales manager. His wide experience of the radio trade will undoubtedly prove of great value in his new appointment. See page 233.

The vacancies which will occur in the Council of the Institution of Electrical Engineers on September 30th will be filled by Col. Sir T. F. Purves, O.B.E., who has been elected president; Mr. E. Welbourn, vice-president; Mr. E. Leete, hon. treasurer; Mr. A. R. Cooper, Mr. R. S. Whipple and Prof. E. Wilson, ordinary members of Council; and Mr. E. E. Sharp, associate member of Council. Sir Thomas F. Purves has been engineer-in-chief of the Post Office since 1922. He was engaged at the G.P.O. in Edinburgh until 1895, and has since been occupied in important work in the engineer-in-chief's department in London. His knighthood, which was announced in the last New Year's Honours list, was granted in recognition of his services to the Post Office. See page 233.

The presentation of the first Benjamin G. Lamme medal to Mr. Allen Bertram Field, one of the engineers of the Metropolitan-Vickers Electrical Co., was made recently at Swampscott, Mass., U.S.A., the proceedings being broadcast by the short wave transmitter of station KDKA, Pittsburg. The Lamme medal was created by provisions in the will of the late Mr. Benjamin G. Lamme, chief engineer of the Westinghouse Electric and Manufacturing Co., and is given for meritorious achievement in the design of electrical machinery. The specific accomplishment for which Mr. Field was awarded the medal was "the mathematical and experimental investigation of eddy current losses in large slot-wound conductors in electrical machinery."

Obituary.

MR. J. STUART BEDDOE, superintendent of the Dockyard Department of the Admiralty, at Swansea, last week. Mr. Beddoe was an associate member of the Institution of Electrical Engineers.

MR. ARMISTEAD K. BAYLOR, commercial engineer with the American General Electric Co., aged 61 years. In 1896 he came to England to manage the traction department of the British Thomson-Houston Co. He left, after fourteen years, to join the American G.E. Co. He had been a member of the Institution of Electrical Engineers since 1898.

MR. THOMAS HENRY LAWSON, on August 9th, aged 53 years. He was in partnership with Mr. Pascoe in the firm of Lawton and Pascoe, electricians, of Douglas, Isle of Man, and was engaged repairing the electrical installation on the "King Orry," which was lying alongside the Victoria Pier. The work was finished about midnight on August 8th, and he was proceeding to the shore over a gangway composed of two planks, when he fell into the water, and his body was recovered the next morning. Prior to establishing his own business he was for a number of years with the Manx Electric Railway Co

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BLACKPOOL CORPORATION.—Twelve months' supply of electricity meters. Particulars from the borough electrical engineer, Mr. C. Furness.

PORTSMOUTH CORPORATION.—Supply and installation of armourclad, e.h.t. switchgear to control alternators, feeders and station auxiliaries. Specifications, etc., from Mr. B. Handley, Electricity Works, Portsmouth; deposit £2.

MANCHESTER CORPORATION, August 23rd.—Supply of steel tramway poles. Specifications, etc., from the General Manager, 55, Piccadilly, Manchester.

CENTRAL ELECTRICITY BOARD, August 24th.—Supply, delivery, and erection of metering equipment for certain stations in the area of the South-East England Electricity Scheme, 1927. Specification No. S.E.E.-G.M.1 from Mr. Richard H. Fox, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit, £2 2s. for first copy, £1 1s. for each subsequent copy.

NEWCASTLE ENDOWED SCHOOLS, August 24th.—Electric light installation in a new wing to be erected at each of two schools, viz.: Newcastle-under-Lyme High School, and Newcastle-under-Lyme Orme Girls' School. Specifications, etc., from Messrs. Cramp and Frith, 1, Dickinson Street, Manchester; deposit £3 3s. in respect of one contract, or £6 6s. in respect of both contracts. Tenders are invited only from firms on the National Register of Electrical Installation Contractors.

BURTON LATIMER URBAN DISTRICT COUNCIL, August 26th.—Electric light wiring of 44 houses on the Station Road estate. Tenders to the Clerk.

COMMITTEE OF VISITORS OF GLOUCESTERSHIRE MENTAL HOSPITALS, August 26th.—Electric wiring of Wotton and Coney Hill Mental Hospitals, on "Stannos" earthed concentric system. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

WEST HAM EDUCATION COMMITTEE, August 26th.—September 16th.—Installation of electric light apparatus at Plaistow Secondary School. Specification, etc., from Mr. J. H. Jacques, 61, West Ham Lane, Stratford, London, E.15, until August 26th; deposit £1. Tenders by September 16th.

BRIGHTON GUARDIANS, August 27th.—Electric lighting equipment in Nurses' Home, Poor Law Infirmary, Pankhurst Avenue, Brighton. Specification, etc., from the Clerk, Prince's Street, Brighton.

POPLAR (LONDON) BOARD OF GUARDIANS, August 28th.—Supply and installation of e.h.t. switchgear, a 75 kW mercury arc rectifier, and l.t. d.c. switchboard at the Institution. Specification, etc., from Mr. G. Butler, clerk, 45, Upper North Street, Poplar, London, E.14; deposit £2 2s. returnable.

WESTMINSTER GUARDIANS, August 28th.—Electric lamps, fittings, etc. Forms of tender from the Clerk, Princes Row, London, S.W.1; stamped, addressed envelope to be sent.

STAPLEFORD RURAL DISTRICT COUNCIL, August 29th.—Electrical pumping stations, etc., in connection with Chilwell and District sewerage works. Specifications from Elliott and Brown, Burton Buildings, Parliament Street, Nottingham; deposit £3 3s.

Alternating Current Meters.

ALDERLEY EDGE AND WILMSLOW ELECTRICITY BOARD, August 30th.—Supply of 2 200 a.c. house service electricity meters. Particulars from Mr. E. Hesketh, Electricity Works, Alderley Edge.

MANCHESTER CORPORATION, August 30th.—Supply and delivery of one water-tube boiler superheater, for Barton power station. Continuous actual evaporation of boiler, 130 000 lb. of water per hour. Specification, etc., from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester.

PLYMOUTH CORPORATION, August 30th.—Electrician's ironmongery, etc. Forms of tender from Mr. R. J. Fittall, town clerk.

WEST RIDING EDUCATION COMMITTEE, August 30th.—Electric light installation at Highfields School, Doncaster. Particulars from the divisional clerk, Mr. A. J. Dempster, 20, Christ Church Road, Doncaster.

BURY AND DISTRICT JOINT HOSPITAL BOARD, August 31st.—Supply, delivery and installation of electric refrigerator at (1) Florence Nightingale Hospital, Bury; and (2) Aitken Sanatorium, Holcombe. Specifications, etc., from Mr. F. Wild, clerk, 2, Cross Street, Bury.

WARRINGTON WATER COMMITTEE, August 31st.—Supply of electrically-driven centrifugal pumping plant. Forms of tender, etc., from Mr. J. Gray, water engineer, Warrington; deposit £2 2s.

STOKE-ON-TRENT CORPORATION, September 2nd.—Electric services to new ward and garage at Bucknall Infectious Diseases Hospital. Specification, etc., from the City Electrical Engineer; deposit £2.

Annual Supplies of Cables, etc.

WARRINGTON CORPORATION, September 2nd.—Twelve months' supply of (1) e.h.t. and l.t. paper and lead-covered cables; (2) earthenware conduits; (3) reinforced concrete cable protector slabs and tiles, and hard burned red tiles. Specifications (deposit £1 1s. for each) from Mr. F. V. L. Mathias, Electricity Works, Warrington.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, September 4th.—Extension of extra high pressure switchgear (contract No. 52). Specifications, etc., from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

EPSOM GUARDIANS, September 4th.—Electric light installation at the institution. Particulars from the clerk, Mr. Alick G. Ebbutt, Mead House, 61, South Street, Epsom.

WOOLWICH GUARDIANS, September 4th.—Refrigerating plant. Further particulars from the Steward at the Hospital, Plumstead High Street, London, S.E.18.

STEPNEY (LONDON) GUARDIANS, September 5th.—Six months' supply of electrical fittings, etc. Forms of tender from Mr. S. McClelland, Administrative Offices, Bancroft Road, Mile End, E.1; stamped, addressed envelope to be sent.

HARROGATE CORPORATION, September 7th.—Supply and erection of overhead 11 000 V lines and 346/200 V lines. Specification, etc., from Mr. Neil McLean, borough electrical engineer, 33, Swan Road, Harrogate.

SCARBOROUGH CORPORATION, September 7th.—Supply and erection of e.h.t. and l.t. overhead lines (spec. 8/29); and supply of e.h.t. and l.t. paper insulated cable (spec. 9/29). Specifications, etc., from Mr. E. J. Jarvis, 89, Westborough, Scarborough.

LONDON COUNTY COUNCIL, September 9th.—Supply and erection of e.h.t. switchgear, etc., for tramway sub-stations. Specifications, etc., from the General Manager of Tramways, 23, Belvedere Road, S.E.1; deposit £2.

NEW MILLS URBAN DISTRICT COUNCIL, September 9th.—Electrical equipments, including e.h.t. and l.t. switchgear, transformers, transformer kiosk, e.h.t. and l.t. cables, feeder pillars, etc. Specification, etc., from the clerk, Mr. D. Bennett.

OLDHAM GUARDIANS, September 9th.—Electrical lamps and fittings. Particulars from the clerk, Mr. F. W. Fletcher.

LIVERPOOL CORPORATION, September 10th.—Electric power and lighting installation for new abattoir, Stanley, Liverpool. Specification, etc., from Land Steward and Surveyor, Municipal Buildings, Liverpool; deposit £3 3s.

CENTRAL ELECTRICITY BOARD, September 11th.—Supply, delivery and erection of 132 kV overhead transmission lines (approach to Clarence Dock, Liverpool). Specification No. N.W.E.-P.L.3, from Mr. R. H. Fox, secretary, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s., for first copy, and £1 1s. for each subsequent copy.

CROYDON GUARDIANS, September 11th.—Six months' supply of electrical fittings and appliances, etc. Forms of tender from the Clerk, Mayday Road, Thornton Heath; stamped addressed envelope to be sent.

EAST LOTHIAN EDUCATION AUTHORITY, September 27th.—Electrical work in connection with erection of public schools at Longniddry and Aberlady. Forms of tender, etc., from Messrs. Morham and Brotchie, 29, Hanover Street, Edinburgh.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Three 125 000 lb. per hour normal (150 000 lb. per hour maximum) steam generating units, water tube boilers, with stokers, economisers, coal and ash handling equipment, etc.

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with foundations and boiler house buildings. Specification, etc., from the Borough Electrical Engineer, 18-24, Lower Clapton Road, London, E.5; deposit £3.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc. Specifications from the Borough Electrical Engineer, 18–24, Lower Clapton Road, E.5; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled, duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links, one 30 000 kVA busbar coupler equipment, with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18–24, Lower Clapton Road, E.5; deposit £3.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

BELGIAN POSTS AND TELEGRAPHS, August 26th.—Telephone cables between Ghent and Antwerp, Liege and Combain-au-Pont, Verviers and Francorchamps, and Charleroi and Liege. Cahier des Charges (fr. 6¼) from the Post and Telegraph Department, Brussels.

GREY ELECTRIC POWER BOARD, August 27th.—Supply and erection of generating plant, for the Arnold river hydro-electric scheme. (Reference B.X. 5 422.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 27th.—Supply of cord type switchboards (schedule C. 448). (Reference B.X. 5 428.)

INDIAN STORES DEPARTMENT, August 28th.—One 30 kW two-wire d.c. generating set. (Reference B.X. 5 522.)

JOHANNESBURG MUNICIPALITY, August 29th.—Supply of two miles of 0000 S.W.G. (4 in. diameter) round section, h.d. copper trolley wire (contract No. 236). (Reference A.X. 8 345.)

JOHANNESBURG MUNICIPALITY, August 29th.—Copper weatherproof wire for overhead lines. (Contract No. 234.) (Reference B.X. 5 565.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 29th.—Supply of 3 000 lamp fittings. (Reference B.X. 5 534.)

COMPAGNIE DES CHEMINS DE FER PORTUGAIS, August 31st.—Mechanical or electrical apparatus for operating points and signals. (Reference A.X. 8 367.)

CARLOW DISTRICT MENTAL HOSPITAL, August 30th.—Electric wiring in the principal mental hospital, Kelvingrove. Specification, etc., from Messrs. MacEntee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £2 2s.

WATERFORD HARBOUR COMMISSIONERS, August 31st.—Light standards, poles, cables, lamps, etc. Specification, etc., from the Harbour Engineer; deposit £2 2s.

PRETORIA CORPORATION, September 2nd.—Columns, fittings, lanterns, etc., for street lighting, and master clock for frequency regulation. (Reference A.X. 8 322.)

DUBLIN PORT AND DOCKS BOARD, September 3rd.—Supply and erection of two 4-ton level luffing electric portal cranes. Specifications from the engineer of the board, Mr. J. Mallagh, East Wall, Dublin.

OUDTSHOORN MUNICIPALITY, SOUTH AFRICA, September 3rd.—Supply and delivery of 35 kW steam-driven generating set, together with the supply and delivery only of certain switchgear material. (Reference B.X. 5 524.)

CAPE TOWN MUNICIPALITY, September 4th.—Steel poles, insulators, street lighting fittings, etc. (Reference A.X. 8 334).

NEW ZEALAND GOVERNMENT RAILWAYS, September 4th.—Supply of motor generator (specification 287). (Reference B.X. 5 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 7th.—Supply of v.i.r. wire. (No. P. and T. 151/1 573.) (Reference B.X. 5 416.)

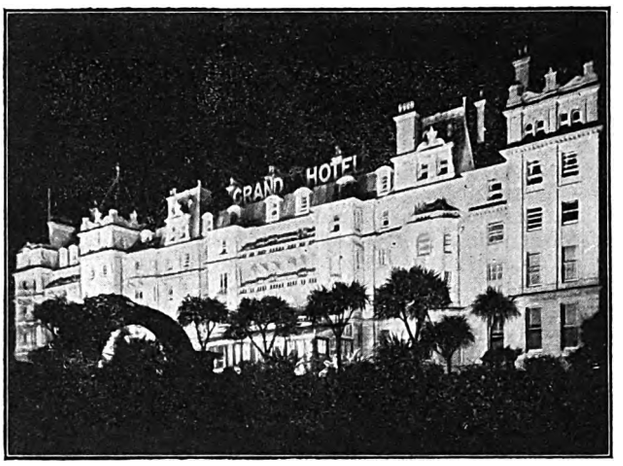
MAFEKING MUNICIPALITY, September 9th.—Steam raising plant, engines, alternators, switchgear, etc. (Contract "A.") (Reference A.X. 8 352.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 10th.—Two-conductor cores (P. and T. 151/1 600). (Reference B.X. 5 462.)

LOURENÇO MARQUES PORT AND RAILWAYS, September 11th.—Battery tractors and trailers. (Reference A.X. 8 172.)

BULAWAYO MUNICIPALITY, September 13th.—Supply of h.t. overhead transmission lines, stepdown transformers, pumps with motors, etc. (Reference A.X. 8 181.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, September 16th.—Supply of automatic sub-station at Remuera (two 500 kW machines and switchgear); automatic sub-station at Point Chevalier (two 1 000 kW machines and switchgear);



THE Grand Hotel, Torquay, the façade of which is illuminated by B.T.H. coloured floodlighting. The projectors are arranged in two groups fixed at ground level, 45 ft. in front of the building, one group being trained at the lower half of the building and the other on the upper portion. The projectors are equipped with 1 000 W gasfilled lamps, and are provided with screens of flame colour.

22 000 V switchgear; 6 600 V switchgear; and supervisory control apparatus. (Reference B.X. 5 506.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 17th.—Supply and erection of petrol-electric sets. (Reference B.X. 5 537.)

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Supply of electric goods, locomotives and battery tenders, in connection with electrification of Madras suburban services. Specifications, etc. (£1) from the company's offices, 91, Petty France, Westminster, S.W.1.

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Electrical control and traction equipment for suburban services. Specifications, etc. (£1, not returnable), from the Company's Offices, 91, Petty France, Westminster, S.W.1.

EGYPTIAN MINISTRY OF THE INTERIOR, September 23rd.—Electric light installation and distribution system for the town of Kafr-el-Cheikh (Gharbick Province). (Reference B.X. 5 502.)

INVERCARGILL (N.Z.) CORPORATION, September 23rd.—Supply and delivery of switchboard, to be directly operated and suitable for controlling 11 000 V, three-phase, 50-cycle current, it may be either of the draw-out truck type or totally armour clad, and will at first consist of seven units. (Reference B.X. 5 507.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 23rd.—Crude oil engine-driven 150 kW electric generating plant. (Tender No. 1 528.) (Reference B.X. 5 566.)

Condensers Required for Australia.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 24th.—Supply of condensers (schedule C. 461). (Reference B.X. 5 488.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 26th.—Two 100 kVA motor-alternators (tender No. 1 521). (Reference B.X. 5 564.)

DURBAN CORPORATION, September 27th.—Supply of three-phase ironclad, compound filled switch panels (specification S. 778). (Reference B.X. 5 505.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Machine tools, Diesel and semi-Diesel engines, boilers, electric batteries, etc., for the Prisons Administration. (Reference A.X. 8 245.)

MARLBOROUGH (N.Z.) ELECTRIC POWER BOARD, September 28th.—Supply and erection of 600 B.H.P. Diesel driven generating plant and switchgear. (Reference B.X. 5 556.)

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STATE ELECTRICITY COMMISSION, VICTORIA, September 30th.—Supply and delivery of three 3 000 kVA 50 cycle, oil immersed, self-cooled, outdoor type single-phase transformers and spare coils and bushings. (Reference B.X. 5 523.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 30th.—Twelve months' supply of electric lamps (tender No. 1 526). (Reference B.X. 5 590.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Three 3 000 kVA transformers and spares. (Reference B.X. 5 523.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £2 2s.

WELLINGTON CORPORATION, September 30th.—Electric motors, starters and switchgear, for the Milk Department. (Reference B.X. 5 508.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 1st.—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B.X. 5 567.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—Supply of electric lamp standards. (Reference A.X. 8 251.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 1st.—Supply and delivery of switchboard cords. (Reference B.X. 5 515.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 1st.—Supply of bolts, brackets, screws, springs, etc., for British Post Office No. 121 wall telephones and No. 2 receiver switch. (Tender No. P. and T., 151/1700).

VICTORIAN RAILWAY COMMISSION, October 2nd.—Supply of a.c. line relays for power signalling. (Reference B.X. 5 563.)

MONTEVIDEO PORT ADMINISTRATION, October 7th.—Electric trucks, for load of 1 500 to 2 000 kilos, with generating sets for charging batteries, etc. (Reference A.X. 8 353.)

VICTORIAN ELECTRICITY COMMISSION, October 7th.—Supply and delivery of 11 000 V three-core cable. (Reference B.X. 5 539.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Supply of B.P.O. type resistances. (No. P. and T., 151/1712).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single-phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 15th.—Switchboard instruments, test plugs and sleeves (schedule C. 472). (Reference B.X. 5 541).

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type resistances. (Reference B.X. 5 551.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type retardation coils. (Reference B.X. 5 552.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 16th.—Electric motors, pumps, filters, and artesian well. (Reference A.X. 8 373.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic wall and table telephones. (Reference B.X. 5 509.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Supply of insulated wire (schedule C.475). (Reference B.X. 5 580.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Telephone transformers (schedule C.474). (Reference B.X. 5 581.)

MELBOURNE CITY COUNCIL, October 30th.—Two 2 500 kW motor-convertors and accessories, or two 2 500 kW rotary convertors, with transformers and accessories. (Reference B.X. 5 570.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General, Savoy House, Strand, London, W.C.2.

Tenders Accepted.

SLOUGH URBAN DISTRICT COUNCIL.—W. G. Bedford, rewiring work at Chalvey pumping station, £26 5s.

KNIGHTON URBAN DISTRICT COUNCIL.—Knighton Electric Light Co., public lighting during winter season, £173.

EVESHAM RURAL DISTRICT COUNCIL.—H. Parker, electric light installation in 52 houses at Broadway, £215 8s.

SEAHAM HARBOUR URBAN DISTRICT COUNCIL.—Favell and Co., extension of lighting cables to Carr House estate, £365 14s.

STOKE-ON-TRENT CORPORATION.—Messrs. Barnett and Soans, wiring for lighting and motors at the Central power house, £971 7s.

NORTHAMPTON CORPORATION.—Northampton Electric Light and Power Co., Ltd., provision of mains and lighting for the refuse disposal plant, £640.

ISLINGTON (LONDON) BOROUGH COUNCIL.—Tudor Accumulator Co., repairs to and replacement of emergency lighting battery at electricity station, £461.

MANCHESTER SOUTH JUNCTION AND ALTRINCHAM RAILWAY.—Metropolitan-Cammell Carriage, Wagon and Finance Co., Ltd., 24 motor cars, 22 trailer cars and 22 driving trailer cars. The contract amounts to nearly £200 000.

SOUTHEND CORPORATION.—General Electric Co., Ltd., supply of 1 500 kW motor-generator, £5 483; Westinghouse Brake and Saxby Signal Co., Ltd., signalling apparatus, for use on pier tramway, £960. (Both recommended.)

Switchgear for National Scheme.

CENTRAL ELECTRICITY BOARD.—English Electric Co., Ltd., 33 kV metal clad switchgear for the North West England Electricity Scheme. The contract, which is of the value of over £80 000, covers 39 metal-clad units, of which 29 are Class O.L.F. with a rupturing capacity of 500 000 kVA, and 10 Class O.L.G. having a rupturing capacity of 750 000 kVA. All units have duplicate busbars with plug changing, and are electrically operated from a remote control board. The contract is a comprehensive one, and includes protective gear, control boards, cabling, batteries, handling gear, l.t. auxiliary switchgear, etc. It will be remembered that an order for 33 000 V transformers for this scheme was also placed with the English Electric Co.

LONDON COUNTY COUNCIL.—Hurst, Nelson and Co., Ltd., 100 double-deck electric tramcar bodies (class E. 3 bogie type), £172 200. Also tendered: English Electric Co., Ltd., £173 200; Brush Electrical Engineering Co., Ltd., £173 200; R. Y. Pickering and Co., Ltd., £180 600; Metropolitan-Cammell Carriage, Wagon and Finance Co., Ltd., £181 100; Cravens Railway Carriage and Wagon Co., Ltd., £183 100; Short Brothers (Rochester and Bedford), Ltd., £186 100; W. and E. Hill, Ltd., £250 200. English Electric Co., Ltd., 50 double-deck electric tramcar bodies (class H.R. 2 bogie type), £87 400. Also tendered: Brush Electrical Engineering Co., Ltd., £87 900; Hurst, Nelson and Co., Ltd., £88 400; Metropolitan-Cammell Carriage, Wagon and Finance Co., Ltd., £92 050; R. Y. Pickering and Co., Ltd., £92 550; Cravens Railway Carriage and Wagon Co., Ltd., £93 300; Short Brothers (Rochester and Bedford), Ltd., £93 550; W. and E. Hill, Ltd., £125 650. Electro-Mechanical Brake Co., Ltd., 100 complete tramcar sets of class 4 centre-bearing swing bolster bogie trucks, £24 900. Also tendered: Kilmarnock Engineering Co., Ltd., £28 675; English Electric Co., Ltd., £28 675; Maley and Taunton, Ltd., £28 800; Brush Electrical Engineering Co., Ltd., £29 830; Cravens Railway Carriage and Wagon Co., Ltd., £30 500; Malleable Steel Castings Company (1909), Ltd., £32 400; Hurst, Nelson and Co., Ltd., £33 400. Electro-Mechanical Brake Co., Ltd., 50 complete tramcar sets of class 6 centre-bearing swing bolster bogie trucks, £15 600. Also tendered: Kilmarnock Engineering Co., Ltd., £16 548 15s.; English Electric Co., Ltd., £16 698 15s.; Maley and Taunton, Ltd., £17 350; Cravens Railway Carriage and Wagon Co., Ltd., £18 500; Malleable Steel Castings Co. (1909), Ltd., £19 850; Hurst, Nelson and Co., Ltd., £19 950; Brush Electrical Engineering Co., Ltd., £22 350. English Electric Co., Ltd., 100 complete tramcar sets of electrical equipments for class E.3 cars, and assembly and connecting up of 100 class E.3 car bodies with trucks, brakes and electrical equipments, etc., £83 750. Also tendered: Metropolitan-Vickers Electrical Co., Ltd., £83 950; General Electric Co., Ltd., £86 350; British Thomson-Houston Co., Ltd., £88 150. Metropolitan-Vickers Electrical Co., Ltd., 50 complete tramcar sets of electrical equipments for class H.R. 2 cars, and assembly and connecting up of 50 class H.R. 2 car bodies, with brakes, trucks and electrical equipments, etc., £60 000. Also tendered: English Electric Co., Ltd., £63 450; General Electric Co., Ltd., £63 700; British Thomson-Houston Co., Ltd., £65 950. Estler Bros., Ltd., sets of magnetic track and wheel brake equipments for 100 class E. 3-bogie tramcars and 50 class H.R. 2-bogie tramcars, £8 152 10s. Also tendered: Malleable Steel Castings Co. (1909), Ltd., £9 875; Metropolitan-Vickers Electrical Co., Ltd., £13 275; Electro-Mechanical Brake Co., Ltd., £13 600; Maley and Taunton, Ltd., £13 600; British Thomson-Houston Co., Ltd., £15 050; English Electric Co., Ltd., £15 050.

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WORK IN PROSPECT.

BASINGSTOKE.—School, Worting. Particulars from the county architect, Mr. A. L. Roberts, The Castle, Winchester.

BILLINGHAM.—Housing scheme (100). Particulars from the surveyor.—Hotel for J. Eadie and Co.—Houses (34), Sunnybrow Estate, for Harland and Parker.

BIRKENHEAD.—Housing scheme (182) Particulars from Mr. R. W. Johnston, borough engineer.

BLACKBURN.—Housing scheme (200). Particulars from the Borough Engineer.

CAMBUSLANG.—Additional 52 houses. Particulars from Mr. P. C. Smith, district offices, Hamilton.

CANTERBURY.—Cement works, for Frank Cooper (Canterbury), Ltd.

DARLINGTON.—Extensions, War Memorial Hospital. Particulars from the contractors, Gustavus Bailey, Ltd., Newcastle on-Tyne.

DARTFORD.—Additional housing scheme (56). Particulars from the Surveyor.

DERBY.—Isolation hospital extensions to cost £50 000. Particulars from the Borough Engineer.

DOVER.—Laundry extensions. Particulars from William Beeston and Son, Castle Street.

EGHAM.—Isolation hospital extensions. Particulars from the surveyor, Mr. A. P. Sturt.

ELLESMERE PORT AND WHITBY.—Municipal buildings and Market Hall. Particulars from Mr. Eric E. Evans, 17, Beresford Road, Oxton, Birkenhead.

ELTHAM.—Boys' secondary school to cost £14 250.

GLENBOIG.—Additional 24 houses. Particulars from Mr. P. C. Smith, District Offices, Hamilton.

GLOUCESTER.—Hostel, Training College of Domestic Science, to cost £39 000. Particulars from the Director of Education, Gloucester.

HALESOWEN.—Housing scheme (326). Particulars from the architect, Mr. T. S. Beach, 5, New Road.

HALIFAX.—Operating theatre, St. Luke's Hospital, to cost £12 000. Particulars from the Clerk.

HARTLEPOOL.—Housing scheme (15), for the Town Council. Particulars from the Borough Surveyor.

HUDDERSFIELD.—Extensions, Salendine Nook Baptist Sunday schools to cost £2 750. Particulars from Mr. J. E. Lunn, Milnsbridge.

LANARK.—Reconstruction. Bank premises, for the Commercial Bank of Scotland.

LEWISHAM.—Houses (193), Downham, for the London County Council.

MITCHAM.—Houses (300), and shops. Particulars from Messrs. A. A. Moyniham.—School to cost £34 940. Particulars from the contractors, G. H. Denne and Son, Ltd., Deal.

NEW CROSS.—Rebuilding Kender Street school, to cost £14 383. Particulars from W. H. Gaze and Son, Ltd., Kingston-on-Thames.

NEW MALDEN.—Central school. Particulars from Mr. W. W. Finny, Kingston-on-Thames.

NEWTOWN (MONT.).—Maternity wards, County Infirmary. Particulars from the architect, Mr. A. Stanley Hill.

NORTHALLERTON.—Extensions, County Hall, to cost £9 027, for North Riding County Council. Particulars from the contractors, Armitage and Hodgson, Ltd., Camp Road, Leeds.

RIPON.—Showroom premises. Particulars from City Engineer.

ROMFORD.—Rebuilding station to cost £250 000, for the London and North Eastern Railway Co.

RUGBY.—Central and infants' schools, and extensions, College of Technology and Art (£7 120). Particulars from the Director of Education, Warwick.

ST. HELENS (ISLE OF WIGHT).—Houses (30). Particulars, Mr. W. J. Attrill.

SMETHWICK.—Central Clinic, and school, Uplands. Particulars from Director of Education.

SOUTHBOROUGH.—Cinema theatre. Particulars, the High Brooms Brick and Tile Co., Ltd.

SOUTHPORT.—Bank, Cambridge Road, for Lloyds Bank, Ltd., London.

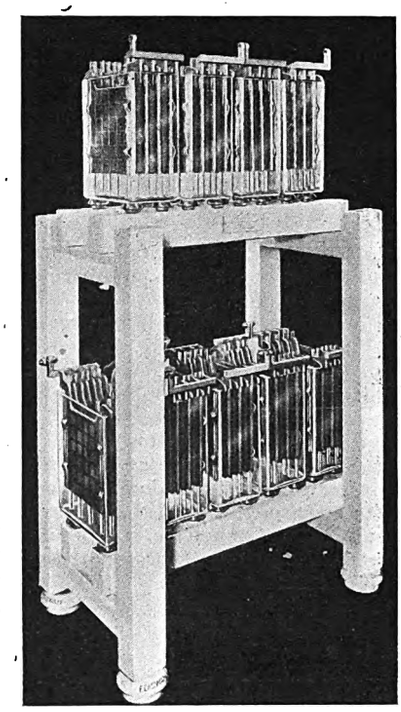
STOURBRIDGE.—Labour Exchange. Particulars from contractors, Messrs. T. W. Edwards and Sons, Audnam.

WELLINGTON (SALOP).—Housing scheme (12), Ketley, for Rural Council. Particulars, the surveyor, Mr. R. B. Phillips, Edgbaston House.

WINDSOR.—Houses (500), Farnham Road, for W. Gradwell and Co., Ltd.

TRADE PUBLICATIONS.

WE have received from FERRANTI, LTD., of Hollinwood, Lancs, copies of charts Nos. 1 and 2, which give full details for the construction of h.t. supply units, using respectively a full-wave metal rectifier and a full-wave valve rectifier. The output of each of these units is claimed to be adequate for the largest receivers in domestic use, and the design is in accordance with the usual "Ferranti" practice, with a view to eliminating back coupling or "motor-boating." It is stated that there is no appreciable mains hum on a good speaker up to a total audio frequency amplification of 5 000 times. These units can readily be assembled and enclosed within the "Ferranti" sheet steel safety box, when they will comply with the wiring regulations of the I.E.E.



A NEW type of stationary battery which has been added to the range of the Edison Swan Electric Co., Ltd., It is a 10-cell unit with A.C. type plates.

The PERFECTA SEAMLESS STEEL TUBE AND CONDUIT CO. (1923), LTD., of Plume Street, Birmingham, has published catalogue No. 16 covering the full range of conduits and fittings made to B.E.S.A. specifications.

YARROW AND CO., LTD., Scotstoun, Glasgow, have published a special brochure describing the Yarrow system of pulverised fuel firing.

"Bus Bodies and Trolley Buses" is the title given to a new publication, No. K27, by the ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2.

J. A. CRABTREE AND CO., LTD., have sent us leaflet No. 1051, dealing with "Jacelite" moulded lampholders for industrial and domestic use.

MAWDSLEY'S, LTD., of Dursley, Glos, have compiled a new brochure in connection with electric arc welding sets. The brochure is one of considerable interest, in that the details are given in no fewer than five languages.

The JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, London, E.C.4, has published a new folder entitled "Induced Draught and Flue Dust Arresting." The issue is well illustrated, and gives a very full description for the plant recommended to power station engineers, etc.

The LONDON ELECTRIC FIRM, Brighton Road, Croydon, has published a special pamphlet dealing with the company's exhibits at the recent International Aero Exhibition. The subjects dealt with are aerodrome and airway lighting, including flood and boundary lighting, ceiling and signalling projectors, obstruction lights, Neon beacons, etc.

"Complete Small Power Houses" is the title of a new brochure issued by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., of Trafford Park, Manchester. The new issue is intended to illustrate the compactness of small generating stations when the company's self-contained turbo-sets are installed. Developed only a comparatively short time ago, this combination, we understand, is finding a ready sale in every branch of industry. In addition to orders for the home country, orders have been received from Japan, Chile, India, Federated Malay States, South Africa, Australia, and Russia, for gasworks, supply stations, cement works, linoleum manufacturers, iron works, coal, iron, copper and gold mines, jute and textile mills, paper mills, civil contractors, and the Admiralty.

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ELECTRICITY SUPPLY.

Inauguration of Holbeach Supply—New Power Station at Oldham—Good Progress of Heckmondwike Undertaking—Gillingham's Wiring Scheme—Official Opening of Ripon Supply—New Experiment at Avonmouth.

ELECTRIC street lighting was inaugurated at Otley last Saturday.

Finchley Electricity Committee recommends various mains extensions at a cost of £1 086.

East Grinstead U.D.C. has applied for loans of £6 000 for mains and services and £500 for meters.

Wimbledon Corporation has purchased a site in Poplar Grove, New Malden, for the erection of a sub-station.

The sum of £600 has been contributed from the profits of the Thornton Cleveleys electricity undertaking towards relief of rates.

Paul U.D.C. has consented to the application of the West Cornwall Power Co. for authority to supply electricity in Mousehole and Paul.

Salford Electricity Committee recommends acceptance of a tender amounting to £910 for the erection of a transformer sub-station at Pendleton.

Whitehaven T.C. has applied for a loan of £400 for extending the mains to a building site in Loop Road, and for an extension of the public lighting.

The Stretford and District Electricity Board is to take over the stores of Stretford Council's electricity undertaking at a price to be agreed, and this has been fixed at £16 558.

Kent County Council has sanctioned an expenditure of £8 500 for an electric light installation at the Barming Heath Mental Hospital, near Maidstone. Electricity will be obtained from Maidstone Corporation.

The Minister of Transport proposes to grant a Special Order to Johnson and Phillips, Ltd., for the supply of electricity within the Burgh of Dunoon. Objections may be posted not later than September 23rd.

To encourage the demand for electricity at Holbeach, four-light installations, with the necessary services, are being supplied free of cost to consumers. The streets were lighted electrically for the first time on August 15th.

The investigation into the administration and organisation of the Blackburn electricity undertaking is coming to a close. The special committee appointed by the Town Council to deal with the matter has agreed to its report.

Oldham Electricity Committee is to seek sanction for a loan of £50 000 for distributing mains. It has been arranged to have a formal opening of the new power station next October and to invite Sir Andrew Duncan to be present as chief guest.

Llanfairfechan U.D.C. has accepted the new terms offered by the North Wales Power Co. for a bulk supply. The terms are £6 per kW, plus ¾d. per kWh, but the maximum payable is not to exceed £11 per kW per annum including the kWh charge.

The Development Co., which is carrying out an electricity supply scheme for the Ponterwyd district, hopes to inaugurate the supply at the end of September. The charges for small houses in which meters will not be used will range from 20s. per annum for one light to 55s. for four lights.

Stepney (London) B.C. has received an application from Shoreditch B.C. for a bulk supply of electricity. The Electricity Committee has authorised the consulting engineer and manager of the Electricity Department to submit an offer for the consideration of the Shoreditch Council.

Macclesfield R.D.C. has received a request from the Mid Cheshire Electricity Supply Co., Ltd., for assent to the company's application for a Fringe Order to supply electricity by overhead lines to Great Warford. It has been decided to consent to the application on condition that underground mains are used.

The Minister of Transport proposes to confirm the Special Orders authorising Messrs. W. H., E. and W. Burton to supply electricity in Aysgarth and Reeth (Yorks) rural districts and the Hawes Electric Lighting Co., Ltd., to supply electricity within part of the Aysgarth (Yorks) rural district. Any objections must be sent to the Ministry by September 23rd.

Dr. H. S. Houldsworth, chairman of Heckmondwike Electricity Committee, stated at last week's meeting of the U.D.C. that the electricity undertaking showed a profit of £5 326 for the past year. Of the 2 500 houses in Heckmondwike, 900 were now consumers of electricity. The Council approved a recommendation to reduce the charge for lighting by 1d. per kWh, making it 4d.

Gillingham (Kent) Town Council has adopted a two-part tariff, on the basis of a fixed charge per annum of 15% of the net rateable value, plus ¾d. per kWh, as an alternative to the present flat rate for private properties. The Council has adopted the principle of a scheme for the installation of wiring and fittings, the wiring to be let out to contract with local contractors, the electric light department having the right to tender.

An Electricity Commission has produced a scheme for transmitting and distributing electricity to all parts of the Isle of Man at a capital cost of £85 000, the current being obtained from Douglas, where the Corporation is erecting a new generating station. Plans have also been prepared for hydro-electric development by utilising water power in Sulby Glen, the expenditure on this work being estimated at £150 000.

Lieut.-Col. Tucker held a Ministry of Transport inquiry recently into the application of the Derbyshire and Nottingham Electrical Power Co. for leave to erect an overhead cable at various points in the Hatton district. It was stated that 36 out of 38 owners of land had consented to the erection of the poles. The company offered to pay 4s. per annum as way leave, but one owner asked 14s. He said the erection of poles would be a handicap in mowing pastures, and amenities would be diminished.

The Ripon Corporation electricity undertaking was inaugurated on August 7th. The supply is purchased from Harrogate at a pressure of 11 000 V. Mr. W. C. C. Hawtayne has been the consulting engineer for the scheme, which has cost about £1 800, and the contractors were the Power Lines Construction Co. and Crompton Parkinson, Ltd. Ald. F. W. Hargrave, chairman of Ripon Electricity Committee, formally handed over the undertaking to the Mayor, who accepted it on behalf of the Corporation. At a subsequent luncheon, Mr. Neil McLean, the Harrogate borough electrical engineer, proposed success to the undertaking, and said he hoped Ripon Corporation would not merge the gas undertaking and the electric undertaking under one head. One of the finest things was to keep the two undertakings competing against each other.

Chorley Corporation Markets Inspector has reported on the electric lighting of the stalls on the market place. There are 22 tenants using electric light. The wires are encased in lead pipes, and carried along under the roofs of the stalls. The tenants have each made their own arrangements with the Lancashire Electric Power Co. The cost to the tenant for meter rent is 6s. 8d. per quarter, and the average cost (including meter rent) for the darkest quarter is £1 6s. 8d. for seven lights of 150 c.p. In regard to the canvas covered stalls, 75% of the tenants are willing to have electric light, provided the charge is reasonable. The Markets Committee has instructed the town clerk to approach the Lancashire Electric Power Co. with a view to an agreement being entered into with the Corporation in regard to electrical apparatus supplied to certain stalls on the market place, and to prepare a scheme for the supply of electricity to the canvas stalls on the general market.

It is announced that plant is in hand for carrying out, at Avonmouth, an experiment involving an original method for utilising impounded tidal waters, so that the energy developed at the time of the fall of the tide may be conserved and employed at the time of the slack water (when the levels inside and outside the dam are approximately the same). It is expected that the experimental plant will be completed and running in the course of the next three or four months. In the scheme to be demonstrated there will be installed a water turbine coupled to an electric generator, while coupled also to the water turbine will be a water heater. The water heated will be retained in a thermal storage vessel, and the power so conserved will be used to drive another electric generator when the main water turbines cannot be employed on account of the small difference in level between the impounded water and the river. This small experimental plant, which will probably be functioning within three or four months' time, will be approximately of 250 H.P. capacity. The experiment is being carried out under the auspices of the Hydro-thermal Power Co., Ltd., a British syndicate.

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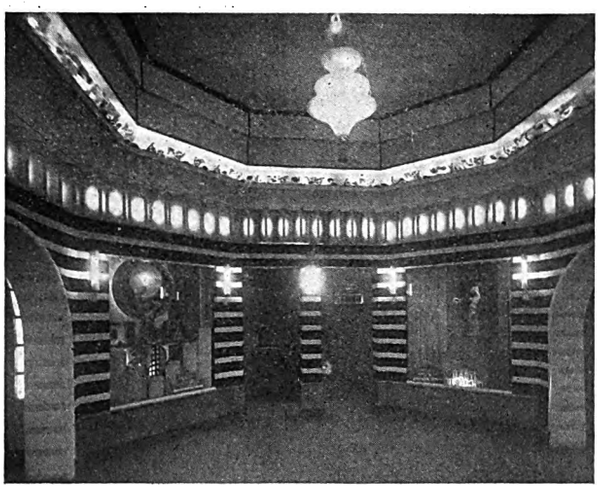
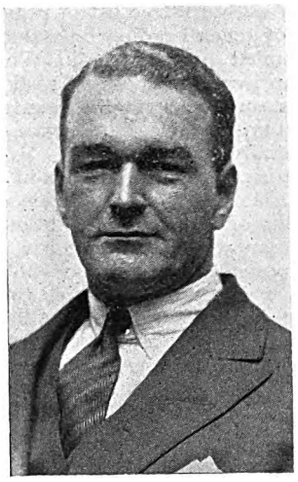
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

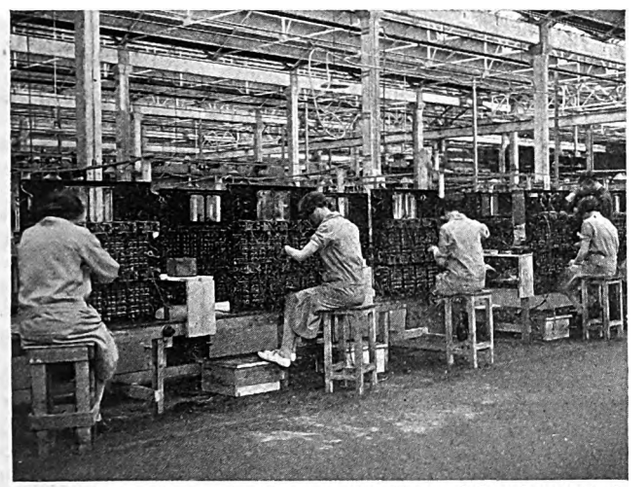
Sir T. F. Purves, engineer-in-chief of the G.P.O., is president-elect of the I.E.E. See page 227.



The Hall of Light in the stand of the Electric Lamp Manufacturers' Association at the North-East Coast Exhibition.



Mr. J. H. Williams, who has been appointed sales manager to the Marconiphone Co., Ltd. See page 227



Showing a process in the construction of hand-operated electrical indicators of totalisators at the Amplion Works, Slough. The automatic switches are being wired to lamps.

An artificial snowball, about 9 ft. in circumference, at the Piccadilly Circus Underground Railway Station. This exhibit has proved a great attraction for the public.

A mechanical spider's web spinner for cinema purposes. An electric fan blows a stream of finely divided liquid rubber, which hardens as it touches the air. Aileen Pringle, the Metro-Goldwyn Mayer star, shows that the apparatus can spin more webs in an hour than a thousand spiders could in a year.

A party of Boy Scouts from the World Jamboree on the occasion of their visit to the works of Messrs. Ferguson, Pailin, Ltd., Higher Openshaw, Manchester. The visitors represented many nationalities, some of them having come from Sweden, Finland, Portugal and Barbados.

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WIRELESS NOTES.

Increased Membership of the R.W.F.—New London Station Testing.

IN response to the desire of many radio manufacturers for an authoritative list of radio wholesalers, a comprehensive list of general radio wholesalers, with their branches, has been compiled by the Radio Wholesalers' Federation. The list comprises 181 wholesale radio depots, which, it is estimated, substantially cover the country and are capable of providing adequate wholesale service to the manufacturing trade generally.

It is common knowledge in the radio trade that the number of firms receiving wholesale distributors' terms is greatly in excess of the requirements of the industry, and it is equally well known that a number do not fulfil the conditions or purposes of general radio wholesalers. The main object of the list, which has been issued to 300 manufacturers, is to secure a definite understanding as to firms and companies entitled to receive wholesale distributing terms. Since the publication of the list, four new members have been added, and as radio retailers, in accordance with the " reciprocal understanding " between the R.W.F. and the W.R.A., will be interested to keep their files up to date, the names and addresses of the additions are as follows: J. G. Coates, Ltd., Bridge Street, Burnley; Eros (Dundee), Ltd., 27, Crichton Street, Dundee; Wm. A. Morton, 76–80, Surrey Street, Sheffield; Smith and Cookson, 22, Paradise Street, Liverpool.

The Potter's Bar Station.

The work of testing the new B.B.C. station at Potter's Bar, which will ultimately supersede the present 2LO, has now been started, and is likely to continue for two or three months. At present the tests are confined to a closed circuit, and no actual broadcasting is taking place.

Within a week or two there will be limited tests after the ordinary broadcasting hours, and interested listeners will no doubt be able to pick them up. Later, the new station will be used, during an experimental period, for the actual broadcasting of such subjects as dance music late at night, and after that, when all the station's special problems have been solved and local peculiarities have been dealt with, it will be put into full commission and will take the place of the present London station. This is expected to occur some time during the autumn, and about three months later a second transmitter, which is housed in the same building, will be brought into service to provide an alternative programme.

The navigation of a ship from Finisterre to Liverpool through fog, solely on wireless bearings, is reported in a communication from the master of the motor vessel " Athelking." The " Athelking " carries a Marconi direction finder, and, commenting upon the efficiency of coastal wireless beacon installations used in conjunction with the ship's direction finder, the captain states that he was able to take the usual four-point bearings for some distance off in spite of the fog. The report again emphasises the valuable aid rendered to navigation by wireless beacon stations, two more of which have recently been completed by the Marconi Co. for Trinity House, at Cromer and Dungeness lighthouses.

" Marking " Application Withdrawn.

The application made for an Order-in-Council requiring the marking of imported wireless sets, components and accessories with an indication of origin has been withdrawn, and the inquiry by the Standing Committee appointed by the Board of Trade arranged to be held on September 30th and October 1st has accordingly been cancelled.

FIXING " FULTOGRAPH " PICTURES.

For a long time past scientists have been conducting experiments to discover means of rendering permanent the pictures received by the " Fultograph " on paper treated with starch and potassium iodide. Until a short time ago no means could be found of making them as permanent as photographic prints. The credit for the discovery of a method of fixing these prints goes to Dr. Alfred J. H. Iles, of Taunton, who discovered that the key to the problem was to be found in that very common and inexpensive substance, alum. After reception, the picture is laid face downwards in a dish containing a solution of alum and ordinary tap water. One teaspoonful of alum to a pint of water is a satisfactory mixture. The picture then becomes as permanent as a photographic plate or print after fixing.

ELECTRIC TRACTION.

Sunderland Corporation to Reconstruct Trams—New Aluminium Car.

SUNDERLAND T.C. last week adopted the report of the Tramways Committee recommending a scheme to bring the present tramway system up to date by reconstructing the track, substituting more powerful motors for those now in use on cars, and speeding up the services. The scheme involves an expenditure of nearly £75 000 on the relaying of the track during five years. The Council rejected a proposal to scrap portions of the system and substitute buses.

An aluminium tramcar, which is said to be the first of its kind, has been placed on the streets of Pittsburg. The car is only about half the weight of a steel car of the same size, and it is claimed that it can easily travel at 45 miles an hour. The entire body and fittings are of aluminium, the floor is of flexolith, a non-skid composition, the car is painted in ivory and green, and the lighting has been arranged so as to avoid glare.

Representatives of Accrington, Rawtenstall and Bacup Corporations have agreed that a day near April 1, 1930, be fixed for the discontinuance of the tramways service and the substitution of a motor-bus service.

A railway terminal, chiefly underground, is to be built by the Canadian National Railways in Montreal, to the design of a British engineer, Mr. Frederick Palmer, at a cost of £10 000 000. Electric locomotives will be used to haul all trains into the station.

An extension of the system of weekly season tickets on the London Underground Railways recently came into operation. These tickets are now available from all stations on the Bakerloo line to all important stations on the Hampstead and City lines, and the Central London Railway.

A project is being made in Japan to establish a submarine railway company with a capital stock of 10 million yen. The project is to run a submarine electric railway between Kiushu and Main Island across the Channel. The project is independent of the one under way by the Government railways.

The Great Western Railway Co. proposes to instal an additional 400 kW motor-convertor and switchgear at Park Royal power station, to meet the increased demands that will be created by the running of 7-car trains on the Ealing and Shepherd's Bush Railway in place of the present 6-car trains.

The Ministry of Transport has confirmed a Provisional Order sought by Bradford Corporation for the running of railless trolley vehicles on most of the forty routes of the Bradford tramway system. It is estimated that the total cost of equipping all the routes for railless trolley vehicles would be £494 571. The relaying of track would cost £916 000.

A German firm has submitted to Kovno (Russia) City Board a proposal for the construction of an electric tramway at a cost of £175 000. The firm offer to do all the construction work and allow two-thirds of the amount to remain as a loan to the city, on condition that the city issues debentures to the firm, on which the latter could advance credits at a discount of 10%. The remaining third of the cost would have to be provided by the City in cash.

LEGAL INTELLIGENCE.

Holsworthy Electricity Supply—Gas Undertaking to be Discontinued.

At Barnstaple County Court, last week, an application was made on behalf of the Holsworthy Gas and Electric Supply, Ltd., to authorise an alteration in the company's articles of association. It was stated that the company's difficulty was that the consumption of gas had been decreasing year by year, whereas the consumption of electricity had been increasing. Added to that, the gas plant had suffered considerable depreciation of late, and the company could not find the money for repairing the plant and works. At the same time, the company desired to meet the needs of the inhabitants by reducing the cost of electricity. That could be brought about if the present gas plant was removed and new electrical plant substituted. They asked the judge to confirm the alteration put forward by the special resolution passed on March 14th and April 4th, 1929. No debenture-holder objected, and creditors had all been paid. Judge Lindley authorised the alteration on condition that the name of the company is altered by omitting reference to gas, or in such other manner as may be approved by the Board of Trade.

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COMPANY NEWS.

Decline in G.E.C. Shares—Cables and Wireless Official Quotations—Improved Conditions for Mexican Utility Undertakings—Electricity in Copper Mines—Directors' Reports and Dividend Announcements—New Companies.

AFTER their last week's sharp rise, General Electric shares have relapsed from 66s. 3d. to 60s. There has been little doing, however, among other equipment shares, with the exception of an improvement of 6d. in Ever Readies, which are now 21s. 9d. Cables and Wireless stocks are now quoted in the Stock Exchange Official List, the 7½% non-cumulative "A" ordinary stock at 85, the "B" ordinary stock at 75½, and the 5½% cumulative preference stock at 95. Marconi's International Marine shares have dropped five shillings, to 61s. 3d. County of London Electric Supply shares, at 55s. 6d., have lost nearly half their last week's improvement.

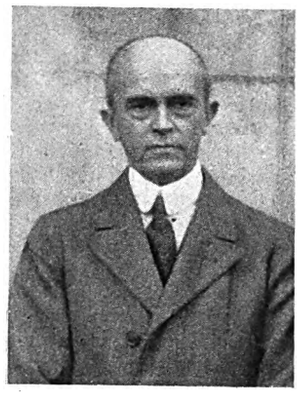
Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
(*d*)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6*	26/6	31/-	24/3
4½	" " " 4½% C.P. (£1)	17/6*	17/6	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/6	25/6	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/-
6	" " " " 6% C.P.	23/-	23/-	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	55/6	57/-	68/6	25/9
6	" " " " 6% C.P.	23/-	23/-	24/-	21/3
(*e*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
1/9½	Lon. Elec. Sup. Ord. (£1).. ..	28/-	28/-	37/6	23/-
1/9½	Metro. Elec. Sup. Ord.	43/9	44/4½	53/-	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	26/10½	26/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P.	23/-	23/-	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6*	26/-	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/-	36/-	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	128½	128½	152	117
7·67	" " " 6% Pf. Stk.	126½	126½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4	" " " 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% pf. Stk.	71	71*	77	68
4	" " " " 4% Deb. ..	77½	77½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	57½	59	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	71	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	56½*	56½	81	54½
3½	" " " 3½% Pf. Stk. ..	61*	63	67	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	72½	72½	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	70	64½
7	Underground Electric Rlys. Ord.	22/6	22/-	28/2	11/-
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	13/9	13/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	75/-	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	22/6	22/6	24/9	19/7
7	" " " 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	131½	153½	120
15	Callender's Cable Ord.	75/-	75/-	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
8	Crompton-Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/-
—	English Elec. Ord.	6/3	6/3	15/9	5/-
—	" " 6% C.P.	7/6	7/6	18/9	7/-
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	21/9	21/3	92/3	18/1
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord...	60/-	66/3	46/6	26/6
25	W. T. Henley's Ord.	127/6	127/6	120/-	69/3
10	Johnson & Phillips Ord.	40/-	40/-	67/11	34/-
7½	Lon. Elec. Wire. & Smith's Pref.	23/9	23/9	25/-	22/3
7½	Siemens Bros. & Co. Ord. ..	30/-	30/-	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23½	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	60½	60½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	85	86	—	—
	"B" Ord. Stk.	75½	76	—	—
	5½% Cum. Pref. Stk. ..	95	98	—	—
3½	Eastern 3½% Pref. Stk.	60½	60½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75*	77	80	74½
22	Gt. Northern Telegraph (£10) ..	31	31	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	61/3	66/3	90/-	16/6
4	Western Tel. 4% Deb. Stk. ..	77½	77½	82	76

(*a*) 19.04d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8,706d. per share. (*e*) 1s. 7·181d. per share. * Ex. Dividend.

WAYGOOD-OTIS, LTD.—Intm. divs. at rate of 5% p.a. (same rate as last year) on ord. shs. is announced.

WASTE HEAT AND GAS ELECTRICAL GENERATING STATIONS, LTD.—Intm. divs. of 2½% for half-year ended July 31, 1929, (same rate as last year), will be payable, less tax, on Aug. 31.

NORTH AMERICAN CO.—Output for year ended June 30 last, 6 450 000 000 kWh, an increase of more than 13% over preceding year.



Mr. Wm. C. Lusk, who becomes chairman of British Thomson-Houston Co., and vice-chairman of Associated Electrical Industries, Ltd.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO. OF BALTIMORE.—A div. on the common shs. of $¾ p. sh. for. qrtr. endg. Sept. 30 is announced.

CANADIAN GENERAL ELECTRIC CO., LTD.—Qrtrly. div. of 1¾% for 3 months endg. Sept. 30, 1929, being at rate of 7% p.a., on the pref. stk., will be payable on Oct. 1.

WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. of 8d. p. sh., less tax, on acct. of standard div. on ord. shs. for current year, will be payable on Sept. 2.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Coupon No. 47 attached to 6% cum. pref. sh. warrts. to bearer will be paid on and after Sept. 2 at the Bank of Adelaide, 11, Leadenhall Street, London, E.C.3.

HURST, NELSON AND CO., LTD.—Fin. div. of 2s. p. sh. and bonus of 6d. on ord. shs. in respect of year ended July 13, 1929, makg. a total of 20% for year (same as last year), will be payable on Nov. 11.

MELBOURNE ELECTRIC SUPPLY CO., LTD.—Coupon No. 49, attached to 8% 1st cum. pref. sh. warrts. to bearer, will be paid on and after Sept. 2 at the Bank of Australasia, 4, Threadneedle Street, London, E.C.2.

MEXICO TRAMWAYS CO.—Half-year's int. on gen. con. 1st mtge. 50 year 5% gold bonds will be paid on and after Sept. 2 at the Bank of Montreal, 47, Threadneedle Street, London, E.C., agst. surrender of coupon No. 33.

PENN-OHIO EDISON CO.—Definite 5½% gold debs., Series "B," due Feb. 1, 1859, are ready for exchange for outstanding $8 000 000 temporary bonds at the Central Hanover Bank and Trust Co., 70, Broadway, New York.

INTERNATIONAL PAPER AND POWER CO.—In first half of this year output of electy. was 2 284 956 000 kWh, increase 40%. Included in output figures are those of New England Power Association, Canadian Hydro-Electric Corporation, Ltd., and hydro-electric plants of International Paper Co. group.

OFFICIAL QUOTATIONS.—The Stock Exchange Committee has granted official quotatns. to 118 012 £1, fully paid, ord. shs. of Anglo-Portuguese Telephone Co., Ltd., 551 939 shs. of no par value of International Telephone and Telegraph Corpn.; £1 200 000 6% 25 year sterling bonds of Prussian Electric Co. and 15 002 £1, fully paid, shs. of Shanghai Electric Construction Co.

ASSOCIATED GAS AND ELECTRIC CO.—Merchandisg. sales for first six months of 1929 totalled $1 612 241, increase 54% over first half of last year. Of total sales, $1 230 799 represents electric appliances and $381 442 gas appliances. Above totals represent sales in only a portn. of co.'s territory. Merchandisg. in Rochester Gas and Electric, Metropolitan Edison, New Jersey Power and Light, Empire Gas and Electric, and the Elmira properties now promise to add materially to sales of the system. Employees of companies in the system, or affiliated, have been invited to subscribe to Class "A" stk. of Associated Co., which now controls utilities with asset value of over $800 000 000.

LAURENCE SCOTT AND ELECTROMOTORS, LTD.—For purposes of informatn., and not as an invitatn. to subscribe, particulars have been published. Co. was incorporated as a private concern some years ago under the name of Laurence Scott and Co., to acquire business of Laurence, Paris and

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Scott, Ltd., electrical engineers, and to carry on mfre. of dynamos, motors, etc. For the purpose of amalgamatn. with Electromotors, Ltd., co. last April increased its authorised cap. from £259 995 to £310 995. Divs. have been paid every year since formatn. of co. in 1896, and for the past three years div. has been 7½%, tax free, while for 1928 there was also a 10% bonus. There are no debs.

East African Power and Lighting Co.—Pft. for 1928, includg. shs. 30 966 brt. fwd., Shs. 1 129 719. Div. for year on pref. shs. Shs. 339 634, depreciatn. acct. Shs. 180 000, writg. down exes. in connectn. with issues of cap. and survey expenses—Tana River, etc.—Shs. 705 805, leaving blce. Shs. 423 914. Directors propose div. on ord. shs. at rate of 6½% p.a., Shs. 390 000, carrying fwd. Shs. 33 914. In Nairobi area of supply, demand continues to expand in satisfactory manner. Developmt. of further hydro-electric works to augmt. supply for Nairobi area has been delayed by prolonged negotiatns. with Government. Auxiliary oil-engine statn. at Nairobi is now in commission. Progress in Mombasa has been satisfactory. Considerable extensions to Kilindini Harbour are in hand.

Compania de Electricidad de la Provincia de Buenos Aires.—Gross receipts for 1928, £571 111; workg. exes., includg. £40 000 for depreciatn., £338 365, leavg. workg. pft. £232 746, agst. £231 725. The increase is small, mainly due to fact that another co. established in Buenos Aires has obtained concessns. in some of the suburbs, thus creatg. a competitn. which has compelled co. to lower its tariffs. After deductg. gen. exes., directors' and trustees' fees and taxes in Europe, deb. int., sinking fund for redemption of bonds, commissns. and difference in exchange, net profit is £163 699, agst. £165 631. To res. £8 185, to directors £15 551, to res. fund (further allocatn.) £62 116 (agst. £71 767), div. of 8% on pre-pref. shs. £35 847 (agst. £27 847) div. of 8% on pref. shs. £42 000 (same). Sums paid as commissn. and other exes. in connectn. with issue of 200 000 new pre-pref. shs., amtg. to £22 014, have been written off entirely. Electricity sold was 19 697 436 kW, increase 1 905 291. Number of consumers reached 55 071, increase 6 948.

Company Meetings.

Mexico Tramways, Light and Power Co., Ltd.—The annual general meetings of the Mexican Light and Power Co., Ltd., and the Mexico Tramways Co., were held in Toronto on August 2nd. Mr. R. C. Brown, one of the vice-presidents, acted as chairman. The chairman referred to the disturbed conditions in Mexico which have somewhat reflected on the companies' operations, and stated that the trouble was fortunately now settled. He also mentioned the satisfactory settlement of the religious question, and informed the meetings that radical labour laws were now before Congress. He stated that construction progress was satisfactory, and the properties were being well maintained, so that, with the reconstruction of some of the plants and the modernising of the distribution system, the companies would be well prepared to meet the natural growth. The reports and accounts for the year 1928 were adopted, and the existing boards of directors were re-elected for the ensuing year, with the exception of Mr. E. R. Peacock, who for personal reasons has found it necessary to retire. Mr. R. O. McMurtry was elected to fill the vacancies on the boards.

Bwana M'Kubwa Copper Mining Co.—At an ordinary general meeting held in London, on August 1st, Sir Edmund Davis, chairman and managing director, said: The debit balance of March 31st, 1928, of £289 458, has been extinguished by deducting therefrom the net surplus for the year under review of £83 442, and an amount of £206 016 transferred from premium on shares account, and we are now in the satisfactory position of being able to commence the current financial year with a clean sheet. The year's working of the Bwana M'Kubwa mine showed a loss of £23 687, as against a loss of £169 784 for the preceding year, a reduction of £146 097. We are leaving nothing undone to accelerate development and equipment, and at the same time are taking all necessary steps to reduce working costs to a minimum. In this connection we are, in association with other mining and finance companies, forming a power company, which will instal hydro-electric plant of sufficient capacity to create 100 000 H.P., which should be transmitted at a cheap cost to the various Northern Rhodesian mines. We have the advantage of the experience of Rhodesia Broken Hill Co., which has now been running its hydro-electric plant and transmitting power for some time in not only a successful manner, but at a very cheap rate.

New Companies.

Hallwoods, Ltd.—Cap., £1 000. Contractors, electricians, etc. A director: J. A. Hallwood, 133, Bennett Street, Hyde.

Green and Jackson, Ltd.—Cap., £1 000. Electrical and mechanical engineers, etc. Reg. Office: 12, Cherry Street, Birmingham.

Disc-Bar Mills, Ltd.—Cap., £100. Mechanical, electrical and experimental engineers, etc. Reg. Office: 93, Drayton Gardens, London, S.W.10.

Reginald Smith (York), Ltd.—Cap., £600. Manufacturers of and dealers in motors, dynamos, electrical apparatus for telegraphs, telephones, etc. Reg. Office: 138, Micklegate, York.

Walker Brothers (Electrical Engineers), Ltd.—Cap., £10 000. To acquire business of electrical engineers now carried on by Walker Bros. at Quality House, Temple Row, Birmingham.

A. J. Dean and Co., Ltd.—Cap., £1 000. To carry on the business of electrical and wireless engineers, contractors for the supply of electrical plant, etc. Reg. office: 164, Eltham High Street, S.E.9.

Spalton Electrical Stores, Ltd.—Cap., £3 000. To carry on the business of manufacturers of and dealers in electrical and general engineering plant and equipment. Reg. office: 18, Cadman Lane, Sheffield.

Price and Belsham, Ltd.—Cap., £3 350. To acquire business of engineer as formerly carried on by J. T. Corbin as "Price and Belsham" at 52, Queen Victoria Street, London, E.C. Reg. Office: 52, Queen Victoria Street, London, E.C.4.

Leeds Fan and Blower Co., Ltd.—Cap., £100. Electrical and mechanical engineers, manufacturers of motors, fans, etc., and installers of electrical apparatus, erectors of electrical plant, etc. Reg. Office: School Close Mills, Neville Street, Leeds.

National Electrical Supplies Co., Ltd.—Cap., £3 000. To acquire goodwill of National Electrical Supplies Co., and to carry on business of electrical engineers and contractors, dealers in and agents for electrical supplies, etc. Reg. Office: 15 and 16, Fisher Street, London, W.C.1.

Manuus Manufacturing Co., Ltd.—Cap., £2 000. To adopt, agreement with A. B. Smith, H. J. Smith and D. Grant, and to carry on the business of manufacturers of electrical appliances, etc. formerly carried on by them as Manuus Manufacturing Co., and that of manufacturers of and dealers in wireless receivers, electricians, etc. Reg. Office: 53, Capethorn Road, Smethwick.

British Electrical Trust, Ltd.—Cap., £100. To acquire and turn to account shares, securities and obligations of any corporation or company carrying on or authorised to carry on business as generators or suppliers, or distributors of electricity, manufacturers of or dealers in machinery, articles and apparatus used for the equipment of electrical generating stations, or used in connection with the generation, distribution, supply, accumulation and employment of electricity, lay down and provide lines, etc. Reg. Office: 32, St. James's Place, London, S.W.1. (Public Co.)

METAL AND CHEMICAL PRICES.

Tuesday, August 20th

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£77 15 0	5s. 0d.	—
Electro Wirebars .. .. „	£84 15 0	—	—
H.C. Wires, basis .. .. per lb.	11 11/16d.	—	—
Sheet .. .. „	11 11/16d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2 11/16d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	8 1/4d.	—	1/4d.
Sheet „ .. .. .. „	10 1/4d.	—	—
Wire „ .. .. .. „	11 1/4d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£22 15 0	—	£1 15 0
Foreign or Colonial .. .. „	£24 5 0	£1 2 6	—
Tin—			
Ingot .. .. per ton	£210 12 6	£1 7 6	—
Wire, basis .. .. .. per lb.	2s. 9d.	—	—
Aluminium Ingots .. .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£25 2 6	12s. 6d.	—
Mercury .. .. per bottle	£22 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
Sodium Bichromate—Per lb. 3½d.
Rubber—Para fine, 10½d.; plantation, 1st latex, 11 1/16d.
∴ The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

Messrs. James Forster and Co., state that the market was subjected to holiday influences last week, the business done being of a very limited nature. Prices opened firmer, but subsequently a reaction took place on freer offerings of August lead, which resulted in a contango being established. Conditions both here and on the Continent seem likely to remain quiet for the rest of the month. Consumption, however, is well maintained as far as this country is concerned, and, given a sustained demand from the Continent, there does not seem much chance of prices declining to any extent. Closing prices on August 16th were £22 18s. 9d. for August, and £23 2s. 6d. for November, 3s. 9d. lower and 1s. 3d. higher, respectively.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CENTRAL RADIO CO., Britannia Buildings, Fenwick Street, Liverpool, wireless dealers. £14 6s. 3d. July 6th.

HOLROSE MANUFACTURING CO., 43, Lonsdale Road, Kilburn, electrical engineers. £15 14s. 1d. July 2nd.

HUSBANDS, E. A. C., Mr, 16, Bridgegate, Retford, wireless dealer. £14 18s. 11d. July 4th.

HYDE AND COWLEY, 24, St. Alban's Road, Weymouth, electricians. £18 18s. 8d. July 12th.

LEICESTER AND HOLT, Sandcliffe Works, Lower Lane, Haslingden, electricians. £11 13s. 8d. July 9th.

PARKER (G. E.) AND SONS, Merchants' Exchange, Pontlottyn, electrical engineers. £10 4s. 2d. June 27th.

REX-O-TONE RADIO, 326, High Street, Bangor, radio dealers. £15 14s. 8d. June 19th.

SHIELDS AND GARE, 46, Queen's Road, Buckhurst Hill, electrical engineers. £10 12s. 10d. June 22nd.

WARNER, L. C., 4, School Lane, Leominster, wireless dealer. £11 8s. 7d. July 5th.

Bill of Sale.

SIDWELL, Amelia (wife of Stanley Sidwell), 36, Bristol Road, Birmingham, electrical contractor and engineer. Dated August 15th, filed August 19th. £50.

Receivership.

ENTERPRISE MANUFACTURING CO., LTD. P. Leask, of 27/8, Finsbury Square, E.C.2, was appointed receiver on August 8th, 1929, under powers contained in debenture dated June 12th, 1923.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

COURT RADIO CO., LTD., London, W.—Registered July 23rd £750 debenture, to S. H. Baker, Eldon Street House, E.C., C.A.; general charge (ranking as a 1st charge).

MERSEY ELECTRICS, LTD., Bootle.—Reg. August 7th, £1,000 debentures; general charge.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD., London, S.W.—Registered August 1st, £1 600 000 debenture stock and premium of 5% inclusive of £1 350 000 already registered (secured by Trust Deed dated July 30th, 1929, supplemental to Trust Deed dated November 12th, 1926); charged on property charged by principal Trust Deed. *£2 600 000. December 28th, 1928.

POWER CONSTRUCTION CO., LTD., London, S.W.—Registered August 2nd, £4 500 and £4 500 mortgages, to Portman Building Society, 14, Orchard Street, W.; charged on 6 to 24 and 21 to 39, Leeds Avenue, Slough. *£36,925. January 14th, 1929.

RADIO SERVICE (LONDON), LTD. Registered July 16th, £1 500 debenture, to G. D. Le Livre, 105, Torriano Avenue, N.W.5, engineer; general charge. *£2 125. December 31st, 1928.

VERNON (C. N.) AND CO., LTD., Manchester, electrical engineers.—Registered July 29th, £700 debentures; general charge.

VIOZONE, LTD., London, W.C., electrical engineers.—Registered July 10th, £2 000 debenture, to S. Strauss, 104, Dartmouth Road, N.W., merchant; general charge.

Satisfaction.

BAXTER AND CAUNTER, LTD., London, W., electricians.—Satisfactions registered July 29th, £3 000 and £2 000, registered July 12th, 1926.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

WRIGHT (R.) AND CO., electrical engineers, 2, Middleton Road, Cheetham Hill, Manchester. The creditors were called together recently, when the representative of Baxendale and Co., Ltd. was elected to the chair. The statement of affairs showed ranking liabilities of £1 039, of which £912 was due to the trade, and £127 to the bank. The assets consisted of stock at cost £138, estimated to realise £69; work in progress £70; fixtures, fittings and goodwill £131, expected to produce £20; book debts £568, valued at £410; and motor car £20; making a total of £589, less £28 preferential claims, or a deficiency of £478. It was reported that the business was commenced in 1921 by R. J. Wright, who traded on his own account until 1924. He was then joined by a partner who brought in £100, but subsequently a dissolution took place. In 1926, the debtor was joined by another partner who also introduced £100 capital. The business appeared to have been successful until the end of last year, when there was a surplus of £37. The deficiency was accounted for by the depreciation written off the assets in the statement of affairs, and a loss on trading during the present year, together with costs of writs, amounting to £119. About four months ago the debtor Wright, who was the active partner in the business, sustained a serious motor accident, and was away for some time. The other partner had never taken any active part in the business. The debtor Wright had drawn £4 10s. a week, but his partner had never received anything. An offer was submitted of a composition of 10s. in the £, and the creditors decided to accept 12s. 6d. in the £, and failing the offer being increased to that amount, the matter to be referred to the three principal creditors.

London Gazette, etc.

Companies Winding-up Voluntarily.

HERD AND SNOWDEN, LTD. By reason of its liabilities, August 7th. T. G. Thompson, Incorporated Accountant, appointed as liquidator.

NEWCASTLE ELECTRICAL AND MOTOR ACCESSORIES, LTD. By reason of its liabilities, August 13th. I. Nixon, Gibb Chambers, Westgate Road, Newcastle-upon-Tyne, Chartered Accountant, appointed as liquidator.

SHARRATT ELECTRICAL CO., LTD. By Special Resolution July 24th, confirmed August 10th. J. L. Fielding, 368, Edenfield Road, Norden, near Rochdale, Accountant, appointed as Liquidator. Meeting of creditors at the offices of Hardman and Co., Ltd., The Baum, Yorkshire Street, Rochdale, Friday, August 30th, at 3 p.m.

Bankruptcy Information.

THORNTON, William Haigh, 25, Bridge Street, Burnley, electrical and wireless engineer. Receiving order, August 13th, Creditor's petition. First meeting, August 28th, 3 p.m., Official Receiver's Office, District Bank Chambers, Blackburn. Public examination, October 22nd, 11 a.m., County Court House, Bankhouse Street, Burnley.

TURNER, Oliver Bramwhite, Paddock House, Yeadon, Yorks, salesman of electrical apparatus. Receiving order, August 12th. Debtor's petition. First meeting, August 29th, 11 a.m., Official Receiver's Office, 24, Bond Street, Leeds. Public examination, October 1st, 10.30 a.m., County Court House, Albion Place, Leeds.

WOODHEAD, Titus Ernest, 26, Central Drive, Blackpool, electrical factor. Receiving order, August 16. Creditor's petition.

WATSON, Stuart Byrne, trading as S. B. WATSON AND CO., 73, Crouch Street, Colchester, Essex, electrical engineer and contractor. Receiving order, August 14th. Debtor's petition.

Notice of Intended Dividend.

SOUTHWOOD, Thomas Southwood Smith, Pound Farm, Whyke Road, Chichester, electrical engineer. First and final dividend, 1s. 7d. per £, payable August 28th, Official Receiver's office, 12A, Marlborough Place, Brighton.

Partnership Dissolved.

MARTIN AND BROWN (David Hope MARTIN and James Porter BROWN), wireless and electrical engineers, 46, Chapel Street, Hamilton, as at August 10th, 1929, by the retiral of J. Porter Brown. The business will be carried on by D. H. Martin at the same address.

Bankruptcy Proceedings.

WHITING, John Lawrence, 4, Portland Street, Newark, electrical engineer and contractor. The first meeting of the creditors herein was held on August 14th, at the Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. According to the statement of affairs there were liabilities amounting to £491, against assets of £13, or a deficiency of £478. Debtor stated that he commenced business in 1924 at Newark, without capital. In 1927 the debtor was appointed agent for the sale of electric lamps, and he received stock to the value of £50. Just after he received the lamps an execution was levied on his business premises, and the lamps were sold by the Sheriff. Debtor was called upon to replace the stock, and he had to pay £20 to settle the matter. From a trading account prepared for 1926 it appeared that the debtor had made a net profit of £4 12s. on a turnover of £600. He attributed his failure to want of capital and doing work at too low a price. The case, being a summary one, was left in the hands of the Official Receiver.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

313 395 R. Bosch, Akt.-Ges. Electrical ignition system for internal-combustion engines. (26/5/28.)
301 834 International General Electric Co., Inc. Spinning or weaving bobbins. (6/12/27.)
301 877 International General Electric Co., Inc. Bobbins for spinning or weaving mills. (7/12/27.)
13 031 G. W. Pierce. Magnetostrictive vibrator. (3/1/28.)
282 087 Akt.-Ges. Brown, Boveri, et Cie. Control of rotary transformer means for coupling two alternating-current networks consisting of a synchronous and an asynchronous machine with a commutator cascade machine. (13/12/26.)
313 634 C. E. Randall, L. R. Thompson and J. C. Savage. Optical apparatus for projecting illuminated signs upon screens. (14/12/27.)
313 539 B. H. C. Matthews. Device for measuring or recording electric potentials or currents. (14/12/27.)
283 503 H. J. Kuchenmeister. Apparatus for the registration of electric fluctuations. (11/1/27.)
313 540 Brown, Boveri, et cie Akt.-Ges. Abteilung Installationen. Suspension insulators. (13/1/28.)
313 465 British Thomson-Houston Co., Ltd. and R. D. Parry. Speed-regulating devices for dynamo-electric machines. (4/2/28.)
285 016 Electrolux, Ltd. Absorption refrigerating-apparatus. (8/2/27.)
313 468 W. R. Debenham. Dynamo-electric generators. (11/2/28.)
313 638 J. C. P. Kirkwood. Electric heat storage stoves. (16/2/28.)
285 798 W. B. Normelli. Absorption refrigerating-machines. (18/2/27.)
313 509 A. H. Midgley. Control of dynamo-electric machines. (6/3/28.)
286 698 Siemens and Halske Akt.-Ges. Receiving or amplifying circuit with incandescent cathode tubes having cathodes directly heated by alternating current. (9/3/27.)
313 427 A. J. Hall, W. T. Gray and Associated Electrical Industries, Ltd. Electric traction systems. (9/3/28.)
313 474 E. Simmons. Signs for advertising and other purposes. (12/3/28.)
313 475 British Thomson-Houston Co., Ltd., E. D. Regis and J. M. Goodall. Electric switchgear. (12/3/28.)
313 478 International Electric Co., Ltd. and F. R. Baldock. Telephones. (12/3/28.)
313 479 C. A. Turner and L. H. Wadsworth. Switches and plug-in sockets or like connections. (12/3/28.)
313 644 Simplex Conduits, Ltd. and H. F. McLoughlin. Electric lamps. (14/3/28.)
287 175 H. Eberhard and Radio-Frequenz Ges. Quartz oscillator for controlling transmitter valves and oscillation generators. (18/3/27.)
313 655 Haslam Foundry and Engineering Co. (1927), Ltd. and F. H. Foster. Refrigerating apparatus. (16/3/28.)
313 658 W. Haddon and J. M. Burnett. Electrical accumulators. (16/3/28.)
287 182 F. Conrad. Electric clocks. (17/3/27.)
313 661 British Thomson-Houston Co., Ltd. and C. W. Wood. Electric switches. (20/3/28.)
313 664 A. E. White (Leland Electric Co.). Electric motors. (20/3/28.)
292 546 Electrical Research Products, Inc. Television systems. (22/6/27.)
313 665 C. Filmer and Associated Electrical Industries, Ltd. Regulating systems for dynamo-electric machines. (20/3/28.)

Applications for Patents.

May 22nd.

15 832 Associated Electrical Industries, Ltd. Inductor relays. (22/5/28, U.S.,
15 884 Associated Telephone and Telegraph Co. Telephone systems. (6/8/28) U.S.)
15 850 J. W. Astley and British Insulated Cables, Ltd. Connecting device for stranded metal cables.
15 901 Automatic Telephone Manufacturing Co., Ltd., and C. Gillings. Telephone systems.
15 875 Belling and Lee, Ltd., and E. M. Lee. Thermionic valves.
15 876 Belling and Lee, Ltd., E. M. Lee and H. O'Connel. Portable support for wireless cabinets.
15 849 J. Bethenod. Electrical musical instruments, etc. (31/5/28, France.)
15 851 British Insulated Cables, Ltd., and C. Fletcher. Connector for electric conductors.
15 847 British Thomson-Houston Co., Ltd. Electrical windings. (22/5/28, U.S.)
15 867 Burovox, Ltd., and J. K. Haynes. Telephone systems.
15 898 A. E. Chernack. Machines for insulating electric cables, etc.
15 892 G. H. Darby and Oldham and Son, Ltd. Portable electric lamps.
15 855 W. W. Groves (I.G. Farbenindustrie A.G.). Accumulators.
15 866 Jacob, White and Co., Ltd., and A. D. White. Electric switches.
15 838 A. T. C. Moore, and Siemens Bros. and Co., Ltd. Intercommunication between telephone systems.
15 824 P. Ruck. Manufacture of zinc containers for galvanic elements, etc.
15 872 Siemens-Schuckertwerke A.G. High potential switch. (23/5/28, Germany.)
15 871 Siemens and Halske A.G. Means for determining electric creaks, etc. (22/5/28, Germany.)

May 23rd.

13 945 Benjamin Electric, Ltd., and H. T. Harrison. Means for dissipating heat from electric light fittings, etc.
15 976 British Thomson-Houston Co., Ltd. Simultaneous reproduction from sound and picture records.
15 939 C. Chaffer and R. E. Shaw. Devices for correcting deviation in magnetic compasses.
16 018 A. G. Clark. Electric switches.
15 944 Deltavis Co. Electric contact plug. (24/5/28, Switzerland.)
15 975 U. Doring and H. J. Spanner. Applying coatings to electrodes, etc. (23/5/28, Germany.)
15 987 C. S. Franklin. Electric circuit arrangements, etc.
15 969 E. Haefely et Cie A.G. Electrical condensers. (16/6/28, Germany.)
15 904 V. Hope. Electric fuse boxes.
15 988 E. Jaroslaw, Jaroslaws Erste Glimmerwarenfabrik, R. and S. Levis and M. and R. Schroeder. Electric bushing insulators. (24/5/28, Germany.)
16 001 Landis and Gyr Soc. Anon. Device for ascertaining excess consumption of electric meters. (16/6/28, Switzerland.)
15 842 L. B. Miller. Telephones operated by heat.
16 018 Plessey Co., Ltd. Electric switches.
15 946 J. R. Quain. Apparatus for electrical illuminations.
16 004 Siemens-Schuckertwerke A.G. Regulating transformers. (14/6/28, Germany.)
15 973 Soc. de Paris et du Rhone. Ignition distributing apparatus. (23/5/28, France.)
16 020 A. F. Tunstill. Switches for preventing operation of electric circuits.
15 987 B. J. Witt. Electric circuit arrangements.

May 24th.

16 077 E. J. Allmen. Incandescent lamps.
16 053 Associated Electrical Industries, Ltd. Oil insulated transformers, etc. (29/5/28, U.S.)
16 121 J. L. Baird, and Television, Ltd. Television, etc., systems.
16 080 British Thomson-Houston Co., Ltd. Motor control systems. (24/5/28, U.S.)
16 082 British Thomson-Houston Co., Ltd. Electric switches. (26/5/28, U.S.)
16 042 M. B. Field. Magnetic compasses.
16 081 International General Electric Co., Inc. Windings for electrical machines.
16 094 H. J. Kuchenmeister. Selenium, etc., cells.
16 049 L. C. Newham. Telantograph apparatus.
16 108 Siemens-Schuckertwerke A.G. Extinguishing arc in electric switches. (25/5/28, Germany.)
16 028 J. Spencer, Ltd., and Sir T. H. Spencer. Brackets for tramway etc., poles.
16 014 Sperry Gyroscope Co., Ltd. Compasses.

May 25th.

16 171 Arcturus Radio Tube Co. Vacuum tubes. (5/6/28, U.S.)
16 187 Celestion, Ltd., and C. French. Telephone instruments.
16 134 J. A. Crabtree. Metal boxes for electric switches, fuses, etc.
16 193 H. C. Drummond, Sir C. A. Parsons and G. G. Stoney. Treatment of light reflecting surfaces.
16 200 R. Kruger Telegraphen-Bananstalt. Telephone instruments. (26/2/29. Czecho-Slovakia.)
16 177 H. C. Le Vine. Electric toaster.
16 189 O. Muck. Telephone systems.
16 135 A. M. Taylor. Electric power transmission.
16 185 H. N. Wright. Apparatus for electrostatic separation of metals.

May 27th.

16 331 Brown, Boveri et Cie Akt.-Ges. Refrigerators. (5/6/28, Germany.)
16 308 N. R. Campbell and General Electric Co., Ltd. Manufacture of photo-electric cells.
16 342 A. K. Croad (N. V. Fabriek van Instrumenten en Elektrische Apparaten Inventum). Electrically heated bed-warmers, etc.
16 309 E. H. Croad and General Electric Co., Ltd. Control of electrical apparatus.
16 237 General Motors Research Corporation. Electric lamps. (1/9/28, U.S.)
16 228 E. S. Humphreys. X-ray apparatus.
16 273 J. Y. Johnson (I.G. Farbenindustrie A.-G.). Manufacture of layers sensitive to light.
16 290 Kolster-Brandes, Ltd. Piezo-electric crystal oscillator system. (26/5/28, U.S.)
16 288 C. Lorenz Akt.-Ges. Device for influencing radiation of electric waves. (20/10/28. Germany.)
16 286 A. Lulki. Light signal for wall switches, etc. (31/8/28, Germany.)
16 337 F. P. McBerty. Electric welding machines.
16 209 H. F. McLoughlin. Electrically welded metal tubing.
16 293 A. M. Newman and J. Suchomski. Wireless receiving circuits.
16 274 A. Rosenberg. Ultra-violet ray, etc., lamps.
16 296 J. W. Swendsen. Manufacture of magnetic cores for electrical machines, etc. (2/6/28, Norway.)
16 297 J. W. Swendsen. Induction motors. (2/6/28, Norway.)
16 259 J. W. White. Electric switches.

May 28th.

16 391 J. Anderson. Electromagnetic time lag device for circuit breakers, etc.
16 453 A. Baier. Alternating current induction motors.
16 435 British Thomson-Houston Co., Ltd., and G. S. C. Lucas. Photo-electric cells for reproducing sound from films.
16 436 British Thomson-Houston Co., Ltd. Incandescent lamps.
16 414 Callender's Cable and Construction Co., Ltd. Controlling tension of coils.
16 358 G. H. Champ and Eagle Engineering Co., Ltd. Gramophones, etc., and thermionic amplifiers.
16 392 Chloride Electrical Storage Co., Ltd., and H. Dean. Accumulators.
16 377 J. Christie and A. Reyrolle and Co., Ltd. Contacts for circuit breakers, etc.
16 386 H. Foxall and J. Lucas, Ltd. Electric switches for motor vehicle electric lamps.
16 428 K. Geyer and F. Ulbrych. Holders for incandescent lamps.
16 471 P. Hansen. Accumulators.
16 360 S. K. Kirtikar and B. A. Quint. Storage batteries.
16 413 J. G. Krüger. Electric motor.
16 388 J. Lucas, Ltd., and H. E. Whitehouse. Distributors for h.t. ignition equipments.
16 389 J. Lucas, Ltd., and E. O. Turner. Junction boxes for motor vehicle electrical installations.
16 390 J. Lucas, Ltd., and W. C. Turner. Cycle dynamos.
16 387 S. A. Mason. Ignition apparatus for engines.
16 440 Noris Zünd-Licht Akt.-Ges. and H. Weckerlein. Ignition systems for engines.
16 398 Schneider et Cie. Electric distant indicating apparatus. (10/7/28, France.)
16 378 D. S. S. Stewart. Transmitting apparatus for use with telephones, etc.
16 383 D. S. S. Stewart. Apparatus for transmission of sound from vibrating diaphragms. (13/5/29.)
16 396 W. W. Triggs (Kent Garage Investing Corporation). Controllers for electric circuits.
16 438 K. G. Wennerström. Melting materials in electric furnaces.
16 425 H. L. Worthington. Magnetic motors.

May 29th.

16 581 Accumulateurs Monoplaque, Soc. Anon. Accumulators. (29/1/29, France.)
16 582 Accumulateurs Monoplaque, Soc. Anon. Accumulators. (26/2/29, France.)
16 568, 16 589 Automatic Telephone Manufacturing Co., Ltd. Telephone systems.
16 485 J. E. L. Barnes (C. Kelly). Insulators.
16 515 C. R. Belling. Electric cooking ovens.
16 572 British Metallising Co., Ltd., and J. G. A. Rhodin. Non-conducting materials.
16 585 British Thomson-Houston Co., Ltd., and A. Maggs. Alternating current machines.
16 586, 16 588, 16 589 British Thomson-Houston Co., Ltd. Television apparatus. (29/5/28, U.S.)
16 550 A. Codelli. Television systems.
16 478 A. K. Croad (N. V. Fabriek van Instrumenten en Elektrische Apparaten Inventum). Electric heating devices.
16 587 Elektrizitats Akt.-Ges. Hydrawerk. Electric condensers. (29/5/28, Germany.)
16 476 N. W. Gilbert and H. C. E. Jacoby. Alternating current motors.
16 568 C. Gillings and T. G. Rice. Telephone systems.
16 529 J. Y. Johnson (I.G. Farbenindustrie Akt.-Ges.) Secondary cells.
16 556 R. G. Kennard. Microphones.
16 475 H. Miller and Co., Ltd., and W. R. Smith. Coil ignition from engines.
16 593 N. V. Philips' Gloeilampenfabrieken. Thermionic valves. (15/12/28, Holland.)
15 598 Radio Instruments, Ltd., and W. L. Shaw. High frequency choke coils.
16 569 T. G. Rice. Telephone systems.
16 511 H. Roden. Operating knobs of electric switches.
16 549 Telefonaktiebolaget L. M. Ericsson. Traffic signalling systems. (30/5/28, Sweden.)
16 557 Telefonaktiebolaget L. M. Ericsson. High frequency differential transformers. (30/5/28, Sweden.)

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THE ELECTRICIAN

Vol. CIII.—No. 2674. Friday, August 30, 1929. [Registered at the General Post Office.] Sixpence

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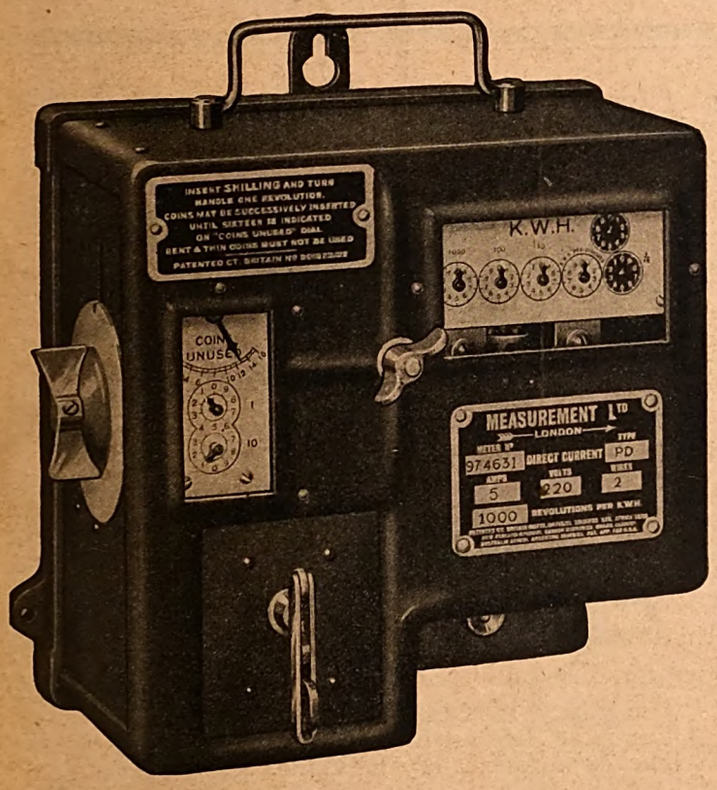

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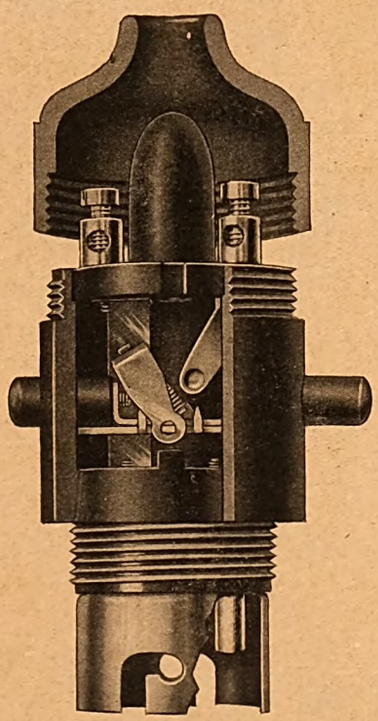

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No. 2674. [Vol. CIII. No. 9.] **Friday, August 30, 1929.** **Annual Subscription, 25s. Overseas, 30s.**

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Current Topics.

A Battery Revolution.

USUALLY when somebody unknown in the electrical world, and generally a priest or a pork butcher, is credited with the invention of a revolutionary type of electric storage battery we know what to do; the wonderful discovery which secures top of column spaces in the daily papers goes no further. The case is somewhat different in regard to the claims put forward on behalf of what appears to be a most remarkable battery constructed by a Dublin University graduate, Mr. J. J. DRUMM, for, if reports from Ireland are correct the development of the invention is being partially undertaken by the Irish Free State Government, following the receipt of favourable reports on the battery from Prof. NOLAN, lecturer in experimental physics at University College, and Dr. HENRY KENNEDY, a member of the Irish Electricity Supply Board. Despite the complete lack of technical information regarding the invention and the remarkable claims that have been made, the high quarters in which the inventor has obtained support turn natural incredulity into anxiety to hear the true facts about a discovery which, if its promise is practically fulfilled, will bring about as great a revolution in the electrical world as did SWAN'S incandescent lamp invention. At present the I.F.S. Government does not seem to be contemplating any application beyond that of railway electrification, and in this direction it expects to electrify the main line between Dublin and Cork at a cost of less than £80 000, compared with the £1 000 000 or more that would be required under existing overhead or third rail systems. It is understood that a railway test of the invention is to be held in Dublin early next month. We hope that on this occasion independent technical observers will be given an opportunity to judge its merits for themselves.

A Real Incentive.

THE need for a battery many times more effective than the types now recognised as incapable of further improvement is such as to justify great interest in Mr. DRUMM'S efforts, and, indeed, in any serious attempt to provide a means for placing large-scale battery traction on a practical basis. At present those most likely to be able to undertake the work lack either the means or the incentive to deal actively with the problem. The offer of a substantial money prize, as suggested by a writer in our correspondence columns this week, for the production of a battery meeting certain easily defined requirements would provide the necessary stimulus.

The Second World Power Conference.

PREPARATIONS are now well in hand for the Second World Power Conference, to be held in Berlin from June 16th to 25th, 1930, and from the preliminary details already available it is apparent that the organising committee in Germany is sparing no effort to make the event a worthy successor of the first conference of its kind, which, as readers will remember, was held at Wembley in 1924. The chief subject around which discussion will centre at the 1930 conference will be the development of power supply and power utilisation. Interesting information may therefore be forthcoming in such directions as new fields for the application of power; the efficient utilisation of generating plants and distribution networks and the improvement of load factor; the storage of power; the advantages of interconnection; the reduction of constructional costs; and tariff systems, to mention only a few of the problems which will definitely receive attention. The extensive nature of the programme will, of course, preclude the reading of papers at the meetings, but all the papers accepted will be printed and distributed to the participants before the Conference. Discussion will follow the reading of general reports, which will give a clear picture of the contributions received in each particular section, and the outstanding points to be discussed. Apart from the business sessions and an attractive social programme, the Conference will provide opportunity to visit a number of important German industrial centres. In Berlin delegates will see the electrical engineering works, and power stations in Central Germany, the Rhineland and Westphalia—especially those using brown coal—will be inspected. Visits to Bavaria and Baden will be arranged to include inspection of interesting water power plants.

Safety in Mines Research.

IN Safety in Mines Research Board Papers Nos. 38 and 39, particulars were given of experiments made to determine the pressures produced on blowing electric fuse links and striking electric arcs in closed vessels when using currents up to 1 350 A at 575 V. In collaboration with the British Electrical and Allied Industries Research Association, and with the aid of facilities granted at Stonebridge Park, London, by the London, Midland and Scottish

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Railway Co., the experiments have been continued with currents up to 10 000 A at 600 V d.c. An account of these later experiments, and a record of the results, has been published in the Safety in Mines Research Board's Paper No. 52, "The Pressure produced on Blowing Electric Fuse Links and Striking Electric Arcs in Closed Vessels," by G. Allsop (H.M. Stationery Office, price 1s. net). The paper records in tabular form the pressures produced by arcs of varying intensity and duration in closed fuse boxes of 400 cu. in. capacity when filled with air and with inflammable firedamp-air mixtures. A table shows the variations caused by using fuse boxes of differing capacities. The chief source of danger with the closed fuse box was found to be the failure of the insulation of the casing, with the establishment of an arc which might melt the casing.

Keep a Record.

MEMORY is a surprising faculty—as surprising by its freaks in functioning as in its occasional failure to function. The helpful law of association notwithstanding, and despite the strange way matters long forgotten are brought back to recollection, in the majority of cases for the majority of men, memory is a sorry hack to trust if precise and accurate reproduction of the thing desired is needed at once. The moral is obvious. Commit the important matter to writing, and, equally important, docket the record so that the note can be consulted as and when required. This is a most advisable precaution in the case of the busy individual; it is indispensable when it comes to the question of a company's larger affairs. It is really astonishing how slipshod and careless many men are who have vital data to collect. It is tragically easy and natural to imagine at the time that a particular reference cannot be forgotten, and it is not always easy to snatch the necessary minute in the midst of multifarious duties to record it. Nevertheless, it is true that the minute commandeered for the docket note is frequently the minute in time which saves nine hours. The record card, containing salient facts in digest tabloid form, is a most invaluable expedient. Its uses and its scope are manifold. Not only an aid for employment or promotion purposes, it serves admirably as a cross-indexing agent for various important data. Test results, for example, can be of great service when properly and informingly docketed. The record card, too, can be pressed into most fruitful use in connection with material which, from one cause or another, has to be diverted from its original allocation, and put to stock for possible future requirements. All too often such relegations find their way into some obscure corner of the stores, only to be unearthed at stocktaking time. After a period of years they pass to the scrap pile—unused when they might have been used. One man saw the potentialities such stock offered. He took pains in the first instance to prepare the necessary information, such as salient features of the components, the size and departure, if any, from precedent, and modifications required to the environment in which the particular part could be used. He circularised interested departments and put the onus on them for not using such stock. The system worked admirably.

"Met, Nat and Emp."

THE steady process of modernising the London telephone system by making it all-automatic will be advanced a further stage to-morrow, (Saturday) when London's largest automatic telephone exchange building will be opened in Wood Street, Cheapside. This building will house METropolitan, NATional and EMPire, the first three of eight new automatic exchanges to be established in London between now and the end of the year. The present transfer to the automatic service will benefit 6 500 subscribers, thus bringing the total number of automatic stations in London to over 45 000. On Saturday next the present Metropolitan manual exchange will be transferred in its entirety to the automatic system without change of title, while National will go over *en bloc* a few days later, probably on September 7th. In addition, certain subscribers at present on the London Wall, Clerkenwell, City and Central Exchanges have been notified of their transfer to the new automatic exchanges. Empire will be brought into operation later.

Growth of Automatic Telephony.

DESPITE the present rapid growth of automatic telephony in London and elsewhere, Britain has far to go before her figures can compare with those of the U.S.A., which can already claim 6¼ million "diallers." Mr. H. L. HARRIS, executive vice-president of the Associated Telephone and Telegraph Co., speaking recently of the rapid developments in the United States, said "the fact that in this country there are more than 6¼ million public telephone stations converted to automatic working, and the further fact that, during the next five years, the Bell system programme alone, for conversion to automatic working, will require over 350 000 lines of automatic equipment annually, provide strong evidence of the success of the automatic service." While progress has been much slower in this country, there are already 13 automatic exchanges in the London inner telephone area out of a total of 57 telephone exchanges. By the end of the year the number will have been increased to 21.

British Broadcasts from the Continent.

THE possibility of broadcasting from British radio stations events taking place on the Continent or in Ireland is opened up by an experiment which has just been made at Montevideo, the capital of Uruguay. A programme of opera which was given at the Colon Theatre, Buenos Aires, was transmitted by land line to the banks of the Rio de la Plata, where it connected with an under-water cable which had been specially designed for the International Telephone Service. The transmission was continued to Montevideo by land line. Special amplifiers were introduced at the theatre and along the route, and specially balanced submarine cable was used to span the 35 miles of water between the banks of the river. The success of the Montevideo broadcast would seem to point to the possibility of broadcasting Continental events from British broadcasting stations, relaying them with much greater success than the present method of re-broadcasting, which is often interrupted by atmospherics. It is gratifying to note that the submarine cable used in the Buenos Aires-Montevideo experiment was made in England.

The "Circle" Movement.

THE Electric Circle movement, started in connection with the Electrical Development Association's "W.O.B." Campaign, has probably done more than anything else to bring together in their own localities the various sections of the electrical industry. Fortunately, many of the original Circles are still in existence, and are functioning even better than they did in the experimental days. Others exist, but only in name, and still other districts are unfortunately without even a dormant Circle organisation. It would be an excellent thing for the industry if a definite effort could now be made to re-vivify the inactive Circles and set up new Circles in the areas which are not so organised. We wonder who will perform this public service. In former years there has been a specialised autumn and winter campaign organised jointly by the E.L.M.A., and the E.D.A., and in each case the Circle organisation has been called upon to work the scheme locally. This year, however, with campaigning almost entirely decentralised, there is no definite call on the Circles to exert themselves in a particular direction. This being so, it seems not at all unlikely that the invaluable Circle movement will languish when it should grow, and that the good work of co-ordinating sales effort between the various branches of the industry will lapse automatically. That such a retrograde movement should be allowed to continue is unthinkable, and we trust that some means will be found before the opening of the autumn season for giving the necessary stimulus to increased Circle activity.

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GENERAL SOLUTION FOR HIGH FREQUENCY TRANSFORMER AND OSCILLATING SYSTEMS.

Some Considerations in the Qualitative and Quantitative Explanation of Phenomena Associated with Transformers and Related Apparatus.

By T. G. HODGKINSON, M.I.E.E., F.Inst.P.

IN power work and telephony it is rarely possible to regard capacities in transformers otherwise than as distributed in a complicated manner, but in high frequency work it frequently happens that the capacities belong to associated apparatus such as valves, rather than to the transformers themselves, and the following work is particularly applicable.

Even in low and audio frequency work there are cases when results given in the following notes will give a qualitative if not a quantitative explanation of phenomena associated with transformers, and attention is drawn to the symmetrical arrangement of the capacity and magnetic coupling factors in the system.

Solution of Transformer Network.

In the system of Figure 1 an inductance l, having resistance r and a shunt capacity P, in series with a conductance s is coupled with mutual inductance M and capacity c to another inductance L, having resistance R and a shunt capacity Q in series with a conductance S.

The conductance s is also the seat of an internal electro motive force V, and it is generally required to ascertain the electro motive force V_1 across the conductance S, as would be the case if S was the conductance of a valve grid-filament space.

If this system is analysed the resulting differential equation can be arranged as follows :—

$$(1)\ \Big[(Ll-M^2)[(Q+c)(P+c)-c^2]\,d^4/dt^4+[(Rl+rL)[(Q+c)(P+c)-c^2]+(Ll-M^2)(S\overline{P+c}+s\overline{Q+c})]\,d^3/dt^3+[L(Q+c)(1+rs)+l\overline{P+c}\,(1+RS)-Mc(2+RS+rs)+Rr[(Q+c)(P+c)-c^2]+ls\,R\overline{Q+c}+LSr\overline{P+c}+(Ll-M^2)sS+Mc(RS+rs)]\,d^2/dt^2+[(LS+R\overline{Q+c})(1+rs)+(ls+r\overline{P+c})(1+RS)]\,d/dt+(1+RS)(1+rs)\Big]V_1=\Big[\overline{Ll-M^2}c\,d^3/dt^3+\overline{Rl+rL}\,c\,d^2/dt^2+\overline{M+Rrc}\,d/dt\Big]sV.$$

This is not the terrifying problem it appears at a first.

The absolute value of V_1 can be abstracted right away for particular cases where V and the electrical quantities are known, but it is generally of more importance to study the modes of Forced and Transient response. These solutions

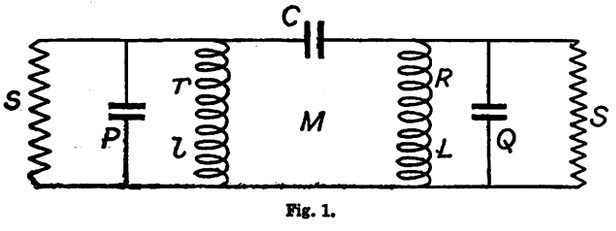

Fig. 1.

as a rule involve cumbersome algebraic expressions, and one is tempted to make unwarranted assumptions in order to simplify these sufficiently to grasp the working of the system. These expressions, however, although cumbersome, are generally symmetrical, and will frequently succumb to a notation. Such a notation is used here in order to present the solutions in the most general form for both modes of response of this system which has two degrees of freedom.

The terms of the fourth line are written in small letters, and these terms, when divided by $(L\overline{Q+c})(l\overline{P+c})$ will be recognised as the squares of damping coefficients and very small quantities in circuits this problem is mainly concerned with; however, without losing sight of them, write them φ^2, and we can rewrite the coefficient of V_1 above.

$$(2)\ (Ll-M^2)[(Q+c)(P+c)-c^2]\Big[d^4/dt^4+\alpha^2\,d^3/dt^3+(\beta+\varphi^2)\,d^2/dt^2+\gamma\,d/dt+\delta\Big]V_1$$

α^2 is of the same order as φ^2 and this coefficient readily factorises into :—

$$(3)\ \Big[d^2/dt^2+\tfrac{1}{2}(\alpha+\theta)\,d/dt+n^2_+\Big]\Big[d^2/dt^2+\tfrac{1}{2}(\alpha-\theta)\,d/dt+n^2_-\Big](Ll-M^2)[(Q+c)(P+c)-c^2]V_1$$

Where :—

$$\theta=\frac{\tfrac{1}{2}\alpha\beta_1-\gamma}{\sqrt{\beta_1{}^2\tfrac{1}{4}-\delta}}.$$

$$n^2_+=\beta_1\tfrac{1}{2}+\sqrt{\beta_1{}^2\tfrac{1}{4}-\delta}.=(2\pi f_+)^2$$

$$n^2_-=\beta_1\tfrac{1}{2}-\sqrt{\beta_1{}^2\tfrac{1}{4}-\delta}.=(2\pi f_-)^2$$

and

$$\beta_1=\beta+\varphi^2-\frac{\alpha^2-\theta^2}{4}.$$

This is a cubic in θ, but remembering what has been said

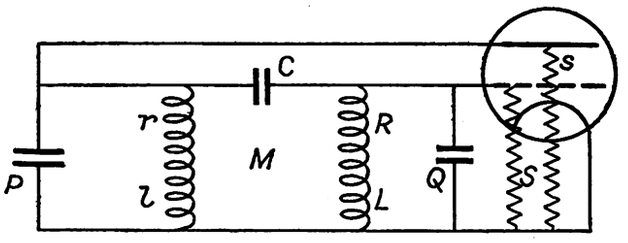

Fig. 2.

about φ^2 and α^2 being small quantities, and after all it is our concern to make them small, θ is readily determined approximately as $\frac{\frac{1}{2}\alpha\beta-\gamma}{\sqrt{\frac{1}{4}\beta^2-\delta}}$.

This also determines the modes of forced response—i.e., the natural frequencies of the system f_+ and f_-.

A careful examination of the coefficient (1) discloses the fact that the quantities $M/\sqrt{Ll}$ and $c/\sqrt{(Q+c)(P+c)}$ are symmetrically arranged in the expression.

$M/\sqrt{Ll}$ is the well understood magnetic coupling factor k, but is more easily used if it is written Sin k. In the same way $c/\sqrt{(Q+c)(P+c)}$ is the capacity coupling factor and in what follows is written Sin ε.

If now A is the arithmetic mean of $L\overline{Q+c}/1+RS$ and $l\overline{P+c}/1+rs$ and G is the geometric mean.

$$(4)\qquad 1/A_1n^2_{\mp}=1-\text{Sin } k\text{ Sin }\varepsilon\,G/A_1\pm\sqrt{(1-\text{Sin } k\text{ Sin }\varepsilon\,G/A_1)^2-\text{Cos}^2k\,\text{Cos}^2\varepsilon\,G^2/A_1{}^2}$$

Where $A_1=A$ with the addition of what can be shown to be the very small terms $\frac{\varphi^2-\frac{\alpha^2-\theta^2}{4}}{2\delta}$.

The solution with the positive sign before the radical is the longer wave, and is distinguished as the "Sum Mode" while the one with the negative sign is referred to as the "Difference Mode" in what follows.

G is less than A, which is less than A_1, and in Graph I the values of $1/A_1n^2$ are plotted against values of Sin k, Sin $\varepsilon\,G/A_1$ for values of Cos k Cos $\varepsilon\,G/A_1=0$, 0·2, 0·4, 0·6, 0·8, and 1·0.

The greater of the two quantities $L\overline{Q+c}/1+RS$ and $l\overline{P+c}/1+rs$ can be written $A_1(1+\sqrt{1-G^2/A_1{}^2})$ and the less $A_1(1-\sqrt{1-G^2/A_1{}^2})$ and notice that

$$\frac{1}{(1-\text{Sin } k\text{ Sin }\varepsilon\,G/A_1)n^2_{\mp}}\ \begin{matrix}>\text{ the greater}\\<\text{ the less.}\end{matrix}$$

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This result is well enough known for the case in which Sin $\varepsilon = 0$—i.e., in which there is no capacity coupling.

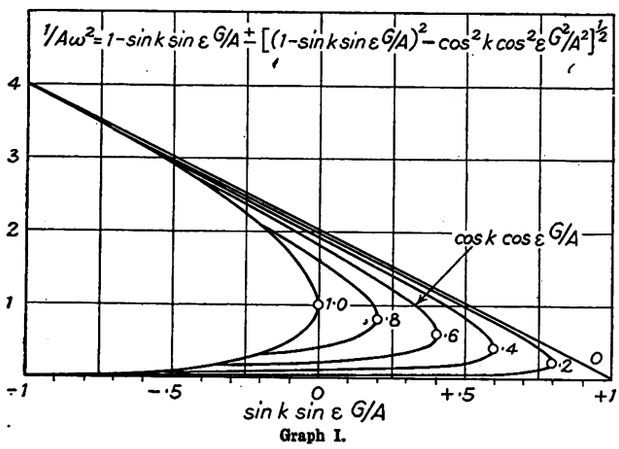
The quantities RS and rs are small quantities in high frequency work, but are often important in audio frequency calculations, however, still bearing them in mind we can imagine the resistances and inductances divided by their corresponding factors—i.e.,

$$R = R/1+RS \qquad r = r/1+rs$$
$$L = L/1+RS \qquad l = l/1+rs.$$

and then write the general expression for the EMF, V_1.

$$(5)\quad V_1 = \frac{M - Llcn^2_{\mp}\cos^2 k + Rrc - M\frac{RS+rs}{2} + icn_{\pm}(Rl+rL)}{\left(\gamma/\delta - \alpha/n^2_{\mp}\right)\left[1 - in_{\pm}\frac{\gamma - \alpha n^2_{\mp}}{\beta_1^2 - 4\delta}\right]}.$$

Ignoring the small terms and the quadrature phase term



Graph I.

for the moment, assuming provisionally that the product $L\overline{Q+c}/1+RS$ is greater than the product $l\overline{P+c}/1+rs$, and substituting values of $n^2_{\mp}$ from (9).

$$(6)\quad V_1 = \frac{[\text{Sin } k \pm \text{Sin } K]\, s\, V}{\left[S(1 \pm \text{Cos } \overline{K-k}) + \frac{R\overline{Q+c}}{L}(1 \pm \text{Cos } \overline{E-\varepsilon})\right]\sqrt{\frac{L}{l}} + \left[s(1 \mp \text{Cos } \overline{K+k}) + \frac{r.\overline{P+c}}{l}(1 \mp \text{Cos } \overline{E+\varepsilon})\right]\sqrt{\frac{l}{L}}}$$

where

$$\text{Sin } K = \frac{\text{Sin } k - \text{Sin } \varepsilon\, G/A_1}{\left[(1 - \text{Sin } k \text{ Sin } \varepsilon\, G/A_1)^2 - \text{Cos}^2 k \text{ Cos}^2 \varepsilon\, G^2/A_1^2\right]^{\frac{1}{2}}}$$

and

$$\text{Sin } E = \frac{\text{Sin } \varepsilon - \text{Sin } k\, G/A_1}{\left[(1 - \text{Sin } k \text{ Sin } \varepsilon\, G/A_1)^2 - \text{Cos}^2 k \text{ Cos}^2 \varepsilon\, G^2/A_1^2\right]^{\frac{1}{2}}}$$

The general adoption of circular functions in these expressions is justified by the facility with which the magnitudes can be grasped.

The coefficients $1 \pm \text{Cos } \overline{K-k}$ and $1 \pm \text{Cos } \overline{E-\varepsilon}$ are associated with the conductances ($\frac{R\overline{Q+c}}{L}$ has the dimensions of a conductance) of the circuit having the greater product of inductance and shunt capacity.

The values of the angles K and E are very readily estimated since

$$(1 - \text{Sin } k \text{ Sin } \varepsilon\, G/A_1)^2 - \text{Cos}^2 k \text{ Cos}^2 \varepsilon\, G^2/A_1^2$$

can be rewritten

$$(\text{Sin } k - \text{Sin } \varepsilon\, G/A_1)^2 + \text{Cos}^2 k\,(1 - G^2/A_1^2)$$

or

$$(\text{Sin } \varepsilon - \text{Sin } k\, G/A_1)^2 + \text{Cos}^2 \varepsilon\,(1 - G^2/A_1^2)$$

If Sin k is greater than Sin $\varepsilon\, G/A_1$ or negative, Sin K has the sign of Sin k, and unless Sin ε is greater than Sin $k\, G/A_1$ or Sin k is negative, Sin E is negative.

In general, in high frequency work the quantities equivalent to those we have called the conductances S and s are determined by the problem, while the quantities more within the control of the designer are the quantities $R\overline{Q+c}/L$ and $r\overline{P+c}/l$ which have the dimensions of conductances.

The resistances R and r include skin effect, radiation losses, etc., and are complicated quantities which have been discussed in detail by various writers. Inductances and capacities are also functions of frequency to a less extent and the art of coil making has been considerably developed.

For a particular size, shape and type of coil the minimum resistance will usually be roughly proportional to the inductance, so that the determining quantities in these losses terms will be the associated capacities $Q+c$ and $P+c$..

The damping coefficients for the two modes are

$$(7)\quad \tfrac{1}{2}n^2 \mp \left[\frac{LS(1 \pm \text{Cos } \overline{K-k}) + R\overline{Q+c}(1 \pm \text{Cos } \overline{E-\varepsilon}) + }{ls(1 \mp \text{Cos } \overline{K+k}) + r\overline{P+c}(1 \mp \text{Cos } \overline{E+\varepsilon})}\right]$$

Where the upper sign refers to the "sum mode" (long wave) and the lower to the "Difference Mode" (short wave).

Remember that this refers to a case where $L\overline{Q+c}/1+RS$ is greater than $l\overline{P+c}/1+rs$. If the reverse is the case the coefficients of the upper and lower lines above are interchanged.

In order to compare these modes, multiply the damping coefficients by $\pi/n_{\mp}$, to give the decrement, and it will be appreciated that transformers can be made selective for modes of response that are quite widely separated.

Decrements will vary from say 0·01 to 0·2, and as an example of the use of the foregoing work, say that we wish to design a tuned transformer, given the values of s, S, P and c, and we decide to tune in the sum mode on the conductance S, i.e., $L\overline{Q+c}$ is to be made greater than $l\overline{P+c}$.

Reverting to the magnification coefficient (6) the optimum value of l will make

$$ls(1 \mp \text{Cos } \overline{K+k}) + r\overline{P+c}(1 \mp \text{Cos } \overline{E+\varepsilon})$$

equal to $LS(\pm \text{Cos } K-k) + R\overline{Q+c}(1 \pm \text{Cos } \overline{E-\varepsilon})$

so that the decrement can be written under these conditions

$$\pi n_{-} L\overline{Q+c}\left[\frac{S}{\overline{Q+c}}(1 + \text{Cos } \overline{K-k}) + \frac{R}{L}(1 + \text{Cos } \overline{E-\varepsilon})\right]$$

$n.^2$ $L\overline{Q+c}$ is not much less than unity, and if Sin k is large (0·7 is a very reasonable value) and Sin ε is made small, the above can be rewritten very roughly

$$2\pi/n_{-}\left[\frac{S}{\overline{Q+c}} + 0{\cdot}7\frac{R}{L}\right].$$

We can guess right away the size of the coils to give the necessary value of R/L and size of the condenser to give the required value of $S/Q+c$.

L is determined now by reverting to the frequency solution. Equation (5) and the only requirement now is to decide the optimum value of l by equating the terms

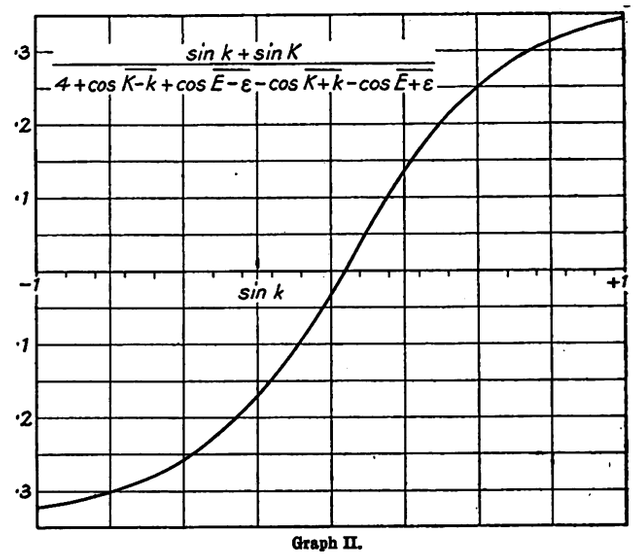
$$ls(1 - \text{Cos } \overline{K+k}) + r\overline{P+c}(1 - \text{Cos } \overline{E+\varepsilon})$$

to the terms

$$LS(1 + \text{Cos } \overline{K-k}) + R\overline{Q+c}(1 + \text{Cos } \overline{E-\varepsilon})$$

Sin ε is now accurately known, as well as Sin k, so that if the latter is made large K and E are approximately determinate and the ratio l/L follows as a matter of course.

A more accurate value for $\overline{Q+c}$ can be obtained by referring



Graph II.

back to the frequency equation and the design is completed.

Graph II is a graph of the value of

$$V_1 S\sqrt{\frac{L}{l}} = \frac{\text{Sin } k + \text{Sin } K}{4 + \text{Cos } \overline{K-k} + \text{Cos } \overline{E-\varepsilon} - \text{Cos } \overline{K+k} - \text{Cos } \overline{E+\varepsilon}}.$$

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This has been drawn assuming that $S\sqrt{\frac{L}{l}} = s\sqrt{\frac{l}{L}}\cdot\frac{R}{L} = \frac{s}{Q+c}$ and $r/l = \frac{s}{P+c}$ for a transformer with the value of $G/A = 0{\cdot}8$.

Sin $\varepsilon = 0{\cdot}1$ and Sin k is varied from a value -1 through zero to the value $+1$.

It will be noticed that the value of $Vs\sqrt{\frac{L}{l}}$ is zero when Sin k = Sin $\varepsilon \frac{G}{A+\sqrt{A^2-G^2}}$ so that if sin ε has appreciable value it will be more profitable to make Sin k negative, as a general rule.

The Valve Oscillator.

The solutions of the general case of the valve oscillator which has inductance in the grid and plate circuits and mutual magnetic coupling as well as capacity coupling between these two electrodes, is a particular case of the solution of the previous portion of this paper, in which the internal electro motive force V of the conductance s has the value $-mV_1$ where m is the so-called valve magnification factor, and the capacity c is the capacity between the grid and anode.

The differential equations for currents in this circuit are

$$(8)\ [1+(R+LD)(S+\overline{Q+c}\,D)+(r+lD)(s+\overline{P+c}\,D)-2McD^2+[(R+LD)(r+lD)-M^2D^2][(s+\overline{P+c}\,D)(S+\overline{Q+c}\,D)-c^2D^2]+ms[MD+cD[(R+LD)(r+lD)-M^2D^2]]]i_1i_2=0.$$

Using the notation of the earlier part the resonant frequencies are determined from the solution of the equation

$$^1/_{A_1}w^2 = 1-\text{Sin } k \text{ Sin } \varepsilon\, {}^G/_{A_1} \pm [(1-\text{Sin } k \text{ Sin } \varepsilon\, {}^G/_{A_1})^2 - \text{Cos}^2 k \cos^2 \varepsilon\, {}^{G^2}/_{A_1^2}]^{\frac{1}{2}}$$

The small losses terms are

$(R\overline{Q+c}+LS)(r\overline{P+c}+ls)+(Rl+rl)msc.-(Rc-Ms)(rc-MS)$ and are those of the earlier case with the addition of the terms $(Rl+rL)msc$.

The conditions under which the system will oscillate are determined from the solution of

$$(9)\ \left[S(1\pm\text{Cos }\overline{K-k}) + \frac{R}{L}\overline{Q+c}(1\pm\text{Cos }\overline{E-\varepsilon})\right]\sqrt{\frac{L}{l}} + \left[s(1\mp\text{Cos }\overline{K+k}) + \frac{r}{l}\overline{P+c}(1\mp\text{Cos }\overline{E+\varepsilon})\right]\sqrt{\frac{l}{L}} + ms[\text{Sin } k \pm \text{Sin } K] = 0.$$

Remember that the coefficients $1\pm\text{Cos }\overline{K-k}$ and $1\pm\text{Cos } E-\varepsilon$ are associated with the conductances $\left(\frac{R}{L}\overline{Q+c}\right.$ is called a conductance) of the circuit having the greater value of the product of inductance and shunt capacity, so that as the equation (9) is arranged above the solution is for a grid oscillator.

An anode oscillator would have required these coefficients with the anode conductances.

Examining equation (9) in relation to the value of

$$\text{Sin } K = \frac{\text{Sin } k - \text{Sin } \varepsilon\, G/A_1}{[(\text{Sin } k - \text{Sin } \varepsilon\, G/A_1)^2 + \text{Cos}^2 k\,(1-G^2/A_1^2)]^{\frac{1}{2}}}$$

(*a*) It will be clear that if Sin $k=0$ and m and Sin ε are sufficiently large the system will oscillate in the "sum mode."

(*b*) If there is magnetic coupling also and Sin k is negative the system requires smaller values of m and, or Sin ε to support oscillation in the "sum mode."

(*c*) If Sin k is made positive and so small that Sin k + Sin $K = 0$ then Sin k — Sin $K > 0$ and the system is incapable of oscillation in either the "Sum" or "Difference" Modes.

(*d*) If Sin k is made positive and greater than Sin $\varepsilon \frac{G}{A-\sqrt{A^2-G^2}}$ the term Sin k — Sin K has a negative value, and if m is sufficiently large the system can oscillate in the "Difference" Mode.

Returning to case (*c*) the capacity coupling factor Sin ε is neutralised, and the system is stable if Sin k is positive and between the values.

$$\text{Sin } \varepsilon\frac{G}{A-\sqrt{A^2-G^2}} \text{ and Sin } \varepsilon\frac{G}{A+\sqrt{A^2-G^2}}.$$

If the products $L\overline{Q+c}$ and $l\overline{P+c}$ are equal $G=A_1$, less the "small losses terms" only and the adjustment is critical.

The expressions given in the foregoing pages are very general and include all sorts of devices that are not classed in the ordinary way as transformers. Tuned chokes, of course, come into this category and although both transformers and oscillators can be made more elaborate than the examples analysed a little rational guessing will reduce them to these forms.

I have to thank the Director of Artillery for his permission to offer this paper for publication.

BOOK REVIEWS.

Die Stromwendung grosser Gleichstrom-maschinen.

By Dr. L. Dreyfus. (Berlin: Julius Springer.) Pp. xii+191. Bound, 17.5 marks.

It is unusual at the present day to see a new treatise on commutation. Despite its shortcomings, the classical theory proved more than enough for many designers; while the more earnest inquirers keenly felt the difficulty of submitting actual conditions to mathematical analysis. The flux oscillations set up by the teeth and the variableness of the brush contact introduced troublesome complications. On the other hand, the universal introduction of commutating poles rendered undue anxiety about commutation superfluous. Having placed the sparking limit beyond the heating limit, the designer felt that his chief care had been removed.

Of recent years, however, no writer has been more active than Dr. Dreyfus in seeking a new orientation of the problem. As he states in the preface, the limitations of the classical theory become apparent to the designer of large d.c. machines, and the difficulties are keenly felt when the limits of such machines are approached. While contented with a close approximation, the author pleads for clearness in understanding the problem and in calculations connected therewith. Among the shortcomings of the older theory, the author mentions: the assumption of a stationary armature field without clearly defining the equivalent steady field assumed to be cut by the conductors; the parts of the leakage field are not clearly defined and calculated; a straight-line commutation curve is assumed, although conditions render this impossible in many cases; the method employed for calculating the requisite commutating field for straight-line commutation is inaccurate. These are some of the gaps that the author tries to fill, or problems he attempts to solve.

The treatment is limited to large units—e.g., 6 000 kW, 12 000 A, 250 r.p.m.—so that the armature windings include only single-turn lap windings with a small number of conductors per slot. This restriction, however, is one for which most readers will be thankful. While the book is essentially for advanced students and designers, it may be stated that the treatment, though mathematical, is not in general difficult. The results are not only given in a usable form, but examples are worked out to illustrate their application. Though the number to whom this work may appeal is relatively small, we feel that the gratitude to the author of those who digest and utilise the results of his labours will be proportionately greater.

S. Parker Smith.

Engineering Electricity.

By Ralph G. Hudson. (London: Chapman and Hall.) Pp. viii+214. 12s. 6d. net.

This is a second edition, and, though written primarily for technical students not specialising in electrical engineering, it forms a brief introductory course for electrical engineering students. As the course is designed to develop the reasoning power of the student rather than to encourage the accumulation of disconnected facts, descriptive matter is only included when it is desired that the student shall visualise the practical devices which illustrate applications of the fundamental principles. The general principles of electricity and magnetism most frequently applied in engineering practice are dealt with, but space limitations preclude consideration of the principles of electrochemistry, illumination, electrostatics, and the wireless propagation of energy.

BOOKS RECEIVED.

"Electrical Engineering Problems." Part II: Alternating-Current Circuits and Apparatus. By John G. Pertsch. (London: McGraw-Hill Publishing Co.) Pp. vii+105. 7s. net.

"Die Stromwendung grosser Gleichstrommaschen." By Dr. Ludwig Dreyfus. (Berlin: Julius Springer.) Pp. xii+191. 16 marks.

"Electrical Transmission and Distribution." Edited by R. O. Kapp. (London: Sir Isaac Pitman and Sons.) Vol. VII. Pp. viii+275. 6s. net.; Vol. VIII, pp. viii+129, 3s. net.

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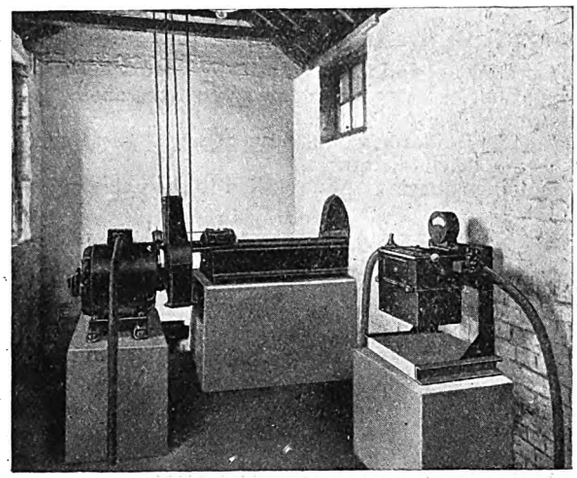

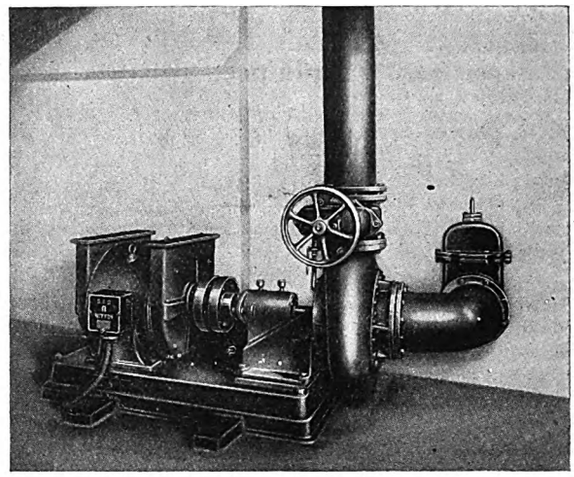

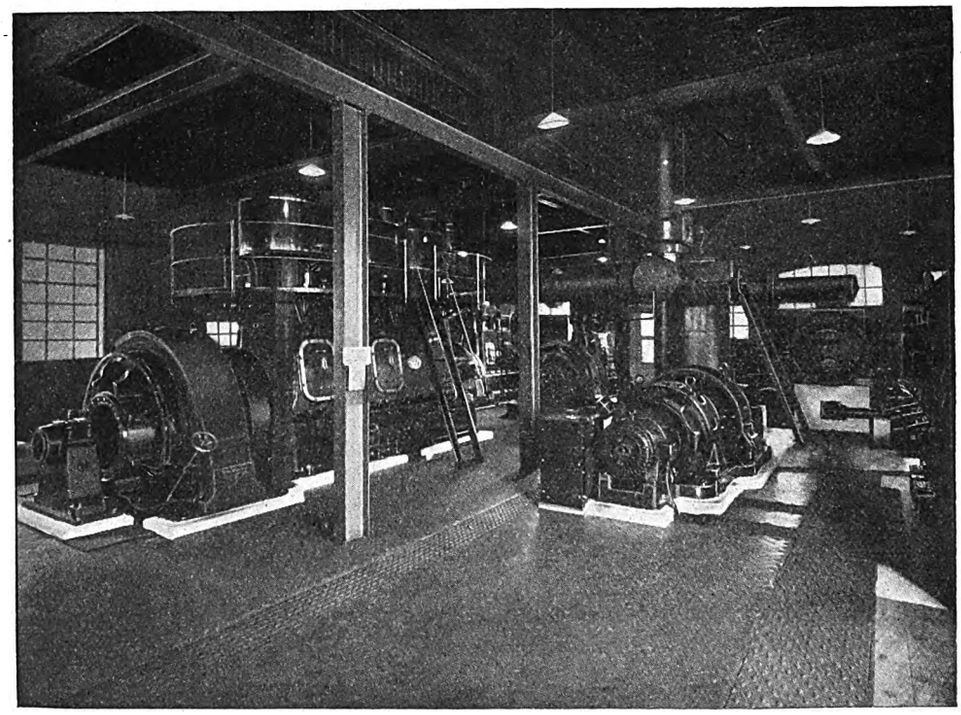

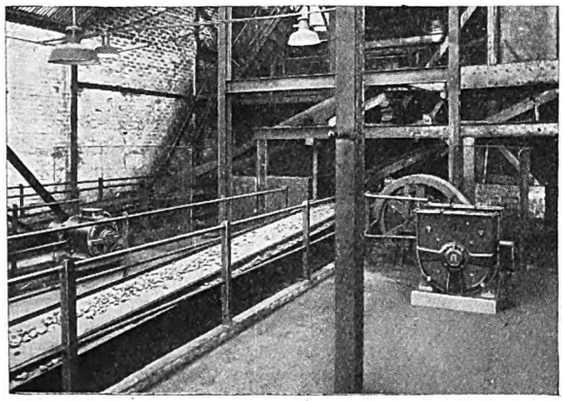

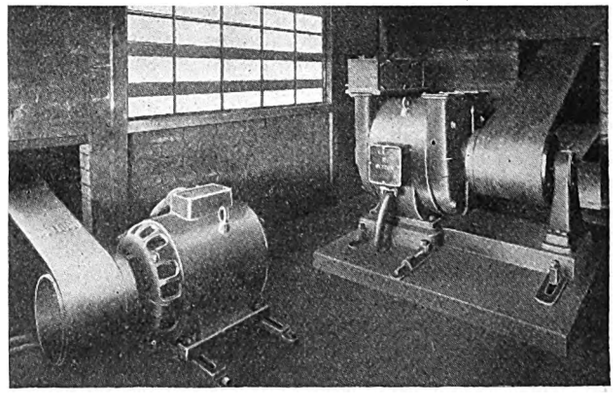

COLLIERY ELECTRIFICATION.

IN the above pictures are seen some of the extensive additional electrical equipment installed at the Emlyn Anthracite Collieries to permit further development of the workings. Besides generating plant, electric motors are used for a variety of purposes. The pictures at the top of the page show a 110 H.P. *"Witton" high torque squirrel cage motor,* 950 *r.p.m., driving a "Waddell" fan, and a* 15 H.P. *motor, at* 720 *r.p.m., driving a centrifugal pump supplying water for the washery. In the centre is a view of the power station, showing the* 600 *kW G.E.C. generator driven by a Browett-Lindley engine at* 500 *V,* 300 *r.p.m., and a* 250 *kW synchronous induction motor generator set at* 500 *V,* 1 000 *r.p.m. The remaining pictures show other motor applications, that on the left illustrating squirrel cage motors, one of* 25 H.P., *driving tilting and belt conveyors, and the other, of* 70 H.P., *driving screening and washery plant. Motors of similar ratings are seen in the last picture, driving a creeper and the main screens.*

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MODERN ADVERTISING.

New Publicity Methods which should Assist in Developing Sales—Advertising Domestic Electrical Appliances through the Schools—International Selling Problems.

WE give below a short account of some of the papers read at the 25th World-Convention of the International Advertising Association in Berlin :—

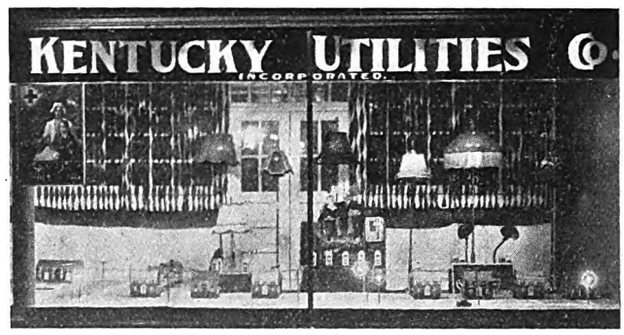
Mr. BERNARD LICHTENBERG, in an informative paper on co-operative advertising, emphasised that there are limits to the individual advertiser's ability to get results. His individual efforts, he said, were subject to diminishing returns, and his experiments tended to overreach and fail. A thousand factors beyond his individual control tended to submerge his individual efforts. He asked whether the facts beyond the control of the individual advertiser could not be controlled through co-operative effort to the end that he would get more out of his advertising appropriation. Advertisers in America, he said, had long seen the need for the creation of an organisation whose word on the circulation of publications would be accepted beyond the question of doubt. The result was that the Audit Bureau of Circulations was created. The Association of National Advertisers in America had been active in various moves to eliminate waste through the standardisation of various advertising materials and methods. Getting the most out of advertising appropriation meant, to advertisers, conveying information as economically as possible to the buying public. To the buying public it meant obtaining this information as economically as possible. The interests of advertisers were, therefore, in common with the buying public. It was up to individual advertisers to originate or inspire progressively improved means of furthering these interests.

Mr. J. F. RITCHIE said we heard a great deal of talk about the co-operation between the sales management and the publicity management, but he had come to the conclusion that this was all a myth, and that the sales management was possessed of only one endeavour; namely, to control. They were existing under the hallucination that they were selling the goods, when, in reality, they were simply supplying the demand which had been created by the publicity fraternity. It was the difference between supplying a demand and creating a demand that was the stumbling block throughout the whole movement of industrial publicity. To him, nothing seemed so terrible, so appalling and disastrous as to think that a publicity campaign—organised, created, tended with great care—was submitted to the sales management, which pulled to pieces everything that would sell the goods, and then said that what they wanted and what they were going to pay for was so and so. What they required was a stronger organisation on the part of the advertising profession to deal with industrial advertisements and to combat the overwhelming control passion of the sales management.

School Demonstrations.

Dr. WERNER DORN said that advertising had for its object, among other things, to make the public acquainted with various articles, and to convince them of their value in use. This object could, he said, in the case of very many articles, also be fulfilled by education in the school. For example, an electric immersion heater could be demonstrated in all well-organised schools and its advantages pointed out. Such demonstrations had an advertising effect, and they were in many points superior to other forms of advertising. The attention need not be directed by expensive means to the object; what was taught in the schools reached the knowledge of everyone. By its educational methods, the school had the best means for clearly and convincingly showing the uses of an article. The scholars, he said, were quite free from prejudice towards these representations. On the other hand, the scholars only came into question as buyers years later, so this meant working for the future.

"With all advertising work during education the interests of the school must be safeguarded." He added, "These considerations suggest the following questions: (1) What can the school do within the limits of the advertising work of our modern economic life? (2) What methods must it adopt for that purpose and what means must be used? (3) What can economic forces do in conjunction with school experts in order to promote advertising work through the school? The school can, during object lessons, discuss devices and machines for saving time, power and money, for the household, for industry, etc., and call attention to their value. During arithmetic lessons, when data are available, it can determine the amount of such savings. Certainly everyone, even without any calculation, will know that with a sewing machine a good deal of time is saved, but the conceptions as to the amount of these savings are very vague. By calculations these misconceptions are cleared up. If, therefore, the school trains the future consumer in an exact valuation of articles for use, this may result in increases of sales and facilitate advertising by producers. In this sense electric lighting and heating, electric cooking apparatus, electric boilers and vacuum cleaners, petroleum ovens, devices for boiling down and thickening, washing and cleaning machines can be discussed. Rationalisation in the household may be systematically dealt with in education. In domestic schools a good deal is already done in this direction, but it is necessary that it should be done in compulsory schools. By such discussions, the entire rising generation will come to be interested in such innovations, and will also be interested in that which gives information about them, in advertising. By such training of critical buyers, many an article which will not withstand careful examination and judgment will undergo a falling-off in its sales, but a far-sighted firm cannot regard this as an evil. If the school succeeded in initiating youth into the true understanding of such data, then this would furnish a guarantee that the consumer would also adopt the right attitude towards them, and thus a basis of mutual understanding would be created.



One of a series of window displays in which a supply undertaking advertised its service to the public. In this picture is seen a miniature representation of local street lighting.

How the Housewife Helps in America.

Mrs. CHRISTINE FREDERICK said: "Advertising, as we regard it in America, is a labour-saving form of transportation, somewhat like radio, which brings the opera and the concert into the home. We regard even any talk about its necessity or value as nonsense. Naturally we do not want to see it used extravagantly, or to make prices high, but by this time we are educated to know that wide publicity means cheaper manufacturing cost. Mrs. Consumer in America works very closely with manufacturers. She writes letters to home-service heads employed by the manufacturer, and secures a woman-to-woman reply. She attends household lectures and secures free education. She is supplied with general household information, recipes and housekeeping aids that are only indirectly connected up with the manufacturer's product. She is asked for her opinion both before a new product is put out and afterward; she is offered prizes and rewards for participating in the improvement of the product and the widening of its scope and usefulness. She is given information in the newest developments, told promptly of new inventions, and is offered through reduced prices, made possible by mass production, a dividend share in the patronage she supplies."

Mr. H. G. HART, managing director, Lever Brothers, dealing with international problems of selling, said the problems which met the international advertiser differed as widely as did their solutions. Each individual country was in a different stage of advertising history, and the advertiser was bound to study each problem afresh and with an eye to the stage of development in which he found the country he was tackling. There was an underlying and guiding principle, capable in every case of abstraction, of clear definition, and if he was wise he would not enter into a publicity campaign until he had provided himself with skilled advice. It was beyond question that the practice of advertising to-day was a highly complex thing. From being purely an art, and subject to no other tenets than the whim and fancy of the practitioner, it might now be more accurately described as a science, and in its practice they might consider themselves entitled to look for definite results, flowing from a definite policy and action.

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THE DOMESTIC CONSUMER.

How American Electrical Manufacturers Cater for the Market—Novel Forms of Appliances—The Decorative Use of Coloured Bakelite.

[FROM A CORRESPONDENT.]

ALTHOUGH I have recently returned from a tour of America, during which I have seen domestic appliances which would be welcomed over here—if only they were available—it must not be thought that I am in favour of the Americanisation of the British electrical appliance-manufacturing industry.

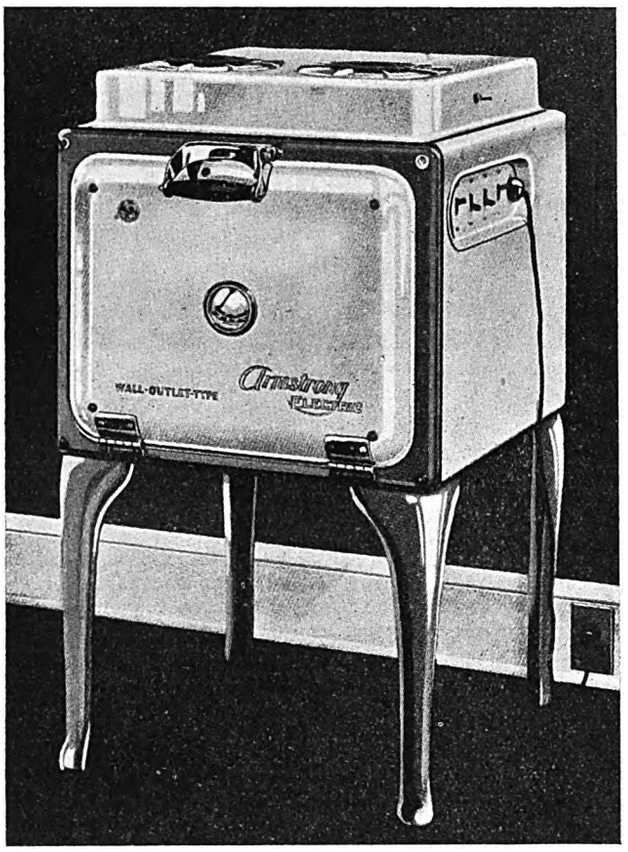

Fig. 1.—A portable type electric cooker requiring no special wiring which is finding favour on the American market.

Perhaps it may be counted in my favour that I draw attention to the fact that I possess a bowl heater of American origin which is provided with a lampholder adaptor which has only 6 ft. 6 in. of flex between fire and lighting point. As my lighting points are outside this range I was faced with the alternatives of fitting a new length of flex—the existing flex being too thick to correspond with any commonly used in this country—or of standing the heater upon a table. In fairness to British manufacturers I should add that this was the case until a Birmingham firm introduced a plug-cum-lampholder fitting which permitted the plugging-in of my fire to a wall plug.

But while I have no bias in favour of American apparatus I am bound to acknowledge that American manufacturers have gone further than we have in the design and manufacture of domestic electrical appliances that give real, and in some cases, novel service to the housewife.

At the present time electrification in this country is not sufficiently advanced to warrant the marketing of some of the special types of appliance seen in the U.S.A., but there is not the slightest doubt that there will shortly be a tremendous market here for appliances of the kind which I am about to describe, and that American progress in a field in which our own experience is so slight cannot fail to be of general interest.

It is, of course, realised that conditions in the two countries are vastly different, and that a good deal of the impetus towards the production and exploitation of new energy-consuming devices in the U.S.A. arises naturally from the need of many of the electricity suppliers to sell their product; whereas in England it is often difficult for the supply of energy to keep pace with the demand.

With hundreds, and perhaps thousands, of potential consumers unable to obtain a supply, in spite of the hopes held out for the national schemes, it is not surprising that electrical manufacturers have not developed the domestic appliance business so thoroughly as have the American manufacturers. The opportunities here are tremendous, but it will be some years before we are ready to go ahead in every department of domestic appliance utilisation.

It may be of interest to those who contemplate the development of domestic apparatus on larger lines to have a brief account of the types of apparatus used in the United States, and special points in its design.

One is naturally impressed by the remarkable variety of models of American domestic equipment. There seems, in fact, to be so much from which to choose that the customer must often experience difficulty in making a decision on the machine to buy.

Colour Schemes for Washers.

Of electric washers alone there are many different makes. The tendency to make this equipment attractive to look at is very pronounced in American electric washers, and some remarkable colour schemes are to be seen.

One machine has a polished copper tub with a plated rim, while the remainder of the body and the wringer are finished in two tones of green lacquer. Green is a popular finish colour on American washers. It is used on a rectangular model with heavy pressed aluminium tub, and on another with a copper tub, nickel plated inside, and provided with a red lacquered lid.

Colours are not, however, universal, and one prominent firm is concentrating on the production of washers with a porcelain finish. Whether or not the American housewife's love of colour in the kitchen will find a porcelain finish acceptable remains to be seen. This restrained note seems eminently suited for the British market, where it would doubtless command greater favour than the more exotic finishes.

On the constructional and operational side American electric washers have some interesting points. One type, which has its motor and drive concealed beneath the tub, employs an agitator which can be inverted; with the agitator disc placed downwards the washer is ready to deal with a small wash, and the reverse position is used when there is a tubful to wash. The sides of the tub are slightly curved to facilitate removal of the clothes.

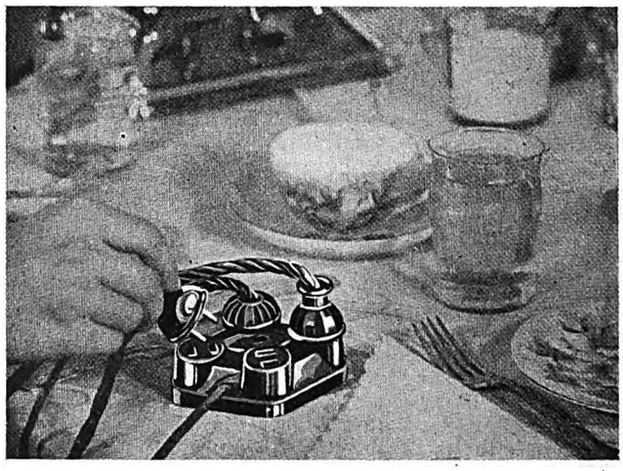

Fig. 2.—A "table tap" which permits four electrical appliances to be used at the meal table, without a maze of trailing flex.

To meet the demand for a combined washer and centrifugal dryer one firm has produced an interesting model. A modern centrifugal dryer takes the place of the wringer normally used. It accommodates a full load of clothes and "damp-dries" them in three minutes. Each piece comes out of the dryer in a soft and fluffy condition and evenly dried.

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Emptying of the washer tub is done electrically by means of a small pump which forces the water out of the tub up to an adjustable draining board and suitable run-off means.

Portable washers are also being developed for use in small houses and flats. One model, retailing at less than £9 10s., and capable of being used on the kitchen draining board, and of being stored under the sink when not in use, employs a new washing principle. It has a domed top in which are fixed a motor and a fan. This rapidly draws the suds and water up and down through the clothes. No paddles, cups or agitators are used to come in contact with the clothes.

Another portable type operates on more conventional lines. It washes and dries clothes by a spinning process, and therefore has no wringer; and all its mechanism is enclosed.

In the electric cooker field, too, there is a good deal to be learnt from current American practice, though many features that are acceptable to the American housewife would not find favour here, either because of price or of the difficulty of finding room to accommodate some of the large table models.

As regards finish there is the same love of colour, such shades as "sunshine yellow" and "nile green" being as popular as the more utilitarian-looking white and grey, white and black, or plain white.

Most of the American cookers are provided with three hotplates—a tendency which is gradually introducing itself into British cooker design—and some have four or more plates. Temperature and time control equipment is generally provided. Other features to be found on new models include load balancing switches, and, on some of the table models, a built-in kitchen heater.

A cooker novelty is a comparatively small sized cooker operating from any wall socket, which is claimed to be capable of cooking a meal for ten people. This cooker, which is illustrated in Fig. 1, is 40 in. high, 23 in. wide and 26¾ in. deep. It is fitted with 600 W reflector-type elements, an oven temperature indicator, and has a large warming shelf behind the two top heating elements. The finish is white enamel with grey enamelled edges and legs, and the appliance retails around £20.

New Cooker Features.

Several features new to electrical cooking are introduced in a device 21 in. high, 11 in. wide and 14 in. deep, having an enclosed vertical boiler with double heating elements, which operates on a principle of reflected as well as direct heat, and this lessens considerably the time needed for cooking. Two doors in the front close in the two vertical heating elements and the removable grill. On top of the cabinet is a hot-plate, and below is a small drip drawer. A four-section aluminium steamer is provided for use on the hot-plate. The removable grill is adjustable, so that it will accommodate the thinnest slices of bacon or a 3 lb. chicken, and is large enough to hold 12 chops. One of the heating elements is stationary, while the other may be moved backwards or forwards by turning a small knob in the base of the stove, thus making it possible to bring both the heating elements into direct contact with the meat or other food-placed in the grill. The two heating elements of the boiler are loaded to 1 320 W and the loading of the hot-plate is 660 W. The construction is such that the boiler and hot-plate cannot be used simultaneously. The device has two-heat control and may be operated from the ordinary lighting circuit. It sells at about £9.

Another interesting device is an automatic table timer, which consists of a variable timing mechanism, a cord and plug for attaching to an ordinary electric outlet, a non-automatic electric outlet and an automatic electric outlet. Appliances plugged into the automatic outlet may be controlled for periods of two to twenty minutes, depending upon the position of the "time adjustment" lever which moves over a scale graduated from 1 to 5. By the use of this outlet, coffee, for instance, can be percolated the same number of minutes every day. For operation, the time adjustment lever is set in the desired place and the automatic current switch is pushed over to the left as far as it will go, thus making electrical connection. At the end of the period, the switch will snap off, opening the circuit. The switch may be thrown off by hand before the end of the time period if desired. The non-automatic outlet will accommodate an appliance while the automatic outlet is in operation, thereby giving the service of a twin outlet.

A refinement noticed in one make of iron is a dial indicator situated on the base of the handle, and when turned to "silk," "cotton," "wool" or "linen," marked on the face of the dial plate, gives the correct ironing temperature for the material that is being ironed.

The extension of colour to such utilitarian objects as plugs and sockets is another development worth noting, and the decorative possibilities of coloured bakelite mouldings have to be seen to be appreciated. Beside the use of colour, these accessories are assuming new shapes which are not only more agreeable to the eye, but, by their capacity for fitting the finger tips and being easy to push or pull, make easier the use of the electrical appliances with which they are employed.

The "Table Tap."

There is also a new connector for irons, kettles, etc., which accommodates appliances with round flat or tapered prongs; and a multiple convenience outlet (depicted in Fig. 2) for use on the dining-table. This "table tap," as it is called, is made of bakelite in attractive colour combinations. It greatly facilitates the preparation of electrically-cooked meals at the table, as it does away with the necessity for a variety of unsightly lengths of flex trailing across the floor to their respective wall sockets. The "table tap" is connected up to one conveniently-placed wall socket, and four appliances can be plugged into the moulding where it stands on the table.

Incidentally, before leaving the question of wiring and accessories, mention may be made of a new type of snap or surface tumbler switch, the cover of which snaps on without any screwing. It makes a very neat job.

In the ventilating field new developments include lighting fixtures incorporating built-in fans. The fan portion, which is, of course, hidden within the lighting unit, is of similar general construction to the ceiling-type fan, but the blades are of special formation, and of only 12 in. diameter. In spite of the small diameter this type is said to be capable of circulating 50% more air, watt for watt, than a 16 in. desk-type fan. An advantage is that, instead of creating a direct blast of air, this fan draws the cool floor-air upwards, and circulates it around the room.

There is also on the market a slow-motion "airator," a pedestal device on which is mounted a globe-shaped cage, inside which large blades revolve slowly, thus circulating the air without causing undue draught.

A modification of the industrial-type exhaust fan is also being developed for domestic applications. It is very easily installed. The fan frame fits the window like a screen, but, unlike a screen, it creates a steady and very effective suction. This appliance is also available in a box made to fit walls of varying thicknesses. This 12 in. fan can be installed in walls as thin as 5¾ in.

Among small domestic appliances is a pair of small electric heating pads for use on eyes, ears, face, or wherever a small local heat application is desired. The pads, which are soft and pliable, and covered with fluffy eiderdown, are thermostatically adjusted to the correct temperature for eye application, but pads set for higher temperatures are also available.

A Phenomenal Development.

One of the most phenomenal developments in the American appliance field is the health exerciser, which is selling in large numbers throughout the States. One or two makes of electrical exercisers are on sale in this country; but the American market is embarrassed with the quantity and variety of different makes on offer. I have personally counted at least nineteen different types of health machine, and each one of these is being marketed with the aid of large advertising appropriations.

Emphasis is laid on the health value of the massage which these handy machines provide, and people have been instructed how they can be independent of the weather for their exercise.

When this appliance was first introduced, its appeal was mainly to athletic clubs and gymnasia and to the portly society matron. But with the spread of the health exercise idea the average middle-class family has become the biggest potential user. These devices are usually equipped with ¼ H.P. motors, and incorporate a device for adjusting the number of pulsations per minute according to the purpose for which they are required. The motors are usually of the universal type, and run at about 1 700 r.p.m., but the speed is reduced in the vibrating arms to about 625 r.p.m. As it is considered logical to attempt to sell ironers with washing machines, enterprising electrical traders in America sell sunlight lamps with the health exerciser—a plan which seems to work out satisfactorily.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Concrete Pole Designs and Costs."

[To the Editor.]

Sir,—Replying to the comments by Mr. W. Fennell, printed on page 224 of your issue for August 23rd, I have to say that the machine-made reinforced concrete pole is not condemned. The reasons are given why it cannot very well compete in total costs *in place* with the pole mentioned.

Incidentally, the writer would suggest that the compound word "ferro-concrete" be dropped. The word "concrete" is universally used, but the word "ferro" is of Latin origin, and means iron in English. Let us speak English in England.

As with steel, the reinforced-concrete pole is a manufactured product (not grown like the wood pole); design figures and tests and process practices may be found necessary to satisfy different understandings of obscurity. The design strengths of the poles to meet the loadings, etc., imposed can be sufficiently checked by the steel and concrete material quantities and dimensions given. The design and configuration cannot be shown here for patent and commercial reasons. The best assurance available is that the writer will guarantee to build the reinforced concrete pole line referred to, in strict accordance with Regulations as to minimum clearances, loading conditions and factors of safety, for the costs mentioned on page 103 of The Electrician for July 26th last. The writer also confirms all the questions given by Mr. Fennell in his penultimate paragraph, so that his final paragraph is nullified.

Regulations provide for a factor of safety of 3·5 for steel and concrete; all the designs given by the writer conform to this factor. However, the writer maintains (as will every engineer familiar with reinforced concrete construction) that concrete should have a higher factor of safety than steel. To meet this condition, the writer proposed a value no higher than 2·5 for steel, and around 4·5 for concrete.

Steel, or reinforced concrete, poles are not ordinarily or primarily intended for short-span construction which, incidentally, is only one of the reasons why the line, and not the pole, should be considered. We need only consider the relative pole and/or line material annual expenses to see that, when comparing a construction with heavy annual maintenance costs and another without annual maintenance costs, the pole line is the true and proper basis of comparison.

In this country the skill in design and construction of reinforced concrete pole lines may be in its infancy. We all have different conceptions of the full meaning of infancy. For instance, the writer likens it to the once common belief (not yet 10 years old) which made it quite positive that the manufacturers of this country could not possibly compete in the 100 000 V transformer and power transmission fields. We certainly know better. They were grown up—simply waiting for the opportunity.—I am, etc.

William T. Taylor.

August 24th.

"Where *is* that Battery?"

[To the Editor.]

Sir,—The letter in your issue of August 16th signed "Battery Electric" refers to a matter which deserves concentrated attention on the part of the battery makers. Admittedly the solution of the problem is beset with what appear to be enormous difficulties, both chemical and mechanical; also economic, since the range of suitable, i.e. reasonably inexpensive, materials is decidedly limited. Apart, however, from this aspect of the question, it would appear that those who possess the knowledge to tackle this type of research do not also possess the means or the incentive, whilst those who have the means are too busy making and selling normal lead and alkaline batteries to bother about the future.

On a number of previous occasions I have suggested that if the B.E.A.M.A. would offer a very large prize—say, £100 000—for half rights in a 40-watt hour per pound cell, which proved on test to be reasonably cheap and durable, this would inspire electro-chemists all over the world to get down to the job in earnest. There has been much newspaper talk concerning a new cell from the Irish Free State, which country—although at present one of the least industrialised in the world—has had the pluck to back its judgment by giving the inventor £5 000 for a half share. This is the right way to do things, and should inspire others to follow suit.

What about the possibilities of the manganese dioxide cell, with some metal of the zinc group as negative active material? The MnO_2 would be reduced to Mn_2O_3 on discharge, and would be practically everlasting. It could be mixed with graphite to improve its internal conductance.

There are several metals of the zinc group which are becoming commercial, for example, beryllium, the lightest known metal except lithium; also boron, which can be alloyed with aluminium. Don't forget that sixty or seventy years ago aluminium was about £50 per lb.; now it is about a shilling!

I hope that when Mr. Drumm of Dublin is free to publish his results The Electrician will be the first journal in England to receive his confidence.

Do not let us forget that, so far, electrical engineers have not fully delivered the goods where road transport is concerned. All commercial vehicles and most automobiles will in the long run be pure electrics. Some will be engine-cum-battery vehicles, but that does not affect my main contention that the technical workers in the accumulator world have exhibited symptoms of too much pessimism and far too little real striving after improvement.

In saying this I do not for an instant belittle the knowledge of the leading technicians in the existing battery industry, but I am sure they could do much better if they really tried.

The first step is the international announcement of that £100 000 prize. Remember there is no financial risk in such an offer, and the results might be epoch making.—I am, etc.,

Raymond J. Mitchell.

August 27th.

A NOTABLE "TALKIE."

First Repetition in London of a N.E.L.A. Convention Speech.

The first notable use of the talkie outside the entertainment field was that made by the National Electric Light Association of America when it obtained talking films of distinguished men in other countries, rushed the films over to the States, and reproduced them as part of the business programme at their annual convention at Atlantic City in June. Speakers whose voices were heard in this way included Sir Ernest Benn (chairman of Benn Brothers, Ltd., proprietors of The Electrician), Signor Pirelli, and Mr. T. A. Edison.

At the London offices of the Western Electric Co., on Tuesday, some of these sound films were given their first public showing in England before a party which included Mr. J. H. McGraw, chairman of the McGraw-Hill Co., proprietors of our American contemporary, the "Electrical World."

Mr. P. L. Thomson, director of public relations of the Western Electric Co., pointed out that these films represented the first employment of the sound film by an industry. By obtaining sound film records of abstracts of papers actually read at the Atlantic City meetings, they had secured a complete record in abstract of the whole Convention. The abstract films were arranged to be shown in conjunction with those of Sir Ernest Benn and others, the whole making a two hours' programme; the actual meetings occupied four days. Copies of this vocal record of the conference were now being shown to electrical associations and other bodies all over the United States.

Mr. J. H. McGraw, who had heard the speeches reproduced at the Convention, testified to the remarkable effect produced by them on the American delegates, and predicted that the "sound picture" would become one of the greatest factors in promoting good international feeling and understanding. Sir Ernest Benn's speech on "Private versus Public Ownership of Property" appealed particularly to his American audience.

Mr. Pelley, assistant general manager of the Western Electric Co., explained that while the obvious application of the talking film was in the entertainment field, its possibilities in other directions were endless. It would enable the lectures and demonstrations of great scientists to be reproduced in detail before students all over the world. In the same way the technique of an eminent surgeon conducting an operation would be made clear to thousands of medical students who would not otherwise receive such expert tuition. Religion and advertising would also benefit greatly.

At the conclusion of the demonstration, Mr. P. L. Thomson, on behalf of the Western Electric Co., presented to Sir Ernest Benn the sound-film of his address to the N.E.L.A. Convention.

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NEWS IN BRIEF.

Electrically-operated Doors at Bank of England—Blackpool's Illuminations—A Museum Loud Speaker—Electric Timing for Schneider Trophy Race—More Employment in Electrical Industry.

A mess room is to be erected at the Portsmouth electricity works at a cost of £560.

The new electrically-controlled clock in the reconstructed town steeple at Falkirk is now in operation. The clock is worked on the " Pul-syn-etic " system.

The Barnsley Medical Officer has reported a gas leakage at the tuberculosis dispensary, and has been instructed to report as to the installation of electricity.

It is reported that representatives of the American Telephone and Telegraph Co. have completed the purchase of a site at Frenchport, on the Mullet peninsula, in Ireland, for the landing place of the European end of a transatlantic telephone cable which the company proposes to lay.

The electrical mechanism which was, in the first place, installed temporarily in the organ of St. Paul's Cathedral, London, is to be retained. It is stated that it comprises three hundred miles of wire.

Electric lighting is to be adopted in Norton-juxta-Kempsey (Worcestershire) Church, and a successful fête to raise the money to pay for the installation took place on August 15th in the grounds of the vicarage.

A proposal that Sculcoates Board of Guardians should establish its own electric light and power plant at the institution has been referred back. Mr. J. N. Waite, the Hull city electrical engineer, is to be given an opportunity to submit comparative figures for a supply by the Hull electricity department.

In the reconstructed Bank of England, vault doors weighing 12 tons each will be manipulated electrically, and the electricity for lighting the vaults will be received from three distinct and separately controlled sources.

The Standing Committee of the Board of Trade, under the Merchandise Marks Act, recommends that the following classes and descriptions of imported glassware shall bear an indication of origin at the time of sale or exposure for sale, both wholesale and retail, in the United Kingdom :—Illuminating blown glassware of all descriptions, other than electric lamp bulbs ; pressed glassware of all descriptions, etc. The Committee has also recommended the marking of certain imported scientific glassware (including tubing and rods).

Features in the Blackpool autumn illuminations will be an aeroplane carrying 200 electric lamps, which will fly over the town, and an illuminated yacht on the water at the South Shore open-air baths. The promenade illuminations will include arches, a windmill, and a crystal device of flashing lights. There will be 50 new illuminated stars and several new kaleidoscopes at various points along the carriage drive. About 5 000 lamps will be employed on each pier, and the total number used will be over 100 000. The illuminations will continue from September 21st to October 21st.

A logarithmic loud speaker horn, measuring 27 ft. in length and 7 ft. across the mouth, designed by Mr. R. P. G. Denman, has been installed in the Science Museum, South Kensington, London. It is intended to be used in connection with the daily auditions of broadcasts from local wireless stations. It is stated that, with a driving unit powerful enough to create the sound waves, this horn will be capable of reproducing notes of frequencies ranging from 32 up to about 6 000. After measurement of the sound pressure developed for all musical frequencies, a suitable amplifier will be made by the Museum authorities.

Seaham Harbour electricity department has purchased electric irons at 10s. each, for issue to prepayment consumers.

The August issue of " County Pie," just to hand, is as well-produced and as entertaining as usual, and its frontispiece is a portrait of Mr. F. J. Rynd, the supervisory engineer of the County of London Co.

Sir Joseph Ward, premier of New Zealand, referring to the British cables and wireless merger, said, in the House of Representatives, he thought the British Government made a huge mistake in giving up its superior interest in the beam system to enable the Eastern Telegraph Co. to become part proprietors with them.

Glossop Corporation has authorised an electrical installation in the markets.

Glasgow Electricity Committee has asked the electrical engineer to report further regarding the question of instituting a charge for installing cookers, radiators, and hired water-heaters.

New stores, workshops, and office extensions are being constructed by Burnley Electricity Department, on land vacated by the Gas Department, and adjoining the existing electricity offices. The new premises will be ready for occupation at the end of the year.

Glasgow Corporation Wages Committee has agreed to increases of wages of blacksmiths and hammermen in the tramway works to 1s. 6½d. and 1s. 3d. an hour respectively, but has refused an application by the A.E.U. for an increase of 2d. per hour for the fitters in the works.

Mr. J. Rowan, general secretary of the Electrical Trades Union, states, in his monthly notes to the members, that the efforts of the Union to get the Institution of Electrical Engineers to interest themselves in the question of securing the registration of sea-going electricians, have been unsuccessful. The Council of the Institution state that, having regard to the recently reiterated attitude of the Board of Trade, the Council are of opinion that no useful purpose would be served by reopening the matter at present.

On the occasion of the trial flights of the supermarine Rolls-Royce S6 at Calshot last week, records were taken of flights by a special electrically-operated timing apparatus, which is a development of the camera-gun system used in the last Schneider race. The apparatus takes cinematograph pictures of the aeroplane at the rate of 20 pictures a second. In place of a stop watch which, under the old system, was photographed at the same time as the 'plane, electrical vibrations record numbers and make it possible to calculate the speed at which the machine is travelling to the hundredth part of a second.

The number of insured persons usually employed in electrical engineering was 79 770 at July, 1928. The percentage of such persons unemployed at June 24th, 1929, was 4·6, a decrease of 0·3 compared with June 25th, 1928, and 0·1 compared with June 20th, 1927. The insured persons usually engaged in electric wiring and contracting numbered 15 530 at July, 1928, of whom 7·7 per cent. were unemployed in June last, a decrease of 0·7 per cent. compared with June, 1928, and an increase of 0·8 compared with June, 1927. The number of insured persons normally engaged in electric, cable, wire and lamp manufacture was 86 180 at July, 1928, and the number unemployed at June 24th, 1929, was equal to 5 per cent., showing decreases of 0·6 per cent., and 2·5 per cent., respectively, compared with June, 1928, and June, 1927.

C

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated August 30th, 1879 :—*

More than 3 000 working men of Sheffield attended Prof. Ayrton's British Association lecture on " Electricity as a Motive Power."

A leading article advocated the adoption of electric lighting in mines.

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN *dated September 2nd, 1904, stated that :—*

Wireless telegraphy was being employed for furnishing weather reports from Atlantic liners from distances up to 900 miles from land.

The Eastern Extension Co.'s new cable steamer " Magnet " sailed on her maiden voyage.

New submarine telephone cables were described in which an effort had been made to put into practice the principles " so long advocated by Mr. Oliver Heaviside."

* * *

FIFTEEN years ago it was stated in THE ELECTRICIAN *dated August 28th, 1914, that :—*

The foresight of the General Electric Co., in undertaking the manufacture of arc lamp carbons—carried on for twelve years at a loss—was seen to be justified, a supply of British-made carbons being immediately available for war purposes.

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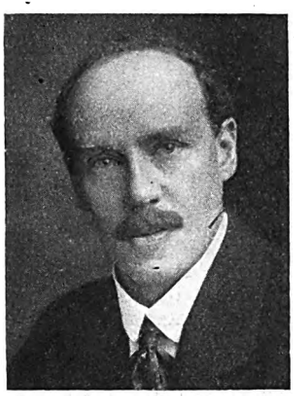
PERSONAL.

THE late Mr. Claude Wilson, M.I.E.E., of Old Queen Street, Westminster, S.W.1, left £2 502; net personalty £1 404.

Mr. J. S. Highfield added to his yachting successes by winning, with his 50-ton "Dorina," the handicap race at the Torbay Royal Regatta, on Tuesday.

Mr. W. A. Christmas, who recently retired, after 41 years' service, from the Hastings electricity department, was presented with a clock by the employees.

Mr. H. E. Yerbury, deputy general manager of Sheffield Corporation electric supply department, has been appointed chief totalisator engineer to Graham Amplion, Ltd.



Mr. H. E. Yerbury, appointed chief totalisator engineer to Graham Amplion, Ltd.

Mr. John Blackshaw, electrical engineer, has been adopted as Conservative candidate for Park Ward, Blackburn, at the forthcoming municipal elections.

Mr. H. H. Lancaster, traffic superintendent of the Blackpool tramways, has been appointed to a similar position at Leeds, at a commencing salary of £600 per annum. Mr. Lancaster succeeds Mr. A. Daggett, retired on superannuation, and will take up his new duties on October 1st.

Sir Alexander Roger, chairman of the Automatic Telephone Manufacturing Co., Ltd., and the Telephone Development Association has gone to Braemar for the deer shooting. The Derry portion of Mar Forest, which he has rented from the Princess Royal, covers about 20 000 acres, including some of the wildest scenery in Glen Lui.

Mr. James H. McGraw, chairman of the board of the McGraw-Hill Publishing Co., of New York, the proprietors of the "Electrical World," "Electrical Merchandising," and numerous other technical publications and books, has been on a short visit to London, following a holiday at Bad Nauheim, and preparatory to his return to the U.S.A. The faculty of New York University recently conferred upon him the degree of Doctor of Commercial Science in recognition of his many contributions to the advance of American business and science through the publications of the companies he has founded.

Mr. James Jeffery.

We have received from a correspondent the following appreciation of the late Mr. James Jeffery, whose death on August 6th was announced in our issue of August 16th:—

The late Mr. Jeffery was born on June 8th, 1854, and was educated at Victoria College, Jersey. Upon leaving school in April, 1870, he joined the staff of the Submarine Telegraph Co., at St. Helier, Jersey, as a telegraph clerk. After a little over two years' experience with that company's cables he entered the service of the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., with which company he remained, directly or indirectly, until his death. After some service as assistant electrician on the c.s. "Dacia," and as senior clerk at the Lizard, he was appointed in 1874 to the charge at Marseilles of the Marseilles–Barcelona cable. In 1876 he became senior superintendent of the Direct Spanish Telegraph Co., Ltd., and was transferred from Marseilles to the Lizard. In August, 1879, he again joined the "Dacia" on the cable expedition between Marseilles and Algiers. He was in charge of cables between the Lizard and Falmouth, and between Las Arenas and Bilbao. On August 20th, 1883, he was appointed manager of the cable stations comprising the system of the Spanish National Submarine Telegraph Co., Ltd., and from 1886 to 1888 he was also manager of the Northern Division of the West African Telegraph Co. He was engaged in the laying of the Lizard–Bilbao 1872, Marseilles–Barcelona 1874, Marseilles–Algiers 1879, and Cadiz–Tenerife, Tenerife–Gran Canaria, Gran Canaria–Lanzarote, Tenerife–La Palmas and Tenerife–Senegal 1883–1884, cables. In 1896, 1903 and 1908 he represented his company at the International Telegraph Congresses held at Budapest, London and Lisbon respectively. In 1922 a presentation was made to him by the India Rubber Co. on completion of 50 years' service with them. He was a director of the Dumfries Electricity Supply Co., Ltd., until 1922, and chairman of the Ross Electric Light and Power Co., Ltd., and was also associated with other subsidiary Companies of the India Rubber Co., Ltd.

No nominations having been received from the general body of members of the Wireless Section Committee of Institution of Electrical Engineers to fill the vacancies which will occur on the Committee on September 30th next, those members nominated by the Committee are, under the Section's rules, elected. The Committee for 1929-30 will therefore be:—Captain C. E. Kennedy-Purvis, R.N. (chairman), the President of the I.E.E. (ex-officio), the Chairman of the I.E.E. Papers Committee (ex-officio), a representative of the I.E.E. Council, a representative of the I.E.E. General Purposes Committee, Lieut.-Col. A. S. Angwin (nominated by Post Office), Mr. R. H. Barfield, Mr. F. S. Barton (nominated by Air Ministry), Mr. F. W. Davey, Mr. A. J. Gill, Dr. J. Hollingworth, Captain C. E. Kennedy-Purvis, R.N. (nominated by Admiralty), Lieut.-Col. A. G. Lee, Prof. E. Mallett, Mr. E. B. Moullin, Mr. G. H. Nash, Mr. L. C. Pocock, Mr. C. E. Rickard, Commander J. A. Slee, Mr. P. K. Turner, and Major J. S. Yule (nominated by War Office).

OBITUARY.

MR. JAMES CARTMELL, for 25 years a member of the Blackpool Tramways staff.

MR. ALFRED CHARLES HOLLIS, aged 39 years, who has been since 1922 foreman of the Kalenite department at the works of Callender's Cable and Construction Co., Ltd.

MR. CHARLES THOMAS HANNA, an engineer at the Rugby works of the British Thomson-Houston Co., Ltd., on August 14th. He was born in Jamaica, and had been engaged at the B.T.H. Works for about 22 years.

MR. H. J. SCHIASSE, at Blonay-sur-Vevey, Switzerland. Mr. Schiasse entered the service of Callender's Cable and Construction Co., Ltd., in 1888, and was on the engineering staff of that company until his retirement in 1922.

MR. ROBERT MANN LOWNE, on August 17th, at his residence at Catford, London, S.E. Mr. Lowne was the inventor of many scientific and meteorological instruments, the Lowne electric clocks, the electrical wind vane, etc. He was 85 years of age.

MR. WILLIAM SHARMAN TOPLISS, on August 25th, aged 52 years. Beginning his electrical career in the municipal field, he held positions at South Shields, Sheffield, and Manchester, where he was assistant mains engineer. He next joined Ferranti, Ltd., and later went to the British Westinghouse Co., with whom he remained for some years. At the end of 1919, he went out to Burma for the Burmah Oil Co., and superintended a big electrification scheme for the company's oilfields. On resignation of his position with the Burmah Oil Co., he was retained in an advisory capacity. Mr. Topliss, who was a full member of the Institution of Electrical Engineers, and a life member of the Ex-British Westinghouse Association, is survived by his widow and one daughter. The funeral at Marylebone Cemetery, on Wednesday, was attended by some of his many friends in the industry.

MR. EDWARD B. CRAFT, on August 21st, in the forty-eighth year of his age. Mr. Craft entered the Bell Telephone System at 21 years of age and, at the time of his death, was executive vice-president of the Bell Telephone Laboratories, an organisation employing 5 000 persons in the prosecution of scientific and engineering research. Nearly every phase of telephony has, at one time or another, felt the stimulating influence of Mr. Craft's genius. Over seventy patents stand to his credit, and range from manual telephone apparatus to complicated circuit details of the dial telephone system, and from radio telephony to talking motion pictures. One of his best known contributions is the flat type telephone relay, which is fundamental to both manual and dial central office equipment, and which is now manufactured every year in many millions. Mr. Craft took a great interest in what might be called the by-products of telephone research, and the orthophonic gramophone, which has revolutionised the talking machine industry, as well as supplied one of the most important adjuncts of the talking motion picture industry, owes much to Mr. Craft's initiative and imagination. Mr. Craft was a fellow of the American Institute of Electrical Engineers as well as of the Institute of Radio Engineers. He was also one of the vice-chairmen in the National Research Council of America. In June, 1926, he was given the honorary degree of Doctor of Engineering by the Worcester Polytechnic Institute. A fertile imagination, an indomitable will and an amazing capacity for work were outstanding characteristics of the man.

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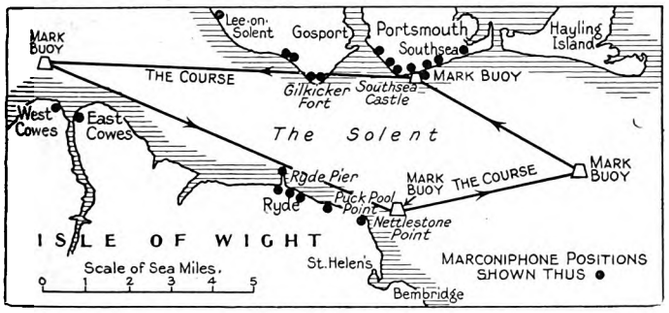
WIRELESS NOTES.

Marconiphone System to Relay Running Commentary on Schneider Cup Race.

THE Schneider Cup race on September 7th will be notable for the arrangements which have been made for broadcasting and relaying the running commentary, both to the crowds present and to the world. The gigantic installation of Marconiphones which is being prepared under the auspices of the Royal Aero Club is said to be by far the greatest ever carried out. Over two hundred of the most powerful loud speakers in existence will be distributed at nineteen centres along both shores of the Solent and on liners in the roadstead, and through these it is estimated that nearly a million spectators will be able to hear the special broadcast running commentary on the race, which will be received on standard model 44 receivers and raised to enormous volume by an unparalleled system of power amplifiers. An idea of the extent of the installation may be formed by a comparison with others provided in connection with recent events. At the Royal Air Force Display, Hendon, nearly 150 000 spectators were present, and approximately 60 Marconiphones were used; during the recent Catholic celebrations in Dublin 400 000 people followed services through 37 Marconiphones; political leaders during the recent election spoke over hundreds of miles to as many as 100 000 electors at a time, up to 60 Marconiphones being employed. These occasions are entirely eclipsed by the Schneider Cup installation. To supply power to the loud speakers 756 valves will be used, 694 of these being of the super power type. Their high tension requirements demand the provision of 392 Exide 30 V high tension accumulators and 168 large capacity 60 V h.t. batteries. Low tension for valves and loud speaker fields require 227 Exide accumulators. Two hundred and fifty coils of wire—over fifteen miles in all—will be used for connecting the various amplifiers



Map of the course of the Royal Aero Club Schneider Seaplane Race, showing positions of Marconiphones.

and batteries together, while the total weight of equipment exceeds twenty tons. The disposition of the points at which the commentary will be audible is shown on the attached sketch map. The shore stations will be at various points, numbering 19 in all, at Ryde, Nettlestone Point, Cowes, Gosport, Lee-on-Solent and Southsea. In addition to the Marconiphones, arrangements have been completed for the erection of a large event board at each centre, and the engineers in charge are installing 38 special telephone sets by means of which the speeds, times and other interesting figures may be posted up without delay.

Mr. J. L. Baird gave a demonstration, at the Baird Television Development Co.'s premises, Long Acre, London, last week, of the latest model of the televisor and of "telekies," a system for reproducing a film and a sound record simultaneously at a distance from the screen. A performance by Mr. George Robey was reproduced, and, although neither sound nor vision was perfect, the results were promising. Mr. Baird remarked that unless the B.B.C. came to a satisfactory arrangement for the transmission of television before the end of this year, he was seriously thinking of transferring his work to Germany, where he did receive official support.

The transatlantic telephone service is now available to and from all places in the Isle of Man and Northern Ireland (Belfast only), and the Irish Free State (Dublin only). Extensions in Northern Ireland beyond Belfast, and in the Irish Free State beyond Dublin, will be made as soon as circumstances permit.

A stockbrokers' office, seating 30 people, has been established in the Cunarder "Berengaria," and will receive prices continuously by wireless all the time the New York Stock Exchange is open, and transactions will be carried out for passengers by wireless.

CINEMA LIGHTING.

Interesting Electrical Equipment in a Glasgow Installation.

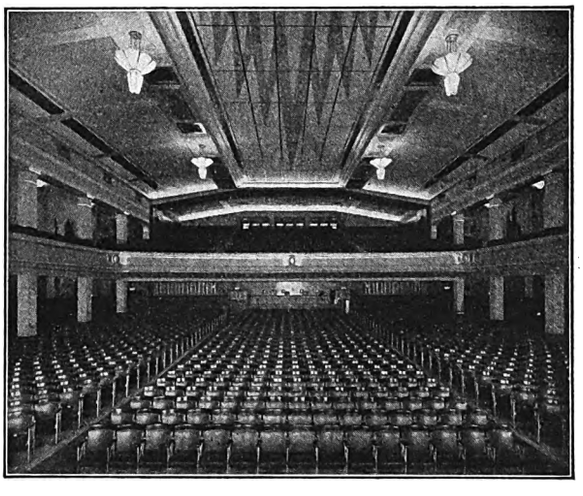
MANY new and interesting features have been incorporated in the lighting of the Tivoli Theatre, Partick, which is a good example of the combination of decorative art

THE stage and proscenium at the Tivoli Picture House, Glasgow, a good example of modern theatre lighting.

and lighting. Throughout the auditorium and on the stage, lighting effects in four colours are obtainable.

Four main lighting units are suspended from the ceiling over the stalls, these units being formed of double tier rippled glass panels, each housing 48 lamps in four colours. The illumination of the proscenium front is secured by means of a continuous reflector which extends the full width of the theatre, involving 280 20-W colour-sprayed lamps. Similar reflector lighting is provided for the organ grilles, and over the balcony.

For the general lighting of the corridors on either side of the theatre, below and above the balcony, four-light ceiling fittings have been adopted, each lamp being a different colour. Underneath the balcony three large ceiling fittings are suspended, each housing 16 100-W lamps in four distinct colours. Provision has been made for the illumination of the conductor's platform, which is formed of plate glass, trough



VIEW of the auditorium of the Tivoli Picture House, Glasgow, taken from the stage.

reflectors equipped with lamps in four colours being fitted in a compartment beneath the platform.

The electrical contractors were Messrs. Primrose and Primrose, Ltd., and the special electric light fittings were designed by the General Electric Co., Ltd.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

ALDERLEY EDGE AND WILMSLOW ELECTRICITY BOARD, August 30th.—Supply of 2 200 a.c. house service electricity meters. Particulars from Mr. E. Hesketh, Electricity Works, Alderley Edge.

MANCHESTER CORPORATION, August 30th.—Supply and delivery of one water-tube boiler superheater, for Barton power station. Continuous actual evaporation of boiler, 130 000 lb. of water per hour. Specification, etc., from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester.

PLYMOUTH CORPORATION, August 30th.—Electrician's ironmongery, etc. Forms of tender from Mr. R. J. Fittall, town clerk.

WEST RIDING EDUCATION COMMITTEE, August 30th.—Electric light installation at Highfields School, Doncaster. Particulars from the divisional clerk, Mr. A. J. Dempster, 20, Christ Church Road, Doncaster.

Electric Refrigerator Contracts.

BURY AND DISTRICT JOINT HOSPITAL BOARD, August 31st.—Supply, delivery and installation of electric refrigerators at (1) Florence Nightingale Hospital, Bury; and (2) Aitken Sanatorium, Holcombe. Specifications, etc., from Mr. F. Wild, clerk, 2, Cross Street, Bury.

LEYTON CORPORATION, August 31st–September 13th.—Electric light installation at Canterbury Road School. Specification, etc., from Mr. J. H. Jacques, 61, West Ham Lane, Stratford, London, E.15, until August 31st; deposit £1.

TIVERTON CORPORATION, August 31st.—One 150 kW semi-Diesel crude oil engine and generator. Tenders to the Town Clerk.

WARRINGTON WATER COMMITTEE, August 31st.—Supply of electrically-driven centrifugal pumping plant. Forms of tender, etc., from Mr. J. Gray, water engineer, Warrington; deposit £2 2s.

DEWSBURY AND WEST RIDING PERMANENT BUILDING SOCIETY, September 2nd.—Electricians' work in new premises in Church Street, Dewsbury. Specification, etc., from Messrs. Kirk, Sons and Ridgway, Market Place, Dewsbury.

STOKE-ON-TRENT CORPORATION, September 2nd.—Electric services to new ward and garage at Bucknall Infectious Diseases Hospital. Specification, etc., from the City Electrical Engineer; deposit £2.

WARRINGTON CORPORATION, September 2nd.—Twelve months' supply of (1) e.h.t. and l.t. paper and lead-covered cables; (2) earthenware conduits; (3) reinforced concrete cable protector slabs and tiles, and hard burned red tiles. Specifications (deposit £1 1s. for each) from Mr. F. V. L. Mathias, Electricity Works, Warrington.

BRADFORD EDUCATION COMMITTEE, September 3rd.—Electric lighting installation at Bolling Secondary School for Girls. Specification, etc., from the City Architect, Bradford.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, September 4th.—Extension of extra high pressure switchgear (contract No. 52). Specifications, etc., from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

EPSOM GUARDIANS, September 4th.—Electric light installation at the institution. Particulars from the clerk, Mr. Alick G. Ebbutt, Mead House, 61, South Street, Epsom.

WOOLWICH ' GUARDIANS, September 4th.—Refrigerating plant. Further particulars from the Steward at the Hospital, Plumstead High Street, London, S.E.18.

STEPNEY (LONDON) GUARDIANS, September 5th.—Six months' supply of electrical fittings, etc. Forms of tender from Mr. S. McClelland, Administrative Offices, Bancroft Road, Mile End, E.1; stamped, addressed envelope to be sent.

HARROGATE CORPORATION, September 7th.—Supply and erection of overhead 11 000 V lines and 346/200 V lines. Specification, etc., from Mr. Neil McLean, borough electrical engineer, 33, Swan Road, Harrogate.

SCARBOROUGH CORPORATION, September 7th.—Supply and erection of e.h.t. and l.t. overhead lines (spec. 8/29); and supply of e.h.t. and l.t. paper insulated cable (spec. 9/29). Specifications, etc., from Mr. E. J. Jarvis, 89, Westborough, Scarborough.

CHARLTON KINGS CLUB, September 9th.—Electric light installation. Specification from the Steward; deposit £10.

LONDON COUNTY COUNCIL, September 9th.—Supply and erection of e.h.t. switchgear, etc., for tramway sub-stations. Specifications, etc., from the General Manager of Tramways, 23, Belvedere Road, S.E.1; deposit £2.

NEW MILLS URBAN DISTRICT COUNCIL, September 9th.—Electrical equipments, including e.h.t. and l.t. switchgear, transformers, transformer kiosk, e.h.t. and l.t. cables, feeder pillars, etc. Specification, etc., from the clerk, Mr. D. Bennett.

OLDHAM GUARDIANS, September 9th.—Electrical lamps and fittings. Particulars from the clerk, Mr. F. W. Fletcher.

WEST RIDING EDUCATION AUTHORITY, September 9th.—Electric lighting installation at the Sanatorium, Bingley Training College. Specification from the Education Officer, County Hall, Wakefield.

LIVERPOOL CORPORATION, September 10th.—Electric power and lighting installation for new abattoir, Stanley, Liverpool. Specification, etc., from Land Steward and Surveyor, Municipal Buildings, Liverpool; deposit £3 3s.

CENTRAL ELECTRICITY BOARD, September 11th.—Supply, delivery and erection of 132 kV overhead transmission lines (approach to Clarence Dock, Liverpool). Specification (No. N.W.E.-P.L.3) from Mr. R. H. Fox, secretary, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s. for first copy, and £1 1s. for each subsequent copy.

CROYDON GUARDIANS, September 11th.—Six months' supply of electrical fittings and appliances, etc. Forms of tender from the Clerk, Mayday Roa d,Thornton Heath; stamped, addressed envelope to be sent.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 12th.—Supply and erection of an electric passenger lift at Natural History Museum, South Kensington, London, S.W. Specifications, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

REIGATE CORPORATION, September 12th.—Supply, laying, etc., of 1 800 yards of 0·2 sq. in. h.t., concentric, paper-insulated, lead-covered and armoured cable. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

HOLBORN (LONDON) GUARDIANS, September 18th.—Six months' supply of electrical fittings. Forms of tender from the Clerk, 53, Clerkenwell Road, E.C.1; stamped, addressed envelope to be sent.

STAFFORD COUNTY EDUCATION AUTHORITY, September 26th.—Electric light and power installation in new wing of Wolverhampton Grammar School. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £3 3s.

Installation Work in Schools.

EAST LOTHIAN EDUCATION AUTHORITY, September 27th.—Electrical work in connection with erection of public schools at Longniddry and Aberlady. Forms of tender, etc., from Messrs. Morham and Brotchie, 29, Hanover Street, Edinburgh.

METROPOLITAN ASYLUMS BOARD, October 2nd.—Installation of electric bells at Paddington Casual Ward (Contract No. 6); new storage battery for t.s. " Exmouth " (No. 7); and alterations to electric lighting in " X " block at Eastern Fever Hospital (No. 8). Specifications from the Board's Office, Victoria Embankment, E.C.4; deposit £1 for each.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Three 125 000 lb. per hour normal (150 000 lb. per hour maximum) steam generating units, water tube boilers, with stokers, economisers, coal and ash handling equipment, etc., with foundations and boiler house buildings. Specification, etc., from the Borough Electrical Engineer, 18-24, Lower Clapton Road, London, E.5; deposit £3.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled, duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links

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one 30 000 kVA busbar coupler equipment, with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £3.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

CARLOW DISTRICT MENTAL HOSPITAL, August 30th.—Electric wiring in the principal mental hospital, Kelvingrove. Specification, etc., from Messrs. MacEntee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £2 2s.

COMPAGNIE DES CHEMINS DE FER PORTUGAIS, August 31st.—Mechanical or electrical apparatus for operating points and signals. (Reference A.X. 8 367.)

WATERFORD HARBOUR COMMISSIONERS, August 31st.—Light standards, poles, cables, lamps, etc. Specification, etc., from the Harbour Engineer; deposit £2 2s.

PRETORIA CORPORATION, September 2nd.—Columns, fittings, lanterns, etc., for street lighting, and master clock for frequency regulation. (Reference A.X. 8 322.)

DUBLIN PORT AND DOCKS BOARD, September 3rd.—Supply and erection of two 4-ton level luffing electric portal cranes. Specifications from the engineer of the board, Mr. J. Mallagh, East Wall, Dublin.

OUDTSHOORN MUNICIPALITY, SOUTH AFRICA, September 3rd.—Supply and delivery of 35 kW steam-driven generating set, together with the supply and delivery only of certain switchgear material. (Reference B.X. 5 524.)

CAPE TOWN MUNICIPALITY, September 4th.—Steel poles, insulators, street lighting fittings, etc. (Reference A.X. 8 334).

NEW ZEALAND GOVERNMENT RAILWAYS, September 4th.—Supply of motor generator (specification 287). (Reference B.X. 5 308.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 7th.—Supply of v.i.r. wire. (No. P. and T. 151/1 573.) (Reference B.X. 5 416.)

A window display which Tungsram Electric Lamp Works (Great Britain), Ltd., have designed for the use of stockists.

LOUTH CORPORATION, September 9th.—(1) Mains and street work, and (2) sub-station equipment. Specifications from Messrs. Burstall and Monkhouse, 14, Old Queen Street, Westminster, S.W.1; deposit £3 for each contract.

MAFEKING MUNICIPALITY, September 9th.—Line material, poles, copper wire and cable, motors, fans, transformers, etc. (Reference B.X. 5 573.)

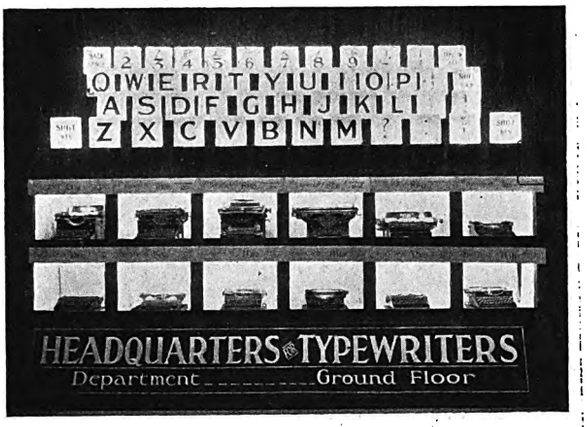
MAFEKING MUNICIPALITY, September 9th.—Steam raising plant, engines, alternators, switchgear, etc. (Contract "A.") (Reference A.X. 8 352.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 10th.—Two-conductor cores (P. and T. 151/1 600). (Reference B.X. 5 462.)

LOURENÇO MARQUES PORT AND RAILWAYS, September 11th.—Battery tractors and trailers. (Reference A.X. 8 172.)

BULAWAYO MUNICIPALITY, September 13th.—Supply of h.t. overhead transmission lines, stepdown transformers, pumps with motors, etc. (Reference A.X. 8 181.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, September 16th.—Supply of automatic sub-station at Remuera (two 500 kW machines and switchgear); automatci sub-station at Point Chevalier (two 1 000 kW machines and switchgear);



A well-lighted display of typewriters at Messrs. Selfridge's storesin Oxford Street, London.

22 000 V switchgear; 6 600 V switchgear; and supervisory control apparatus. (Reference B.X. 5 506.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 17th.—Supply and erection of petrol-electric sets. (Reference B.X. 5 537.)

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Supply of electric goods, locomotives and battery tenders, in connection with electrification of Madras suburban services. Specifications, etc. (£1) from the company's offices, 91, Petty France, Westminster, S.W.1.

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Electrical control and traction equipment for suburban services. Specifications, etc. (£1, not returnable), from the Company's Offices, 91, Petty France, Westminster, S.W.1.

EGYPTIAN MINISTRY OF THE INTERIOR, September 23rd.—Electric light installation and distribution system for the town of Kafr-el-Cheikh (Gharbieh Province). (Reference B.X. 5 502.)

INVERCARGILL (N.Z.) CORPORATION, September 23rd.—Supply and delivery of switchboard, to be directly operated and suitable for controlling 11 000 V, three-phase, 50-cycle current, it may be either of the draw-out truck type or totally armour clad, and will at first consist of seven units. (Reference B.X. 5 507.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 23rd.—Crude oil engine-driven 150 kW electric generating plant. (Tender No. 1 528.) (Reference B.X. 5 566.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 24th.—Supply of condensers (schedule C. 461.) (Reference B.X. 5 488.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 26th.—Two 100 kVA motor-alternators (tender No. 1 521). (Reference B.X. 5 564.)

DURBAN CORPORATION, September 27th.—Supply of three-phase ironclad, compound filled switch panels (specification S. 778). (Reference B.X. 5 505.)

Power Station Plant.

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Supply and erection of electric power station for the town of Samaunoud (Gharbieh Province). (Reference B.X. 5 596.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Machine tools, Diesel and semi-Diesel engines, boilers, electric batteries, etc., for the Prisons Administration. (Reference A.X. 8 245.)

MARLBOROUGH (N.Z.) ELECTRIC POWER BOARD, September 28th.—Supply and erection of 600 B.H.P. Diesel driven generating plant and switchgear. (Reference B.X. 5 556.)

COMPANHIA DOS CAMINHOS DE FERRO PORTUGUESES, September 30th (extension of time).—Signalling apparatus. (Reference A. 8 427.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 30th.—Supply and erection of electric power station, with overhea

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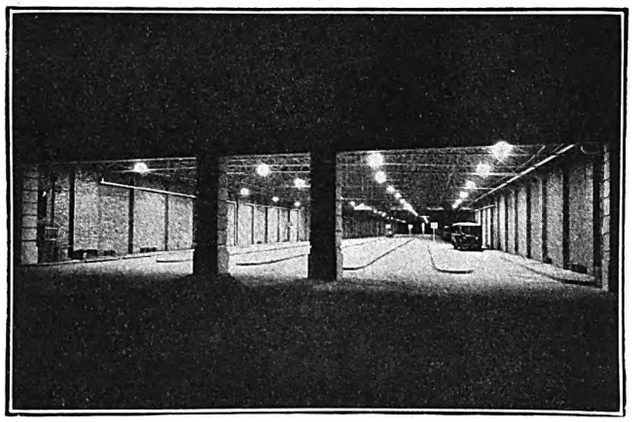
and underground networks, for the town of Deirout. (Reference B.X. 5 598.)

STATE ELECTRICITY COMMISSION, VICTORIA, September 30th.—Supply and delivery of three 3 000 kVA 50 cycle, oil immersed, self-cooled, outdoor type single-phase transformers and spare coils and bushings. (Reference B.X. 5 523.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 30th.—Twelve months' supply of electric lamps (tender No. 1 526). (Reference B.X. 5 590.)



THE spacious station which has been constructed at Kennington Oval (London) for Southern Coastal Services, Ltd., and will be available for the use of motor coach owners. It will accommodate more than 250 coaches. The lighting installation was carried out by Messrs. Pruden and Pope, and it comprises 54 Philips "N.R." type industrial reflectors with 300 W Argenta lamps. The whole station is flooded with an evenly diffused light, free from glare. The lights are more closely spaced over the loading platforms than the remainder of the garage, resulting in 8-10 ft.-candles over the platforms and 4-5 ft.-candles elsewhere.

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Three 3 000 kVA transformers and spares. (Reference B.X. 5 523.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £2 2s.

WELLINGTON CORPORATION, September 30th.—Electric motors, starters and switchgear, for the Milk Department. (Reference B.X. 5 508.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 1st.—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B.X. 5 567.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—Supply of electric lamp standards. (Reference A.X. 8 251.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 1st.—Supply and delivery of switchboard cords. (Reference B.X. 5 515.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 1st.—Supply of bolts, brackets, screws, springs, etc., for British Post Office No. 121 wall telephones and No. 2 receiver switch. (Tender No. P. and T., 151/1 700).

EGYPTIAN MINISTRY OF THE INTERIOR, October 2nd.—Supply and erection of electric power station for Dessouk Town (Gharbieh Province). (Reference B.X. 5 597.)

Railway Signalling Equipment.

VICTORIAN RAILWAY COMMISSION, October 2nd.—Supply of a.c. line relays for power signalling. (Reference B.X. 5 563.)

MONTEVIDEO PORT ADMINISTRATION, October 7th.—Electric trucks, for load of 1 500 to 2 000 kilos, with generating sets for charging batteries, etc. (Reference A.X. 8 353.)

VICTORIAN ELECTRICITY COMMISSION, October 7th.—Supply and delivery of 11 000 V three-core cable. (Reference B.X. 5 539.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Condensers (P. and T. 151/1 733). (Reference B.X. 5 602.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Supply of B.P.O. type resistances. (No. P. and T., 151/1 712.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single-phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 15th.—Switchboard instruments, test plugs and sleeves (schedule C. 472). (Reference B.X. 5 541.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type resistances. (Reference B.X. 5 551.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type retardation coils. (Reference B.X. 5 552.)

EGYPTIAN MINISTRY OF THR INTERIOR, October 16th.—Electric motors, pumps, filters, and artesian well. (Reference A.X. 8 373.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic wall and table telephones. (Reference B.X. 5 509.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic telephone dials (P. and T. 151/1 734). (Reference B.X. 5 605.)

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Turbo-alternators, steam piping, crane and switchgear (contract 52). (Reference B.X. 5 607.)

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Supply of h.t. cables, transformers and sundries, in connection with extensions of the electricity undertaking (contract 53). (Reference B.X. 5 604.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Supply of insulated wire (schedule C. 475). (Reference B.X. 5 580.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Telephone transformers (schedule C. 474). (Reference B.X. 5 581.)

MELBOURNE CITY COUNCIL, October 30th.—Two 2 500 kW motor-convertors and accessories, or two 2 500 kW rotary convertors, with transformers and accessories. (Reference B.X. 5 570.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 30th.—Head receivers (P. and T. 151/1 725). (Reference B.X. 5 603.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General, Savoy House, Strand, London, W.C.2.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 10th.—Three single phase, oil insulated, water-cooled transformers, with accessories (section 295). (Reference B.X. 5 600.)

Tenders Accepted.

OLDHAM CORPORATION.—Union Cable Co., Ltd., supply of cable.

HULL CORPORATION.—General Electric Co., Ltd., twelve months' requirements of Osram gasfilled and vacuum and Robertson carbon filament lamps.

ROYAL MAIL STEAM PACKET CO.—Siemens Electric Lamps and Supplies, Ltd., supply of metal filament and carbon filament lamps during twelve months. (Repeat contract.)

NEW ZEALAND GOVERNMENT.—British General Electric Co., Ltd. (Wellington), supply of electric lamps, for a further twelve months. The contract for 1928 called for nearly 70 000 Osram lamps.

EASTBOURNE CORPORATION.—General Electric Co., Ltd., supply of switchgear and transformers required to control supply proposed to be taken from Central Electricity Board, £28 678. (Recommended.)

MANCHESTER SOUTH JUNCTION AND ALTRINCHAM RAILWAY.—Callender's Cable and Construction Co., Ltd., overhead equipment; British Thomson-Houston Co., Ltd., electrical plant for two sub-stations; General Electric Co., Ltd., electrical equipment of trains.

LONDON COUNTY COUNCIL.—Stegman and Co., wiring and fittings for electrical lighting at Baring Road School, Lewisham. £215. Also tendered: Coleby and Co., £223; H. J. Cash and Co., Ltd., £253; Electrical Installations, Ltd., £275; Smethurst and Co. (London), Ltd., £285.

LEEDS CORPORATION.—A. Reyrolle and Co., Ltd., supply of sub-station switchgear, £1 060. W. T. Henley's Telegraph Works Co., Ltd., cables, £3 900; Enfield Cable Works, Ltd., cables, £4 182; Macintosh Cable Co., Ltd., cables, £4 331; and Hackbridge Cable Co., Ltd., cables, £163.

CHELTENHAM CORPORATION.—Supplies for 12 months:—The Hackbridge Cable Co., Ltd., cables at schedule prices; meters: the Electrical Apparatus Co., the Edison Swan Electric Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd.; transformers—the English Electric Co., Ltd.

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HIGHLY PARISH COUNCIL.—Shropshire, Worcestershire, and Staffordshire Electric Power Co., erection of 33 brackets for electric light and supply of current for lighting 33 100 W lamps from one hour after sunset until 10.30 p.m. during season between September 1st and April 30th, £2 12s. 6d. per point for the season.

NOTTINGHAM CORPORATION.—English Electric Co., Ltd., six double-deck, top-covered, six-wheel electric trolley buses, each with seating capacity for sixty passengers. The equipment will consist of an 80 H.P. motor and standard foot-operated camshaft controller. The complete vehicles will be built at the company's Preston works.

CENTRAL ELECTRICITY BOARD.—English Electric Co., two 15 000 kVA, 132 000 V 3-phase transformers for Central Scotland Scheme, for installation at Saltcoats. The two units will each be provided with on-load tap changing equipment, and will be similar to the four 15 000 kVA and four 10 000 kVA 3-phase units already supplied and on order.

AUCKLAND TRANSPORT BOARD.—General Electric Co., Ltd., 104 tramway motors, each rated at 40 B.H.P. 500 V, on one-hour rating. The motors will be of the G.E.C. standard self-ventilated interpole type (Oerlikon system) and will be fitted with roller type armature bearings. The order also includes the supply of resistances, lighting arrestors, etc.

HULL CORPORATION.—Annual supplies to Electricity Department: Lamps and fittings, General Electric Co., Ltd; fuse boxes, Sykes and Dyson, J. H. Tucker and Co., Ltd., Crabtree and Co., Siemens Bros. and Co., Ltd., and W. Lucy and Co., Ltd.; meter boards, T. Beadle and Co., Ltd.; fuse wire and strip, Enfield Cable Works, Ltd.; lead wire, Siemens Bros. and Co., Ltd.; conduit tubing, Simplex Conduits, Ltd.; conduit fittings, B. Danby and Co., Ltd.; v.i.r. and c.t.s. cables, Edison Swan Electric Co., Ltd.

GLASGOW CORPORATION.—Johnston, Park and Co., Ltd., electrical installation at Partick Burgh Hall, £500 15s. 10d.—D. Henderson, electrical installations at 90 houses on Allan Street area, £382 5s., and Braidfauld Street area, £361 16s. 9d.; Edgar Allen and Co., Ltd., and Titan Trackwork Co., Ltd., special tramway track work; British Insulated Cables, Ltd., copper bonds; Joseph Cookson, Ltd., trolley cord; Manchester Armature Repair Co., Ltd., armature coils; Bolckow, Vaughan and Co., Ltd., fishplates.

COLCHESTER CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., 200 kVA transformer for installation at Hythe generating station, £128; Electric Construction Co., Ltd., two 1 500 kVA step-up transformers and switchgear for installation at Hythe generating station (conditional upon transformers being Metropolitan-Vickers), £3 200, and two additional e.h.t. switch cubicles in sub-station at Water Tower, Wivenhoe, £290; Ferguson, Pailin, Ltd., transformer kiosks at Wivenhoe, West Bergholt and Stanway, £1 277. (All recommended).

MANCHESTER CORPORATION.—Hall and Stinson, electrical installation in houses on Moston estate; Brown and Co. (Electrical Engineers), Ltd., electrical installation in cottages at Thirlmere waterworks; Titan Trackwork Co., Ltd., special tramway track work (portion); Edgar Allen and Co., Ltd., special track work (portion); Hurst Nelson and Co., Ltd., steel underframes for tramcar bodies; Brush Electrical Engineering Co., Ltd., tramcar trucks and brakes. Static transformers: Fuller Electrical and Manufacturing Co., Ltd., C. A. Parsons and Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd.

MANCHESTER CORPORATION.—Twelve months' supplies to Electricity Committee: Cable, Connollys (Blackley) Ltd., Johnson and Phillips, Ltd., Pirelli-General Cable Works, Ltd., Macintosh Cable Co., Ltd., Standard Telephones and Cables, Ltd.; and W. T. Glover and Co., Ltd.; dry batteries etc., for flash lamps, General Electric Co., Ltd.; insulators, Doulton and Co., Ltd., Gaskell and Grocott, Wm. Kent, J. Macintyre and Co., Ltd., Metro-Vick Supplies, Ltd., and Taylor, Tunnicliffe and Co., Ltd; service boxes, etc.. Forrest and Sym, W. Lucy and Co., Ltd., Meldrums, Ltd., J. Needham and Sons, Ltd., Siemens Bros. and Co., Ltd., and Sykes and Dyson, Ltd.; street lanterns General Electric Co., Ltd., and Wardle Engineering Co., Ltd.; transformers, (autos and balancers (auto), British Electric Transformer Co., Ltd., and General Electric Co., Ltd; trifurcating boxes, British Insulated Cables, Ltd., Forrest and Sym, and Sykes and Dyson, Ltd.; wires (cotton and silk covered), London Electric Wire Co., and Smiths, Ltd.; conduit and accessories for wiring, Simplex Conduits, Ltd.

BUSINESS ITEMS.

FROM September 1st the telephone number of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, will be Temple Bar 8000 (70 lines); special number for trunk calls up to 6 p.m., Temple Bar 2051.

SUPER-ELECTRIC HEATERS (1929), LTD., have removed to larger and more convenient premises, and their new address is Albion Works, West Bromwich.

A well-known Canadian firm proposes to erect a modern 15-storey office building in Winnipeg at an estimated cost of $2 000 000, and the architect responsible for the plans of the building desires to receive catalogues and quotations from United Kingdom manufacturers of furnishings and such other requirements as cannot be obtained from Canadian sources. Further particulars from the Department of Overseas Trade. (Reference C.X. 3109.)

Mr. Thomas Wood, Midland Counties' representative of A. H. Hunt, Ltd.

Messrs. A. H. Hunt, Ltd., of H.A.H. Works, Tunstall Road, Croydon, announce the following changes in their outdoor sales staff for the London area:—Mr. F. S. Richmond, who has previously worked the eastern half of London, i.e., within 11 miles of Charing Cross and east of a north and south line through Kingsway, has now taken over the whole of the London district, concentrating solely upon manufacturers of electrical, motor and wireless accessories, and Mr. A. Hudson, of 37, St. Mary's Road, Leyton, E., has been appointed on Mr. Richmond's old ground to take care of the wholesale and trade customers. Mr. Hudson has been intimately connected with the electrical and wireless trade for a number of years in the capacities of salesman and buyer to several large London wholesalers. Mr. E. West continues with the western half of London, excepting manufacturers, where he has represented the company for the last seven or eight years. A change has also been made in the Midlands district, which is now journeyed by Mr. Thomas Wood, of 22, St. Lawrence Avenue, Warwick. Mr. Wood is, well known amongst electrical and wireless wholesalers and manufacturers in the Midlands.

Mr. A. Hudson, representative of A. H. Hunt, Ltd., for the Eastern half of London.

MESSRS. LEONARD TOOMER AND CO., wholesale electrical and radio suppliers, 54, Lower Thames Street, London, E.C.3, will be glad to receive new season's catalogues of electric lamps, lighting supplies and wireless sets and components, together with factors' quotations.

The Leicester branch of T. BEADLE AND CO., LTD., wholesale factors of electrical and wireless supplies, of 3, 4 and 5, Castle Street, Hull, has been removed from 26, Charles Street, Leicester, to 27, Fox Lane, Leicester, and a new branch is being opened at 34, Heathcote Street, Nottingham, on September 1st.

Messrs. Bruce, Peebles and Co., Ltd., have appointed Mr. G. E. Whitehead, 102, St. Mary Street, Cardiff, as their representative in South Wales and Gloucestershire, Somerset, Devon, and Cornwall.

The current stock list of the A.C.E.C. has been received.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, have sent us a copy of leaflet No. 407F, dealing with a new range of ceiling units.

SIEMENS BROTHERS AND CO., LTD., Woolwich, London, S.E., have sent us Catalogue No. 160, Section VI, dealing with straight joint boxes.

Pamphlet No. P.1332 concerning "wave" tumbler switches has been issued by FALK STADELMANN AND CO., LTD., 83-93, Farringdon Road, London, E.C.1.

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ELECTRICITY SUPPLY.

Conversion of Bridlington Supply—Two-Part Tariff for Bournemouth—Loan for Louth Scheme—Loss of Employment Caused by Irish National Scheme—Inauguration of Antrim Company's Supply.

BARNSLEY Electricity Committee has decided to extend mains to the Willow Bank district.

Cannock U.D.C. has decided to lay a new main to Rawnsley and Cannock Wood at an estimated cost of £2 663.

The Yorkshire Electric Power Co. has applied to Welton R.D.C. for its consent to supply electricity in several parishes in the district.

Driffield R.D.C. has decided to withdraw opposition to the electricity scheme for the Buckrose area promoted by the Holderness Trust, Ltd.

An application has been made by Bridlington T.C. for a loan of £41 890 to defray the cost of converting the distribution system from d.c. to a.c.

The Bournemouth and Poole Electricity Supply Co. has informed Bournemouth Corporation that it is proposed to introduce a two-part tariff system.

Barnsley Electricity Committee recommends that £5 000 be transferred to reserve fund and £6 718 to renewals fund out of the surplus on the past year's working of the electricity undertaking.

The applications of Ipswich and Norwich Corporations for powers to supply electricity in the Brandon rural area have not been granted, and the supply will be in the hands of the East Anglian Co.

Louth T.C. has decided to apply to the Electricity Commissioners for sanction to borrow £27 000 for the electricity scheme, under which it is proposed to purchase current in bulk from Grimsby Corporation. It is expected that the scheme will be in operation by the end of the present year.

Dunfermline Dean of Guild Court has passed the plans of the Central Electricity Board for extensions at the Fife Electric Power Co.'s station at Townhill. The extensions are to consist of the erection of a battery house and control room, oil plant house, insulator table, and eight lattice towers. The cost of the work amounts to £3 500.

Stockport T.C. has applied for loans of £100 000 for mains extensions and services, £7 001 17s. 9d. for meters, £10 000 for sub-stations on consumers' premises, £36 000 for changing over in Davenport and Heaton Norris districts, and £10 000 for changing apparatus on consumers' premises. A loan is also to be sought for replacing No. 4 turbine.

Wexford Corporation has approved of a recommendation of the Lighting Committee to accept the quotation of the Electricity Supply Board to light the town till March 31st, 1930, for £450. The Mayor recently stated that, under the agreement, 45 extra lamps would be lighted, and the cost of lighting the town would be 6d. in the £ instead of 10d. as at present.

Mr. E. Cross, borough electrical engineer of Rotherham, has submitted a report to the Electricity Committee on the operation of the rateable value system of charging under existing conditions of assessments. Consideration of the matter has been deferred, and the Engineer has been instructed to obtain information with regard to this system of charging in other towns.

Battersea (London) Borough Council has applied to London County Council for consent to the installation of an a.c. distribution system at 50 cycles and 230 V single-phase and 400 V three-phase in that part of the borough in which a d.c. supply is at present in force, and in substitution for such d.c. supply. Any representations by consumers or other interested parties are to be sent to the County Council before September 9th.

Col. T. C. Ekin held an inquiry on behalf of the Electricity Commissioners on August 15th into the application of Retford T.C. for a loan of £16 250 for electricity purposes. There was no opposition. The inspector said that he understood that the Council had modified its application, and that the actual sum applied for was £6 314. It was explained that the Council desired to limit the inquiry to the route which took in various places as far as Tuxford.

Reigate T.C. has applied for a loan of £5 200 for laying a new h.t. feeder from the works to Redhill. The Council is making inquiries of the Commissioners concerning a bulk supply of electricity as from the autumn of 1930. The Electricity Committee is to lay mains and wire houses on the Redstone site, under a hire-purchase scheme, at a cost to the Housing Committee of £2 per house.

The deferred payment scheme for covering the cost of installations at Oldham has been successfully inaugurated by the Electricity Committee, which during the past year dealt with 1 156 applications. The Committee has introduced a rateable value system of charging. The Corporation's Slacks Valley station, scheduled as a "selected" station, is nearly completed. A net profit of £26 617 on the electricity undertaking is recorded for the past year.

In order to supply the parish of Telscombe, a small electrically-driven boosting plant is to be installed by Brighton Waterworks Committee, at a cost of £805. The Electricity Committee has obtained sanction for the following loans: £4 235 for the reconstruction of the boiler house roof at Southwick power station; £30 000 for alterations and additions to the North Road sub-station; £5 360 for ash disposal plant at Southwick power station; £5 500 for telpher equipment at Southwick; £45 000 for additional boiler plant at Southwick, and £18 000 for work in connection with the new switchroom at North Road.

From the experience of a deputation which waited on the Electricity Supply Board in Dublin recently, it is surmised that the Limerick power station will be closed down in September. The deputation asked for compensation for eight members of the Limerick staff who will be thrown out of work by the Shannon scheme. They were informed that consideration could not be given to compensation claims or alternative work provided, and that would not only apply to Limerick but to every station taken over by the Board.

Mr. C. Norman Staniland, borough electrical engineer, Hornsey, has reported to the Electricity Committee that he has been going into the question of gear made by Mr. Bertram Thomas, installed at the Southfield Road sub-station of the Metropolitan Electric Supply Co., Ltd., and designed to assist in avoiding any delay in getting away after a breakdown. He has obtained prices, and estimates that similar gear for Hornsey would cost, installed, from £700 to £800. The Committee recommends such gear be obtained.

Messrs. Twyfords, Ltd., have been in negotiation with Stoke-on-Trent electricity department for a supply of about 50 H.P. at their new works proposed to be erected in Garner Street, Cliffe Vale. The committee has agreed to consider the question of the provision of the mains and sub-station equipment, subject to the company's providing or selling a site for a sub-station and guaranteeing to pay for energy to the value of at least £500 per annum. Cables are to be laid from the central power house to the Newcastle boundary, in connection with the supply to the Hill Farm Estate.

The first sod of the new Antrim Electricity Supply Co.'s scheme was formally cut at Curran Point, Larne, on August 22nd. The transmission line will be 27 miles long, though an extension to 50 miles is to be provided for. The line will be laid in the water at Curran Point and carried below the waters of the Lough—Larne Lough and thence over the mainland by lattice towers to Ballymena, *via* Ballyclare and Doagh, with subsidiary lines, eventually, to other towns. Ultimately, the Antrim Co. will link up with Belfast Corporation's system. The construction work is being carried out by Messrs. Henry Boot and Sons, Ltd. (Mr. R. B. Waite acting as their engineer-in-chief) and W. T. Henley's Telegraph Works Co. Henley's contract comprises 14 miles of six-wire and 12¾ miles of three wire aluminium conductor steel reinforced transmission line on lattice steel towers.

Marylebone (London) reports that it recently made representations to the London County Council urging that consent should be given to the B.C.'s proposal that the pressure of alternating supplies throughout the borough should be at 240 and 415 V. Representatives of the County Council expressed the opinion that the standard pressures, 230 and 400 V, should be adopted, with a view of establishing a uniform pressure for the whole of London. The Committee pointed out, that this would involve expenditure of at least £100 000 for the changing of lamps alone, and, subsequently, an application was made to the County Council for a temporary general consent to an alteration to 240 and 415 V, three-phase. The County Council, however, decided generally that it could not consent to any changes from d.c. to a.c. other than changes involving the adoption of pressures of 230 and 400 V.

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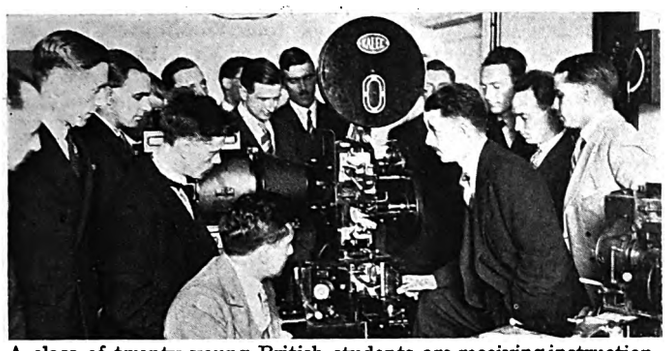
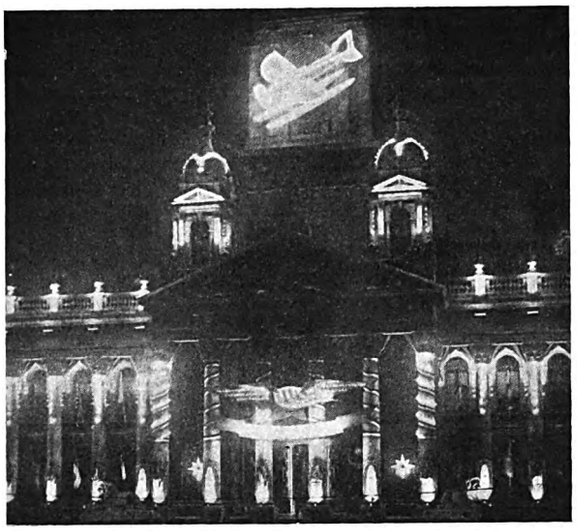
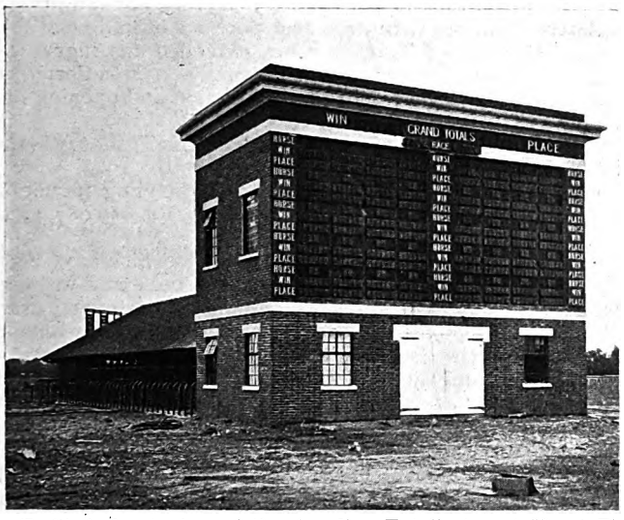
ELECTRICAL NEWS PICTURES

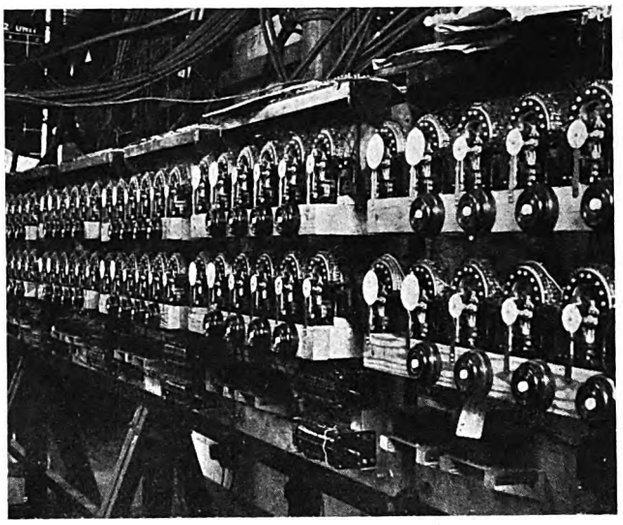


A class of twenty young British students are receiving instruction, relating to the construction and use of " talkie " apparatus, at Bush House, London. The tuition to an ever changing class will go on for some months. The operation of the Western Electric reproducer set is being explained by an English teacher.

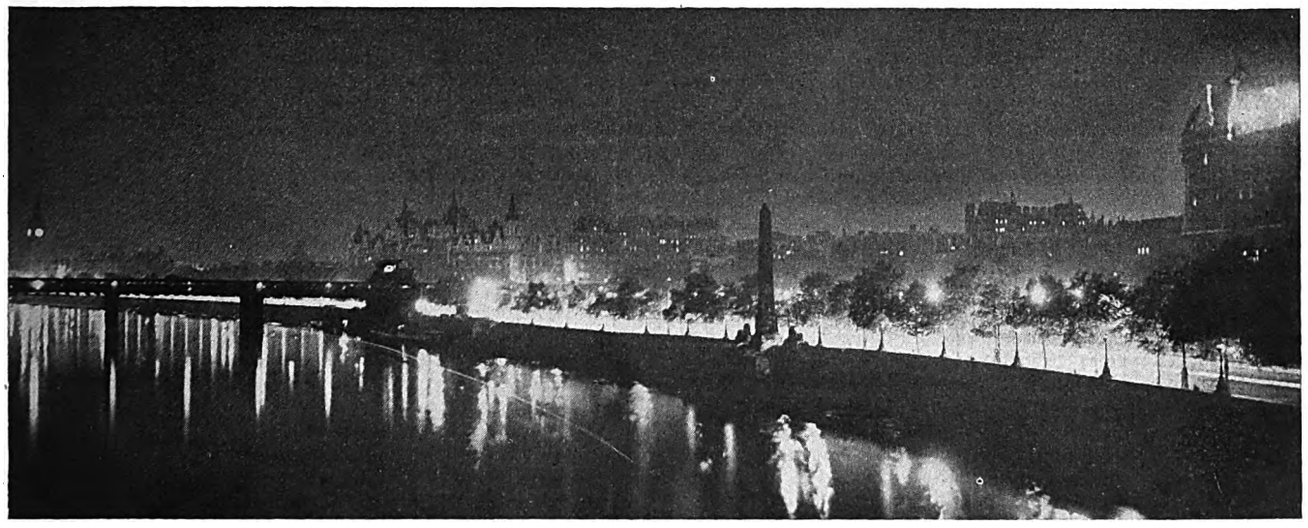


Portsmouth City Hall, illuminated for the Schneider Cup race, showing an aeroplane outlined in light.





(Left) A front view of the Amplion Totalisator at Hurst Park, showing indicator, and (right) an interior view of the same apparatus, showing the temporary controls. This, the first fully mechanised Hamilton Totalisator constructed by Graham Amplion, Ltd., and erected at Hurst Park, did good business at the race meeting there last Friday and Saturday, but, unfortunately, it was impossible to complete the installation so that the electric indicator could be used, this being due to the short time available for the work. A completed totalisator will, however, be supplied for a meeting in the near future.



The Victoria Embankment, London, from Waterloo Bridge, to Westminster, showing the brilliant new central lighting as seen from Waterloo Bridge. The original standards along the parapets have been retained. The twin overhead suspended lighting along the roadway is done by means of units consisting of two General Electric 1 500 W lamps, housed in " Wembley " lanterns suspended 30 ft. over the roadway. The scheme comprises 50 spans, spaced at intervals of 140 ft., each span carrying two lamps.

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REDUCTIONS OF CHARGES.

THE following reduced charges for electricity are announced. Figures in parentheses represent the former rates :—

Bury St. Edmunds, private lighting, 6d. (6½d.), less ½d. per kWh discount; power, up to 2 500 kWh per quarter, 3½d., less 20% (5½d. per kWh up to 500 kWh per quarter); maximum demand, business premises, £15 per annum per kW, plus 1½d. per kWh; West Suffolk Hospital, 3d. for all purposes. *Canterbury*, large power consumers of a.c., e.h.p current, who have 200 H.P. connected, and take minimum of 50 000 kWh per quarter, £4 per kVA maximum demand, plus 0·5d. kWh, electricity for lighting not to be more than 10% of total used. *Winchester*, flat rate, 6½d. (7d.) per unit; prepayment meters, 7d. (7½d.); maximum demand tariff, private houses, discontinued; business premises, lighting, 9d., 4d. and 2d. (9d., 5d. and 2d.); rateable value tariff discontinued; two-part tariff adopted; living rooms to be assessed at fixed charge of 3s. per room per quarter for the two summer quarters, and 6s. per room per quarter for two winter quarters, plus flat rate 1½d. *Doncaster*, fixed annual charge for domestic supplies, 10% (12½%) on the rateable value, with minimum charge, 35s. per annum, plus ¾d. kWh; Tramways dept. to be allowed discount of 10% on present charge of 1d. per kWh. *Watford*, optional rateable value tariff, Borough, Watford Rural, Bushey and Abbots Langley, 12½% and ½d.; Aldenham, 13¾% and 0·55d.; Hemel Hempstead, King's Langley and Bovingdon, 15% and 0·55d. *Stamford* (*Urban Electric Supply Co.*), lighting, 9d.; power, 3d.; household heating, 2d., provided T.C. grants company monopoly for 40 years. *Bromley*, power, 2d. (2½d.) per kWh for first 3 000 kWh per quarter; next 3 000, 1½d. (2d.); beyond, 1d. (1½d.); heating and cooking, 1¼d. (2d., or if cooker installed 1½d.) service cables to be laid free, up to 30 feet. *Brightlingsea* (*Frinton-on-Sea and District Electric Light and Power Co.*), lighting, 9d.; cooking, heating and power, 2d.; alternative tariff for domestic purposes (lighting, heating, cooking, etc.), 20% on rateable value, plus 1½d. per kWh; minimum quarterly payment, £1; water heating, ½d.; fixed bedroom heaters, ¾d. *Epsom*, alternative all-in two-part tariff to cooker consumers, with fixed annual charge, plus ¾d. per kWh. The charge is £2 16s. 8d. when floor area is up to 1 200 sq. ft. to £45 6s. 8d. when area is up to 16 000 sq. ft.; larger premises *pro rata*; business premises included if cooker is installed. *Millom*, lighting, 6d. (7d.); heating and cooking, 1¾d. (2½d.). *Grantham* (*Urban Electric Supply Co.*), lighting, 8d. (8½d.), kWh allowed to weekly payers increased by approximately 15 to 20%, excess consumption, 5d. per kWh. *Bentham* (*Bentham Electric Supply Co.*), lighting, 1s.; other purposes, 6d. *Grimsby*, ordinary lighting, 6½d.; slot meters, 8d. *Tunbridge Wells*, lighting in Borough and at Southborough, 4d. (4½d.); in other areas, 4½d. (5d.) per kWh; domestic rate 10% of rateable value (12½%) in Tunbridge Wells and Southborough, and 12½% (15%) in other areas; power, 1d. per kWh for first 30 000 p.a. and ¾d. beyond. *Darwen*, domestic rates for summer quarter, 5d. (5½d.) per kWh for less than 30 kWh, and 4¾d. (5d.) over; heavy industrial consumers, over 100 kWh up to 500 per quarter, 2d. (2½d.), second 500 kWh 1 $\frac{5}{16}$d. (1$\frac{5}{8}$d.); second, 1 000 1 $\frac{3}{16}$d. (1¼d.); over 4 000, 1 $\frac{1}{16}$d. ($\frac{7}{8}$d.); domestic power, heating and cooking, reduction of ½d. per kWh over 30 kWh; contracts subject to 27½% discount (22½%), and for late shop window lighting 2¾d., conditional on paying 10s. per quarter for meter rent and time switch. *Connah's Quay*, reduction of 12½% on slot as well as quarterly meters. *Carnarvon* (*National Electric Construction Co.*), lighting, 6d. (7d.). *Wallasey*, kilowatt charge for supply to Birkenhead in bulk, 17s. (18s. 9d.) per quarter. *Oldham*, cotton mill power supplies, first 10 000 kWh per calendar month, 0·7d. per kWh; next 10 000, 0·5d.; next 20 000, 0·45d.; all additional, 0·425d. per kWh.; tariff is based on average price paid for coal and cost of disposal of ashes, amounting together to 15s. per ton; kWh prices to be increased 0·003d. for each 3d. variation per ton. Where a mill is wholly electrically driven, and has constant demand of 500 kW or over, allowance for lighting premises is made of 5% of annual power consumption at 0·7d. per kWh, plus coal variation clause; in other cases lighting charged in accordance with ordinary lighting rates. *Torquay*, fixed rate per week per house, in respect of supply to Corporation houses to 1s. 1d. (1s. 3d.); kWh rates, ¾d. ($\frac{7}{8}$d. and 1d.); standing charges as before; discount for prompt payment to be reduced from 5% to 2½; special sliding scale power rate revised so that lowest price is ¾d. (1d.) *Carlisle*, late shop window lighting, 32s. per annum for time switch and meter, plus 2d. per kWh.

ELECTRIC TRACTION.

Electrical Equipment of Manchester South Junction and Altrincham Railway.

AN interesting feature in connection with the electrification of the Manchester South Junction and Altrincham Railway, contracts for which have recently been awarded by the G.C. and L. & N.W. Railways Joint Committee, is that the overhead contact wire system at 1 500 V d.c. has been adopted. This is the first railway electrification to be carried out in Great Britain at this voltage, which is the higher of the two standard voltages recommended for railway electrification in this country. The British Thomson-Houston Co., Ltd., Rugby, has been entrusted with the order for the complete sub-station plant, comprising switchgear, transformers, rotary convertors and control equipment, the latter being of the automatic type with remote control for one of the two sub-stations. In each sub-station there will be six 750 kW 750 r.p.m. rotary convertors, with transformers to take the incoming supply at 11 000 V, three-phase, 50 cycles from the Stretford District Electricity Board, the rotary convertors being operated two in series.

The traffic receipts on the Belfast tramways on the day of the great motor car race and during the previous night amounted to £2 710, an increase of £584 over the race day takings last year.

The Associated Gas and Electric System has entered into a long-term contract to supply the Delaware Lackawanna and Western Railroad with power for portions of its lines.

The Minister of Transport has extended to August 15th, 1929, the period limited by the Thornaby-on-Tees Corporation Tramways Order, 1919, for the completion and opening of the tramway authorised by such Order.

The traffic receipts of the Madras Electric Tramways (1904), Ltd., for the fortnight ended August 15th, 1929, were Rs. 46 482, against Rs. 47 822 in the corresponding fortnight of 1928. Aggregate from January 1st, 1929, Rs. 659 087, against Rs. 637 795.

The late night services for excursionists which have been in operation for about four years on the Leeds tramways have led to a great increase in the total number of passengers carried. A recent development is an arrangement under which passengers book their seats on the late trams when they take railway tickets, and the tramway accommodation is guaranteed.

A device for encouraging traffic on the public road vehicles in London, and also increasing business on trunk railways is a scheme to be put into operation by the Great Western Railway next month, under which the company will issue all day tickets at two shillings each, for which a half day or whole day excursion from the country to town and a very considerable bus, tube and train service in London may be enjoyed.

Mr. W. Sharp lectured on "Modern Power Plant" at Armstrong College, Newcastle-on-Tyne, on August 18th, his address being the first of a series arranged by the Association of Engineering and Shipbuilding Draughtsmen. Mr. Sharp said, in accordance with the Electricity Act of 1926, we were to have concentration of electricity generation in a few selected stations. He ventured to state that immediately the grids were erected and in working order no time would be lost in the electrifying of the whole of the existing railway system throughout the country.

THE ARAPUNI (N.Z.) POWER SCHEME.

A "Daily Telegraph" correspondent reports that statements in the New Zealand Parliament and the Press indicate that the Government's £2 000 000 hydro-electric power scheme at Arapuni may become a gigantic fiasco. The original contractors refused to complete the contract, the Public Works Department finished the work, and the first set started working in June last, two years behind schedule time. When the big dam was completed and the Waikato River diverted, erosion below the spillway caused trouble and silted up the Horahora power-house down-stream. Now the river is breaking up the rocks and causing serious danger at the waterfall near the spillway. Extensive falls of rock recently caused a sudden retrogression of 200 ft. of the waterfall. The river is in flood, and should it be allowed to continue over the spillway there would be danger of the works being undermined. The only safe course is to open the diversion tunnel under the dam, drain the lake, and close the works for at least a year while the waterfall is strengthened.

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COMPANY NEWS.

Decline of G.E.C. Shares—Rise in Ever Ready's—Tyneside Tramways Show Further Loss—Rapid Rise of Domestic Demand at Stratford-on-Avon—Meeting of Electro-Trust, Ltd.—New Companies Registered.

GENERAL Electric shares are a further half-crown down on the week, at 57s. 6d.; and Henley's at 125s. show a similar decline. Ever Ready's have been in request, and the price has risen from 21s. 9d. to 22s. 9d. Cables and Wireless issues continue an active market, but selling has predominated, and both the "A" and "B" stocks have given way slightly, the "A" 2½ points, and the "B" 3½ points. Marconi's International Marine shares are 2s. 6d. lower at 58s. 9d. Underground Railways ordinary shares have spurted 1s. 6d. to 24s., and Metropolitan ordinary stock is up to 60. Charing Cross and County Supply ordinary shares have both weakened 6d.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
(*d*)	Brompton & Kensington Ord. ..	26/–	26/–	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/–	26/6	51/–	24/3
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/6	25/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	" " " " 6% C.P.	23/–	23/–	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	55/–	55/6	68/6	25/9
6	" " " " 6% C.P.	23/–	23/–	24/–	21/3
(*c*)	Kensington & K'bridge Ord. (£1)	26/–	26/–	27/6	23/9
1/9⅜	Lon. Elec. Sup. Ord. (£1).. ..	28/–	28/–	37/6	23/–
1/9⅜	Metro. Elec. Sup. Ord.	43/9*	43/9	53/–	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2⅝	N'castle-upon-Tyne Elec. Sup.Ord.	26/10½	26/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P.	23/–	23/–	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops.Worcs.& Staffs.Power Pref.	22/6	22/6	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/–
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/–	36/–	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	128½	128½	152	117
7·67	" " " " 6% Pf. Stk.	126½	126½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4	" " " 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77½	77½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	57	57½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	60	56½	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	67	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	72½	72½	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	70	64½
7	Underground Electric Rlys. Ord.	24/–	22/6	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	13/9	13/9	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/–	75/–	86/3	56/–
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	22/6	22/6	24/9	19/7
7	" " " 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	130½	153½	120
15	Callender's Cable Ord.	75/–	75/–	91/3	66/–
6½	" " 6½% C.P. ..	25/–	25/–	25/9	22/–
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	" " 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/–	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/–	15/–	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/–
—	English Elec. Ord.	6/3	6/3	15/9	5/–
—	" " 6% C.P.	7/6	7/6	18/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	22/9	21/9	92/3	18/1
6	Ferranti 6% Pref.	18/–	18/–	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord...	57/6	60/–	46/6	26/6
25	W. T. Henley's Ord.	125/–	127/6	120/–	69/3
10	Johnson & Phillips Ord.	40/–	40/–	67/11	34/–
7½	Lon. Elec. Wire. & Smith's Pref.	23/9	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	30/–	30/–	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	60½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	82½	85	—	—
	"B" Ord. Stk.	72	75½	—	—
	5½% Cum. Pref. Stk. ..	95	95	—	—
3½	Eastern 3½% Pref. Stk.	60½	60½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Gt. Northern Telegraph (£10) ..	31	31	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	58/9	61/3	90/–	16/6
4	Western Tel. 4% Deb. Stk. ..	77½	77½	82	76

(*a*) 19⅛d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. * Ex. Dividend.

PINCHIN, JOHNSON, LTD.—Intm. div. of 10% (same rate as last year) has been declared.

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—Intm. divs. of 2½% on 5% pref. shs. and 4% on ord. shs. have been declared.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.—Intm. div. of 2½% (same rate as last year) on ord. shs. will be payable on Sept. 30.

BABCOCK AND WILCOX, LTD.—It is reported that the co. has purchased 49% of the shs. in the Zieleniewski Fitzner Gamper Co., the largest Polish boiler works.

FARNHAM GAS AND ELECTRICITY CO.—Intm. div. at rate of 7½% p.a., less tax (same rate as last year), on ord. shs. (7% standard) for half-year will be payable on Sept. 6.

ALLGEMEINE ELEKTRICITATS GESELLSCHAFT (BERLIN).—The allotment of new shs. of nom. value of £1 500 000, at rate of 200%, to the General Electric Co. of New York has been approved.

CUBA SUBMARINE TELEGRAPH CO., LTD.—Receipts for 1928, £57 593, agst. £56 720; exes. £27 191, agst. £33 159, blce. £30 402, plus £10 170 brt. in. Pref. div. required £6 000; to gen. res., £20 000; fwd., £12 794.

BOGNOR GAS AND ELECTRICITY CO., LTD.—Intm. div. at rate of 8% p.a. on original and additional ord. con. stks. "A," 9½% p.a on original ord. con. stk. "B" and 7% p.a. on new con. stk., will be payable, less tax, on Sept. 2.

BRAZILIAN TRACTION, LIGHT AND POWER CO.—The Canadian Press has published a denial of the rumours circulated that negotiations were pending for the acquisition of the control by an American concern of the shares of the Brazilian Traction, Light and Power Co.

CLYDE VALLEY ELECTRICAL POWER CO.—Intm. div. of 3% actual, less tax, will be payable on Sept. 19 on ordinary sh. cap. issued prior to 1929 (shs. No. 1 to 1 200 000). No intm. div. will be paid on new ord. sh. cap. issued on April 24, 1929, but this will be adjusted on paymt. of fin. div. for year. A similar mid-term disbursemt. to ord. shhldrs. was made last year.

Company Meetings.

TYNESIDE TRAMWAYS AND TRAMROADS CO.—Mr. G. E. Henderson presiding at the recent half-yearly meeting, said there had been a further reduction in traffic receipts and a further loss on the half-year's working. The deficit for the half-year, after charging interest on mortgages, amounted to £2 062, which had been met by transferring a sum of £2 100 from general reserve. The difficulties with which the company had to contend might be summarised in a few words—heavy cost of track and road maintenance, the approaching necessity of relaying parts of the track, serious 'bus competition, and the obligations on a statutory company to continue its service to the public so long as any funds were available for so doing. The directors took the only course which appeared possible, namely, the promotion of a Bill under which powers were asked to enable the company to abandon its tramway system and substitute omnibuses. It was evident to the directors that continued opposition from the Newcastle Corporation would lead to a heavy increase in the expenditure which would have to be incurred when the Bill came before the House of Commons, so that a renewed attempt was made to find some mutually satisfactory arrangement, and an arrangement had been approved, in principle, by the directors and the Corporation, whereby the present through running agreement with the Newcastle Corporation would be continued, with such modifications as might be necessary to make it apply to 'bus services. The directors felt confident, from reports received from their expert advisers, that the profits from a 'bus service run by the company, with arrangements for carrying passengers through into Newcastle, should be sufficient to pay for any charges on the new capital which will have to be raised, and also go some way towards meeting the company's obligations to the present mortgage debenture holders.

STRATFORD-ON-AVON ELECTRICITY CO., LTD.—At the recent ordinary general meeting Mr. P. M. Rossdale (who presided in the absence of the chairman, Mr. W. G. A. Bond) said the new directors took office at the close of the year under review. The change was consequent upon the acceptance by the majority of the shareholders of the offer to purchase their shares

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made last November by the Shropshire, Worcestershire, and Staffordshire Electric Power Co. The balance sheet showed that a sum of £2 253 was expended on capital account during 1928, chiefly on the extension of mains. The depreciation reserve account and the general reserve account which appeared in the 1927 balance sheet had been merged into one account, to which the directors proposed that for the year 1928 £2 954 be transferred out of revenue, making a total of £14 500 standing to the credit of the depreciation and reserve account at December 31st last. The revenue account showed net receipts from the sale of electricity and other revenue at £9 134, compared with £7 911, an increase of £1 223. The directors would bring to bear on the electricity supply problem at Stratford the cumulative experience gained by the Shropshire Power Co. through many years of work. The Power Co. was responsible for electricity supply over an extensive area, comprising industrial, residential, and rural districts, and had successfully supplied electricity over a large area containing districts of widely varying character. The directors would be in a position to offer the town of Stratford a cheap and abundant supply, not merely for lighting purposes, but for heating and power, by interconnecting the Stratford-on-Avon undertaking with the main transmission system of the Shropshire Power Co. The development of electricity for cooking and other domestic services had made rapid strides in the last few years, and was still going ahead at a great rate. They could not, however, undertake the large expenditure necessary for the development of electricity supply in Stratford until an agreement had been reached with the Town Council for the postponement of the Council's option to purchase the undertaking in two years' time. Small undertakings were now prone to be merged with large systems for reasons of economy in production and efficiency in service. The situation in Stratford-on-Avon called for the immediate expenditure of a large capital sum and for a healthy reduction in its present tariffs. Whether these two events were to take place forthwith depended upon the Town Council, with whom the company were in negotiation. The report and accounts were adopted. The report showed that the net receipts for the year amounted to £9 134 5s. which, added to the balance brought forward, £417 5s. 8d., made a total of £9 551 10s. 8d. Administrative and general expenses absorbed £3 096 18s. 9d., debenture interest £914, and income tax £600, leaving a balance of £4 940 11s. 11d.

ELECTRO-TRUST, LTD.—Mr. J. M. Balfour, presiding at the meeting on August 24th, said the accounts for last year covered a broken period during which only part of the company's capital was available. The balance of 5s. a share outstanding on the preference and ordinary shares was called up in October last, and the outstanding preference and ordinary shares were converted into £180 000 of 6% cumulative preference stock and £120 000 of ordinary stock. The balance of profits on realisation from investments during the year under review amounted to £14 387, which had been carried to capital reserve, raising that fund to £24 388. Temporary loan at June 30 stood at £1 593, against £95 000 in the previous accounts. Investments, at or under cost, stood at £345 711, a figure substantially exceeded by their present value. Total revenue was £19 343. Deducting interest on loans, etc., £2 345, management expenses, £1689, and income-tax, £3 828, balance was £11 481. Dividends on the preference shares amounted to £7 920, leaving a balance of £3 561, to which was added the amount carried forward from the previous account, £755, making a disposable balance of £4 317, which they proposed to carry forward. Whereas at their meeting last year he referred to the fact that the first practical effects of the Electricity Supply Act of 1926 could be discerned in the orders for transmission plant which were then being received by electrical manufacturers, the current year had provided ample evidence of the revolution caused by the Act. At December 31 last five schemes, covering all the main industrial centres of England and Scotland, representing in all over 80% of the electrical output of the country, had been adopted, and the work of surveying the actual alignment of the trunk transmission lines planned under these schemes and the negotiation of the necessary wayleaves, was in full progress. To-day the contracts, amounting to many millions, for the greater part of these lines had been placed. As the reforming effect of the Act, which the future would surely recognise as amongst the most valuable legislation of the century, would only be fully appreciable on the supply side of the industry when the "grid" network was complete, this progress was of good augury both to the consumer of electricity and the authorised undertaker. That the public is very fully alive to the possibilities of the future, the persistent interest in public utility securities during the past year bore witness. Indeed, to those who appreciated what a gradual process must be the education in the use of electricity of a large community, whose members, whatever their views in other respects, were almost notoriously conservative in their domestic habits, it might well seem that, despite the satisfactory and regular increase in consumption recorded each year, the future might even, for the moment, have been overdiscounted. A spectacular and wholesale increase in the use of electricity could only be expected when a really cheap supply was generally available, and the process of reorganisation and rationalisation now on foot would have to continue for some years before this could be achieved. On the other hand, when one turned to America, where the present consumption of electricity *per capita* was from three to four times the figure for this country, and was, therefore, proportionately nearer saturation point, there had been in recent months an appreciation in utility securities which no prophet six months ago would have dared to foretell. The report and accounts were adopted.

New Companies.

ELECTRIC RESISTANCE FURNACE CO., LTD.—Cap., £5 000. To carry on business as indicated by title. Reg. office: 17, Victoria Street, London, S.W.1.

PRINCE'S SUNRAY CLINIC, LTD.—Cap., £300. Medical and general electricians, etc. Reg. office: 52, Catherine Street, Liverpool.

WILLIAM C. MACDOWALL, LTD.—Cap., £500. Engineers, dealers in machinery, electrical equipment, etc. Reg. office: 1A, Bensham Manor Road, Thornton Heath.

H. A. AND C. OWEN, LTD.—Cap., £1 000. Dealers in vehicles of all kinds, wireless apparatus, electrical goods, etc. Solicitor: G. C. Rallison, 2, Bristol Chambers, Nicholas Street, Bristol.

LONDON LIGHTING INDUSTRIES, LTD.—Cap., £100. Manufacturers of and dealers in electric globes and lighting specialities, etc. A subscriber: J. Ismay, 108, Westbourne Terrace, London, W.2, solicitor.

STANFORD TRADING CO., LTD.—Cap., £1 000. Mechanical engineers, electricians, suppliers of or dealers in electrical apparatus, etc. Solicitors: Hore, Pattisson and Bathurst, 48, Lincoln's Inn Fields, London, W.C.

BLUNDELL-CURTIS, LTD.—Cap., £100. Manufacturers, importers and exporters of, agents for and dealers in electrical and other instruments, appliances, etc. Solicitor: M. Blumberg, 31, Princess Street, Manchester.

BRITISH AMERICAN CONSTRUCTION CO., LTD.—Cap., £10 000. To construct, equip, work, etc., railways, tramways, electric light, telephonic, telegraphic, and power supply works, etc. Reg. office: 69, Old Broad Street, London, E.C.3.

SOUND PICTURES, LTD.—Cap., £1 000. To adopt agreement with J. H. T. Roberts, and to carry on business of importers and exporters and manufacturers of and dealers in talking machines, etc. Reg. office: 87, Bishopsgate, London, E.C.2.

MAJESTONE, LTD.—Cap., £1 250. Manufacturers of and dealers in apparatus used in connection with production, operation or display of cinematograph films or moving pictures, general and electrical engineers, electricians, etc. Solicitor: E. M. Redhead, 41, John Dalton Street, Manchester.

RADIUM THERMAL INSTITUTES, LTD.—Cap., £10 500. To adopt agreement with A. Phillips and L. Cardozo, and to promote and conduct institutes and centres for administration of radium, radioactive and kindred medical treatments, etc. Reg. office: Balfour House, 119-125, Finsbury Pavement, London, E.C.2.

WALTER JONES, HARVEY AND CO., LTD.—Cap., £5 500. To acquire business of manufacturer of musical instruments, etc., carried on by W. Jones, and business of wireless, electrical and mechanical engineer, and manufacturer of wireless and electrical apparatus, etc., carried on by J. L. Harvey, both in High Street, Swadlincote, Derby. Reg. office: 32, High Street, Swadlincote.

WESTFIELD PROPERTY AND INVESTMENT CO., LTD.—Cap., £5 000; borrowing powers, £5 000 000. To acquire and turn to account lands, etc., in Great Britain or elsewhere. Engineers, manufacturers of and dealers in automatic machines, for producing or supplying electricity, etc. Reg. office: Britannia Buildings, St. Peters Street, Huddersfield. Public company.

F. W. POTTER AND SOAR, LTD.—Cap., £25 000. To adopt agreement with H. R., A. J. P., B. C., and Agnes M. Soar, and to carry on business of F. W. Potter and Co. carried on by above at Phipp Street, Great Eastern Street, London, E.C., and elsewhere, and that of mechanical, ventilating, electrical and wireless engineers, etc. Reg. office: 6-16, Phipp Street, Great Eastern Street, London, E.C.2.

PORTADYNE RADIO, LTD.—Cap., £1 000. To adopt agreement with R. B. Whittingham and E. C. Scott Smith, to acquire trade mark "Portadyne" registered in names of above in respect of apparatus for use in wireless telegraphy and telephony, to carry on the business of manufacturers of and dealers in wireless sets, apparatus and accessories; electricians, etc. Reg. office: 41, The Broadway, Ealing, London, W.5.

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ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

TRIOTRON.—499 360. Class 8. Wireless telephonic valves. Radiowerk E. Scrack, Schumanngasse 31, Vienna 18, Austria; manufacturers. January 24th, 1929. Registration of this trade mark shall give no right to the exclusive use of the letter "T." Concurrent user claimed from February, 1924. Sect. 21.

PEEL-CONNER.—485 795. Class 6. Magneto electric machines and parts thereof. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2; manufacturing electrical engineers. November 11th, 1927. To be associated with No. B405 494 (2 212) xiii and another. Advertised before acceptance, the applicants alleging distinctiveness.

PEEL-CONNER.—485 796. Class 8. Telephonic instruments and apparatus and parts thereof. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2; manufacturing electrical engineers. November 11th, 1927. To be associated with No. 484 795 (2 678) vi. Advertised before acceptance, the applicants alleging distinctiveness.

MAJESTIC.—495 573. Class 8. Sound amplifying apparatus and parts thereof, amplifying and rectifying tubes or valves, wireless telephonic apparatus and parts thereof, phonographs and parts thereof, phonograph records and wireless telephonic apparatus in combination with phonographs. Grigsby-Grunow Co. (a corporation organised under the laws of the State of Illinois), 4 540 Armitage Avenue, Chicago; manufacturers. October 2nd, 1928. To be associated with No. 474 235 (2 547).

SAMPSON ACCUMULATOR (SIGN).—501 481. Class 8. Electric accumulators (not for medical purposes). Ward and Goldstone, Ltd., Sampson Works, Frederick Road, Pendleton, Manchester; electrical engineers. April 4th, 1929. To be associated with No. 451 013 (2 430). Registration of this trade mark shall give no right to the exclusive use of the word "Sampson."

BI-LATROLA.—502 038. Class 8. Loud speakers for use in wireless telephony, and electrical sound reproducing instruments and apparatus. Ottomar Voelk, Nachod Strasse 27, Berlin, W. 50; manufacturer. April 22nd, 1929.

TRUVOX (SIGN).—502 533. Class 8. Radio receiving sets, gramophones, radio receiving sets in combination with gramophones, and loud speakers. Universal Gramophone and Radio Co., Ltd., Truvox Works, Ryland Works, Kentish Town, London, N.W.5; manufacturers. May 7th, 1929. To be associated with No. 501 753 (2 673).

OCAM.—503 297. Class 8. Philosophical and scientific instruments. Maco Template and Engineering Co., Ltd., 19, Cursitor Street, London, E.C.4; template manufacturers. June 4th, 1929.

K.L.G. (SIGN).—495 923. Class 13. Sparking plugs, waterproof terminals, spanners, and sparking plug accessories, all being goods made wholly or principally of ordinary metal, and not included in other Classes. K.L.G. Sparking Plugs, Ltd., Robinhood Engineering Works, Putney Vale, London, S.W.15; manufacturers. October 13th, 1928. To be associated with No. 382 583 (2 113). Advertised before acceptance, the applicants alleging distinctiveness.

AEROTO.—501 885. Class 6. Electric fans. The British Aerotechnical Co., Ltd., Astor House, Aldwych, London, W.C.2; manufacturers. April 17th, 1929.

C.R. (MONOGRAM).—496 509. Class 8. Philosophical and scientific instruments. Clareth Reproducers, 3, Queen Square, Leeds; manufacturers of electrical reproducing gramophones.—October 31st, 1928.

COLUMBIA ELECTRO GRAPHOPHONE (SIGN).—510 807. Class 8. Electric talking machines and parts and accessories therefor. Columbia Graphophone Co., Ltd., 102 to 108, Clerkenwell Road, London, E.C.1; manufacturers. April 15th, 1929. To be associated with No. 288 624 (1 524) and others. Registration of this trade mark shall give no right to the exclusive use of the word "Electro."

GOTHIC.—502 551. Class 8. Philosophical and scientific instruments. Gothic Electrical Supplies, Ltd., 5, 7, and 9, Severn Street, Birmingham; manufacturers. May 7th, 1929.

PHILOMONIC.—503 617. Class 8. Wireless telephonic apparatus in combination with gramophones, and parts thereof. Kemble and Co., 97, Carysfort Road, Stoke Newington, London, N.16; manufacturers. June 13th, 1929.

GRADIONIC.—503 618. Class 8. Wireless telephonic apparatus in combination with gramophones, and parts thereof. Kemble and Co., 97, Carysfort Road, Stoke Newington, London, N.16; manufacturers.—June 13th, 1929.

METEOR.—500 786. Class 13. Electric lamps (ordinary). Meteor Electric Lamp Co., Ltd., Sicilian House, Sicilian Avenue, London, W.C.1; electric lamp manufacturers. March 8th, 1929.

SUNRAY TRICITY.—500 946. Class 18. Electric radiators for heating. The British Electric Transformer Co., Ltd., Clayton Road, Hayes, Middlesex; manufacturing electrical engineers and contractors. March 14th, 1929. To be associated with No. 296 927 (1 548) and another.

BRITSULITE.—492 509. Class 50. Electrical insulating materials. British Insulite, Ltd., Belfield Old Road Works, Belfield Old Road, Rochdale, Lancashire; manufacturers. June 19th, 1928.

PHOTO-MATIK—.492 330. Class 8. Philosophical and scientific instruments. Stanley Hart and James Isaac Stealey, 76, West Street, Brighton; manufacturers. June 12th, 1928. (By consent.)

LYRIC.—500 548. Class 8. Electric meters, cables, flexibles, resistances and fitted electric switchboards. Max Weinbaum, 419 to 423, Commercial Road, London, E.1; merchant. March 1st, 1929. To be associated with No 500 550 (2 675) xiii and another.

VEERED.—502 481. Class 8. Loud speaking and sound amplifying instruments. S. G. Brown, Ltd., Western Avenue, North Acton, London, W.3; electrical engineers. May 6th, 1929.

THE VOICE OF ACTION.—503 169. Class 8. Recording and reproducing apparatus for sound cinematograph films. Western Electric Co., Ltd., Bush House, Aldwych, London, W.C.2; electrical engineers. May 29th, 1929. To be associated with No. 503 170 (2 679).

LIVER.—503 394. Class 8. Cables for electrical purpose The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool; manufacturers. June 5th, 1929. To be associated with No. 472 162 (2 536).

GROSSAG.—497 780. Class 13. Electric irons, tea and coffee urns, cooking utensils and immersion heaters. Fr. Gross, jr., Aktiengesellschaft, 23, Blendstattstrasse, Schwabisch Hall, Wurtemberg; manufacturers. December 5th, 1928. Address for service in the United Kingdom, c/o M. Oppenheimer, 23, Moor Lane, London, E.C.2.

FERRAX.—504 434. Class 13. Electric lamps (ordinary). Naamlooze Vennootschap Transelectra, Sarphatistraat 43, Amsterdam, Holland; manufacturers. July 12th, 1929. Address for service in the United Kingdom, c/o McKenna and Co., 31-34, Basinghall Street London, E.C.2.

TOASTMASTER.—502 773. Class 18. Electric toasting stoves. Watersgenter Co., 213 to 217, North Second Street, Minneapolis; manufacturers of electrical apparatus. May 14th, 1929. Address for service in the United Kingdom, c/o White, Langner, Stevens, Parry and Rollinson, Jessel Chambers, 88, 89 and 90, Chancery Lane, London, W.C.2.

V.I.R. UNIVERSAL LAMP (SIGN).—501 594. Class 13. Electric lamps. Naamlooze Vennootschap "Vereenigde Industrieen Rotterdam" Voorheen Ph. Verhagen and Zoon, Oude Dijk 149, Rotterdam; manufacturers. April 8th, 1929. To be associated with No. 488 865 (2 637). Address for service in the United Kingdom, c/o Gee and Co., 51-52, Chancery Lane, London, W.C.2. Registration of this trade mark shall give no right to the exclusive use of the word "Universal" or of the device of an electric lamp.

Opposition to the registration of the following trade marks can be lodged up to September 21st, 1929.

TRIOGRANIC.—504 139. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy. Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, E.C.4; electrical engineers. July 2nd, 1929. To be associated with No. 254 366 (1 316) and others.

MICO.—502 624. Class 50. Electrical insulating materials. The Micanite and Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, London, E.17; manufacturers. May 9th, 1929. To be associated with No. 420 136 (2 292).

COMMERCIAL INFORMATION

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

AVON ELECTRICAL CO., 313, Aigburth Road, Liverpool, electricians. £17 2s. 11d. July 24th.

BAILES, Mr. A., 48, Lewin Road, Streatham, electric lamp salesman. £11 10s. 10d. July 11th.

BULLEN (A. G.) AND CO., 79, West Walls, Carlisle, electrical contractors. £19 16s. 1d. July 16th.

CAMEROFF, J. (trading as J. CAMERON), 147, Spencer Place, Leeds, power and lighting engineer. £15 17s. 8d. July 16th.

DAVIS, Laurence Maurice, 93, Shepherd's Bush Road, W., electrical engineer. £27 10s. June 28th.

ELECTRICAL SUPPLIES CO., 306, Deansgate, Manchester, electricians. £19 9s. 8d. July 19th.

ESSEX COUNTY ELECTRICAL CO., 60, High Street, Woodford Green, electrical engineers. £10 0s. 6d. June 26th.

FRANKS, Mr. B., 2, Dorothy Road, Lavender Hill, wireless engineer. £10 10s. July 16th.

GASCOIGNE, Mr. H., Cricklade Street, Cirencester, radio dealer. £16 16s. 2d. June 27th.

SENIOR'S WIRELESS STORES, 961, Abbeydale Road, Sheffield, wireless dealers. £15 16s. 3d. July 4th.

SHAPLAND, Mr. A. E., 13a, High Street, Budleigh, Salterton, wireless dealer. £14 7s. 7d. July 6th.

SHAW, J. (trading as REX-O-TONE RADIO CO.), 30, Orme Road, Bangor, radio factor. £13 0s. 6d. July 5th.

STATION RADIO STORES, 18, Crystal Palace Station Road, S.E., electrical engineers. £16 18s. 11d. June 24th.

WHITEHEAD, Bertram J., 4, Queen's Terrace, Wonford Road, Exeter, wireless engineer. £20 18s. 9d. July 4th.

Bill of Sale.

THURSTON, William Thomas Stanley, 6, Creswold Street, West Bromwich, electrical engineer. Dated August 22nd, filed August 26th. £40.

Receivership.

BAYLISS, MARCH AND NEWEY, LTD. W. F. Bridgwater, of 3, Cherry Street, Birmingham, was appointed receiver and manager on August 14th, 1929, under powers contained in debenture dated December 14th, 1928.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

ELECTRASTORAGE, LTD. (late JUDD ACCUMULATOR AND EQUIPMENT CO., LTD.), London, W.C. Registered August 15th, £500 debentures; general charge.

"K.N." ELECTRICAL PRODUCTS, LTD., London, E.C. Registered August 12th, £1,000 debenture to P. Ferguson, The Garth, Grange Road, Highgate; general charge.

LEATHERHEAD AND DISTRICT ELECTRICITY CO., LTD., London, E.C. Registered August 14th, £9 800 debentures, part of amount already registered; general charge. *£91 550. March 28th, 1929.

SIGMA ELECTRICAL MANUFACTURING CO., LTD., Birmingham. Registered August 20th, £1 250 1st debenture, to W. H Wright, 190, London Road, Leicester, company director; general charge. *Nil. December 31st, 1928.

Satisfactions.

ATLAS CARBON AND BATTERY CO., LTD., London, S.E. Satisfaction registered August 17th, £3 000, outstanding July 1st, 1908.

BANBURY AND DISTRICT ELECTRIC SUPPLY CO., LTD., London, W.C. Satisfaction registered August 20th, £4 500, part of amounts registered March 31st, 1913, to August 11th, 1915.

WADEBRIDGE AND DISTRICT ELECTRIC SUPPLY CO., LTD., London, S.W. Satisfaction registered August 19th, £350, registered January 18th, 1915.

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Private Meetings, etc.

[Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.]

INGHAM ELECTRICAL CO. (THE), LTD., 34, Union Street, Bradford. At the statutory meeting of creditors in the voluntary winding-up of this company the liquidator (Mr. W. H. Curry), submitted a statement of affairs as at July 26th, 1929, showing liabilities of £6 990, of which £6 965 was due to unsecured creditors, and net assets of £1 066, or a deficiency of £5 924. The capital consists of 2 602 ordinary shares of £1 each fully paid up, so that, as regards contributories, there is a total deficiency of £8 525. The company was formed in September, 1926, to take over the business of J. and H. N. Ingham, trading as Ingham Bros. The principal shareholders were Messrs. J. and H. N. Ingham, who were duly appointed joint managers at a salary of £260 per annum each. For the fourteen months ending August 31st, 1927, the turnover was £6 113 and there was a net loss of £2 259, while for the twelve months ending August 31st, 1928, the turnover was £5 262 and the net loss £1 157. The liquidator said that from to time the directors brought further monies into the business by way of loan and at the present time the company were indebted to J. H. Ingham to the extent of £2 787 and to H. N. Ingham £2 908. The meeting resolved that application should be made to the Court for the appointment of Mr. T. A. Stoker, accountant, of 71, Albion Street, Leeds, as liquidator in the place of Mr. W. H. Curry. A committee of inspection, consisting of three of the creditors, was also nominated.

London Gazette, etc.

Companies Winding-up Voluntarily.

NEWCASTLE ELECTRICAL AND MOTOR ACCESSORIES, LTD. Meeting of creditors at the offices of John G. Nixon and Co., chartered accountants, Gibb Chambers, Westgate Road, Newcastle-upon-Tyne, on Tuesday, September 3rd, at 3 p.m.

PAGE ELECTRICAL EQUIPMENTS, LTD. By reason of its liabilities, August 14th. W. Hand, 12, Cherry Street, Birmingham, appointed as liquidator. Meeting of creditors at the offices of the liquidator, Wednesday, September 4th, at 3 p.m.

Bankruptcy Information.

HINE, George Edward, trading as WIRELESS MAINTENANCE SERVICE, 17, The Promenade, Church End, Finchley, and 28, Mayfield Avenue, Finchley. Receiving order, August 21st. Debtor's petition.

MADDOX, Victor Frederick, 6, Homend Street, Ledbury, Hereford, electrical and wireless engineer. Receiving order, August 23rd. Debtor's petition.

WATSON, Stuart Byrne, trading as S.B. WATSON AND CO., 73, Crouch Street, Colchester, Essex, electrical engineer and contractor. First meeting, September 3rd, 12 noon, 9, Arcade Street, Ipswich. Public examination, October 3rd, 11 a.m., Law Courts, Town Hall, Colchester.

WOODHEAD, Titus Ernest, 26, Central Drive, Blackpool, electrical factor. First meeting, September 4th, 11 a.m. Official Receiver's Office, 9, Cannon Street, Preston. Public examination, September 20th, 10.30 a.m., Court House, South King Street, Blackpool.

Notices of Dividends.

CHARLEY, Henry Victor (trading as DINAS POWIS ELECTRICAL SUPPLY CO.), Station Road, Dinas Powis, Glamorgan, electrical engineer. First and final dividend, 1s. 2¼d. per £, payable September 10th, at the Official Receiver's Office, 34, Park Place, Cardiff.

HYDE, Hubert Algernon, 148, Weston Park, Crouch End, North London, lately at 2, East Street, Bromley, Kent, wireless dealer. First and final dividend, 3s. 11½d. per £, payable September 4th, Official Receiver's Office, 29, Russell Square, W.C.1. The above notice is in substitution for notice of dividend of 4s. 1¾d. per £ published in the "London Gazette" of June 4th, 1929, the dividend then advertised not having been paid.

LAURENS, William Hamilton, 492, Prescot Road, Old Swan, Liverpool, radio engineer. First and final dividend, 7d. per £, payable August 30th, Offices of the Official Receiver, Government Buildings, Victoria Street, Liverpool.

KIRK, Ernest William, formerly carrying on business as THE ACE RADIO MANUFACTURING CO., at 26, Curzon Street, Derby. First and final dividend, 3s. 6½d. per £, payable August 27th, Official Receiver's offices, 22, Regent Street, Park Row, Nottingham.

Partnerships Dissolved.

"RHYMOS ELECTRICAL SERVICE DEPOT" and "RHYMOS ELECTRICAL ENGINEERS" (George Frederick MOSS and John RHYDE), electrical engineers, 39, High Road, Wood Green, Middlesex, and at Blenheim Works, Blenheim Road, Wood Green, by mutual consent as from August 12th, 1929. Debts received and paid by G. F. Moss, who continues the business.

WALKER (F. S.) AND CO. (Frederick Sinclair WALKER and Alfred M'DOUGALL), electrical engineers, 6, Queen Margaret Place, North Kelvinside, Glasgow, as at August 20th, 1929, by the retiral of A. M'Dougall. F. S. Walker will continue the business under the same firm name.

Bankruptcy Proceedings.

TABBUSH (JOSEPH) AND CO., LTD., 11, Queen Victoria Street, E.C. Under the compulsory liquidation of this company the Official Receiver reports that the accounts show liabilities £2 672 (including a debenture for £2 500 which is invalid and which the holder has promised to surrender), assets £15 and a deficiency of £159 with regard to contributories, the issued capital being £2. The company was formed in December, 1926, to carry on the business of wireless, radio and electrical engineers and dealers in all kinds of electrical apparatus. The business was mainly as importers of wireless valves. Mr. Joseph Tabbush, the managing director, who is a French national, appears to have purchased the valves in France and to have sold them in this country, advantage being taken of the rate of exchange as between France and this country. That gentleman states that when the French currency was stabilised he was unable to obtain any advantage from the rate of exchange and consequently could not dispose of the valves at a profit. The company ceased to carry on business towards the end of 1927. Mr. Tabbush attributes the failure to the stabilisation of the French currency as the result of which the company had to pay a higher price for the valves, while at the same time British valves were reduced in price and consequently it was not possible to market the French valves at a profit. The company also incurred losses through a number of debtors becoming insolvent. The liquidation remains in the hands of the Senior Official Receiver.

ZONE WIRELESS CO., LTD., Iddesleigh House, Caxton Street, Westminster, S.W. The report of the Official Receiver, who is also acting as liquidator of this company, has been issued to the creditors and shareholders. The accounts lodged under the liquidation show liabilities, £847, assets, £152, and a deficiency of £745 with regard to contributories, the issued capital being £1 000 ordinary shares of 1s. each. The company was promoted by Mr. Drury Dickinson Pyper, as a private company in February, 1928, and was formed *inter alia* to acquire as a going concern the business of wireless apparatus manufacturers carried on by him under the name of Zone Wireless Co., together with the assets and liabilities of the vendor. The work done by the company consisted of the assembling of the various parts which constituted the wireless sets, no parts being manufactured by the company. The business was carried on at a loss and it appears that the wireless sets were sold for lesser sums than the actual cost of production, exclusive of establishment charges. Mr. Pyper attributes the failure of the company to the manufacture of portable wireless sets by other business houses on mass production lines which were being sold at prices lower than the company could produce them.

METAL AND CHEMICAL PRICES.

TUESDAY, August 27th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£77 15 0	—	—
Electro Wirebars	„	£84 15 0	—	—
H.C. Wires, basis	per lb.	11 11/16d.	—	—
Sheet	„	11 13/16d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2 1/16d.	—	—
Brass 60/40—				
Rod, basis	per lb.	9d.	¼d.	—
Sheet „	„	10 7/16d.	—	—
Wire „	„	11 7/16d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig—				
English	per ton	£24 10 0	£1 15 0	—
Foreign or Colonial	„	£23 2 6	—	£1 2 6
Tin—				
Ingot	per ton	£209 10 0	—	£1 2 6
Wire, basis	per lb.	2s. 9d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£25 0 0	—	2s. 6d.
Mercury	per bottle	£22 15 0	15s. od.	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
Sodium Bichromate—Per lb. 3½d.

Rubber—Para fine, 10½d.; plantation, 1st latex, 10½d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

Messrs. James Forster and Co. report that trading on the open market was very quiet last week, the total transactions being approximately 3 000 tons. Declarations of Mexican and American lead in steamers due at the end of that week and early this week rather unsettled the market, and August lead was sold down to £22 16s. 3d., but a recovery took place, and, on a good volume of buying, values advanced. The reported formation of a Lead Producers' Association, comprising the productions of Mexico, Australia, Canada, and Burma would imply a closer control in future of the world's supply, outside America. Closing prices showed an advance of 3s. 9d. to 2s. 6d. per ton, compared with the previous week, August shipment closing at £23 2s. 6d., and November at £23 5s.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

313 667 I. M. E. Aitken, D. A. Gordon and Associated Electrical Industries, Ltd. Electrical signalling systems. (23/3/28.)
287 574 British Thomson-Houston Co., Ltd. Electric cooking-devices. (25/3/27.)
313 668 W. J. Line. Electric plugs. (26/3/28.)
313 671 E. Longbottom and R. Milne. Electric circuit-breakers. (28/3/28.)
313 677 M. Edmunds. Apparatus for regulating gas or electric supply in connection with domestic stoves and the like. (31/3/28.)
313 682 Relay Automatic Telephone Co., Ltd. and A. C. Corner. Telegraph concentrator. (3/4/28.)
313 689 D. Lupi. Measurement of electrical energy in triphase circuits. (13/4/28.)
313 691 Santon, Ltd. and H. C. Sanders. Electric heating-elements. (16/4/28.)
313 693 Igranic Electric Co., Ltd., F. J. H. Charman and F. A. Inskip. Thermionic valve circuits. (18/4/28.)
289 471 Associated Electrical Industries, Ltd. Piezo-electric crystals. (28/4/27.)
313 706 A. F. Pollock and D. A. Pollock. Microphones. (27/4/28.)
313 715 A. G. S. Sandison and Electroflo Meters Co., Ltd. Electrical recording instruments of the relay type. (3/5/28.)
291 437 Siemens Schuckertwerke Akt.-Ges. Annealing-furnaces. (3/6/27.)
313 721 J. A. Crabtree. Electric switches. (16/5/28.)
292 096 Standard Telephones and Cables, Ltd. Loading systems for telephone lines or the like. (13/6/27.)
313 722 P. Bruynseraede. Devices for supplying current to thermionic valves. (17/5/28.)
313 723 English Electric Co., Ltd. and G. Schroeder. Excitation of synchronous dynamo-electric machines. (18/5/28.)
313 726 P. Freedman. Metallic-vapour lamps for producing ultra-violet radiation. (22/5/28.)
313 727 P. Freedman. Electric discharge devices for producing ultra-violet radiation. (22/5/28.)
313 729 P. Freedman. Metallic-vapour electrical discharge devices. (25/5/28.)
313 730 H. H. Berry and W. J. Markham. Advertising and the like signs. (25/5/28.)
313 745 B. Peebles and Co., Ltd. and J. W. Rodger. Insulating pressure clamps for electrical apparatus. (7/6/28.)
291 769 Kabelwerk Duisburg. Paper-insulated multiple-conductor electric cables for carrying large currents. (8/6/27.)
303 131 E. Reisz. Electrostatic loud-speakers and the like. (29/12/27.)
292 913 Dr. S. Loewe. Indirectly-heated thermionic cathode. (25/6/27.)
293 034 M. Buchholz. Method and apparatus for protecting transformers, switches, motors, generators, and other electrical apparatus. (30/6/27.)
313 773 J. Henderson. Signal posts for road or street islands for vehicular passenger traffic. (6/7/28.)
313 775 G. Wilkinson. Electrical automatic temperature controllers. (7/7/28.)
293 805 International General Electric Co., Inc. Electric switches of the truck-type. (12/7/27.)
293 880 Associated Electrical Industries, Ltd. Measurement of electrical quantities. (14/7/27.)
313 784 H. S. Cowx. Electromagnetic make-and-break movements and the like. (16/7/28.)
300 115 Federal Telegraph Co. Phonograph pick-up apparatus. (5/11/27.)
300 116 Siemens-Schuckertwerke Akt.-Ges. Enclosed distributing switch-gear with switch apparatus which can be drawn out or lowered. (5/11/27.)
298 077 F. J. Alderson. Electric incandescent lamps. (1/10/27.)
298 238 International General Electric Co., Inc. Oil switches. (6/10/27.)
300 613 Westinghouse Lamp Co. Vacuum electric tube devices. (16/11/27.)
301 838 F. G. Baum. Dynamo-electric machines. (6/12/27.)
301 844 Associated Telephone and Telegraph Co. Telephone systems. (13/8/27.)
303 013 British Thomson-Houston Co., Ltd. Apparatus for condensing mercury or other vapour, and vaporising water or other liquid. (24/12/27.)
309 408 I.G. Farbenindustrie Akt.-Ges. Partitions for separating the electrolytic products in the fusion electrolysis of chlorides, particularly of magnesium. (23/12/27.)
313 429 G. H. Fletcher, R. Brooks and Associated Electrical Industries, Ltd. Electric motors. (9/3/28.)
285 424 Compagnie Lorraine de Charbons pour l'Electricite. Arc-lamp electrodes for heavy currents. (16/2/27.)
299 028 Frigidaire Corporation. Refrigerating systems and apparatus. (20/10/27.)
289 422 W. S. Kimmig. Vacuum tubes. (27/4/27.)
285 837 Allgemeine Elektricitats-Ges. Coil for electric meters and measuring-instruments. (22/2/27.)
313 895 Standard Telephones and Cables, Ltd., T. N. Riley, and R. A. L. Cole. Manufacture of continuously-loaded electric cables. (14/3/28.)
287 096 International General Electric Co., Inc. Quick-acting reverse-current electric circuit-breakers. (14/3/27.)
314 128 J. Poliakoff. Audio-frequency transformers for wired and wireless telephony. (14/1/29.)
301 790 Siemens and Halske A.-G. Circuit arrangement for telephone installations with semi-automatic working. (5/12/27.)
302 267 Siemens and Halske A.-G. Circuit arrangement for telephone installations in which the calling-lines are connected to an operator through call-finders. (13/12/27.)
313 938 B. Thomas and E. Thomas. Selective remote control of switchgear in electric sub-stations. (17/3/28.)
288 138 J. A. Grier and J. A. Warren. Compression refrigerating apparatus. (31/3/27.)
313 985 British Thomson-Houston Co., Ltd., J. V. Peacock, L. R. Nixon, and F. H. Harris. Electric motor control systems. (19/3/28.)
313 986 J. Neale. Sound transmitters involving the use of light waves. (19/3/28.)
297 078 Electrical Research Products, Inc. Television systems. (14/9/27.)
291 370 Electrical Research Products, Inc., Television systems. (31/5/27.)
313 906 Gramophone Co., Ltd., and A. Whitaker. Recording of sounds with the aid of light. (19/3/28.)
313 987 General Engineering Co. (Radcliffe), Ltd., and S. Taylor. Process and apparatus for impregnating insulating dielectric materials. (20/3/28.)
313 942 British Thomson-Houston Co., Ltd., C. W. Wood, and E. Clifford. Locking and interlocking mechanism primarily for use with electric switches. (20/3/28.)
313 991 S. G. S. Dicker (V. Philips' Gloeilampenfabrieken). Electrical installations. (20/3/28.)
313 943 M. E. Elliott. Wireless receiving-apparatus. (20/3/28.)
313 995 J. Lucas, Ltd., and O. Lucas. Vehicle electric lamps. (21/3/28.)
313 996 J. Lucas, Ltd., and O. Lucas. Vehicle electric lamps. (21/3/28.)
313 997 J. Lucas, Ltd., C. Lucas, and W. H. Eggington. Vehicle and other electric lamps. (21/3/28.)
314 003 Gramophone Co., Ltd., and A. Whitaker. Sound-recording with the aid of light. (21/3/28.)
314 107 R. Brooks, W. T. Gray, and Associated Electrical Industries, Ltd. Electric locomotives. (21/3/28.)
314 112 Siemens Bros. and Co., Ltd., and D. A. Christian. Electrical signalling systems. (22/3/28.)
295 572 Associated Telephone and Telegraph Co. Telephone systems. (13/8/27.)
314 122 E. O. Symonds. Amplification of cable signals. (23/3/28.)
314 123 H. Leitner. Electric accumulators. (24/3/28.)
314 124 Siemens Bros. and Co., Ltd., and E. A. Forceville. Electromagnetic devices. (24/3/28.)
290 156 Electroacustic Ges. Air sound-apparatus. (7/5/27.)
314 133 J. Stone and Co., Ltd., and A. A. Mead. Electric lamps or lanterns. (27/3/28.)
314 136 D. Dunnett. Traffic-signalling devices for use on road vehicles. (28/3/28.)
290 655 Landis and Gyr Soc. Anon. Electric measuring-instruments of the induction type. (19/5/27.)
288 160 British Thomson-Houston Co., Ltd. Arc-welding systems. (1/4/27.)
314 146 G. H. Ide and H. L. Bentley. Electric switches. (4/4/28.)
289 048 International General Electric Co., Inc. Electric circuit-breakers. (22/4/27.)
314 152 L. Mellersh-Jackson (Federal Telegraph Co.). Radio antennae. (11/4/28.)
314 160 Telegraph Condenser Co., Ltd., and W. J. Cole. Electrolytic condensers. (18/4/28.)
314 162 J. A. Brook. Devices for locking incandescent bulbs in their holders (19/4/28.)

A RECENT delivery of Morris-Cowley saloons for the use of representatives of the Mullard Wireless Service Co., Ltd. The Mullard fleet of cars comprises over 100 vehicles. Morris-Cowley saloons have been standardised by the Mullard organisation, it being the policy of the company to buy "British."

314 165 F. Foy. Apparatus for heating liquids by electricity. (21/4/28.)
314 167 E. Y. Robinson and Associated Electrical Industries, Ltd. Electric frequency filters. (23/4/28.)
314 181 L. A. Sharland, G. J. L. Armitage, and Dubilier Condenser Co. (1925), Ltd. Gramophone electric pick-up support. (15/5/28.)
314 188 H. R. G. Moore, L. C. B. Johnson, and H. J. O'Dell. Electric relays and contact-makers. (17/5/28.)
295 009 Sulzer Freres Soc. Anon. Absorption refrigerating-machines. (6/9/27.)
291 442 British Thomson-Houston Co., Ltd. Means for mounting filaments in electric discharge devices. (3/6/27.)
314 191 B. H. Stark. Holders or carriers for trolley pulleys used on tramway and like vehicles. (22/5/28.)
314 192 Stirling Telephone and Electric Co., Ltd., and N. Blades. Microphones. (23/5/28.)

Applications for Patents.

May 30th.

16 729 Associated Electrical Industries, Ltd., and N. P. Hinton. Inductance coils.
16 731 Associated Electrical Industries, Ltd., F. E. Bancroft, and P. Mannassi. Electric couplings, etc.
16 656 V. Bek. Device for utilising tidal power.
16 699 Brecknell Munro and Rogers (1928), Ltd., and H. J. Dolman. Receiving and exhibiting messages, etc.
16 670 British Thomson-Houston Co., Ltd. Electron discharge devices. (1/6/28, U.S.)
16 606 J. A. Crabtree and B. G. Harrison. Electrical plunger contacts.
16 674 J. Feldman. Electric amplifiers. (20/3/29, Germany.)
16 675 J. Feldman. Electromagnetic instruments. (27/3/29, Germany.)
16 678 H. H. Kalber. Electric motors.
16 726 F. J. Keene. Telephone systems.
16 691 L. Ughetti—La Corsa. Electrolyser for separation of tinfoil from salt solutions. (9/6/28, Italy.)
16 641 C. Neff. Power condenser for automatic phase regulator. (31/5/28, Germany.)
16 716 J. E. Noeggerath. Electrolytic apparatus. (21/12/26, Germany.)
16 676 J. Petrik. Thermo-electric batteries. (15/6/28, Czecho-Slovakia.)
16 643 Standard Telephones and Cables, Ltd. Switching mechanisms.
16 644 Standard Telephones and Cables, Ltd. Signalling systems. (5/2/29, U.S.)

May 31st.

16 767 A. A. Ashour. Device for rocking brushes on electrical machines.
16 841 Associated Electrical Industries, Ltd., and E. Y. Robinson. Vacuum electric tube devices.
16 864 Automatic Telephone Manufacturing Co., Ltd., J. E. Ostline and A. H. Williams. Telephone systems.
16 874 W. Bauer. Protective switch for current lines.
16 757 L. G. Brazier and Callender's Cable and Construction Co., Ltd. Device for measurement of telephone, etc., cables.
16 811 British Thomson-Houston Co., Ltd. Incandescent lamps. (31/5/28, U.S.)
16 816 D. A. Christian and Siemens Bros. and Co., Ltd. Automatic telephone systems.
16 774 A. D. Constable. Secondary batteries.
16 786 W. H. Dearden, G. Lawton, and Standard Telephones and Cables, Ltd. Magnetic materials.
16 842 G. P. Dennis. Ceiling fittings for electric lamps.
16 863 C. Gillings and W. H. Paulett. Telephone systems.
16 776 D. Glick and J. Gould. Track signalling systems.
16 748 J. P. Gumbley. Apparatus for indicating electrolyte level of accumulator, etc.
16 877 C. F. M. Hayes and Mullard Radio Valve Co., Ltd. Telephone instruments.
16 813 International General Electric Co., Inc. Electric locomotives. (1/6/28, Germany.)
16 817 A. Klanfield. Photographic, etc., arc lamps.
16 835 Kolster-Brandes, Ltd. Radio broadcasting systems. (31/5/28, U.S.)

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16 878 L. L. de Kramolin. Radio receiving apparatus. (31/5/28, Germany.)
16 750 J. P. Laker. Radio receivers, etc.
16 794 J. F. P. de La Riboisiere. Electric switches.
16 777 J. H. Orr. Junction boxes for lead covered cables.
16 799 O. Schotz and J. Wagner. Electric pocket lamp pencil. (20/2/29, Austria.)
16 823 Siemens-Schuckertwerke Akt.-Ges. Starting frequency convertors. (2/6/28, Germany.)
16 783, 16 784 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic, etc., telephone exchange systems.
16 785 Standard Telephones and Cables, Ltd. Cable sheath. (29/6/28, U.S.)
16 782 T. G. Weavie. Electric switches.

June 1st.

16 925 Allmanna Svenska Elektriska Aktiebolaget. Electromagnetic relays. (15/10/28, Sweden.)
16 926 Allmanna Svenska Elektriska Aktiebolaget. Circuit breakers. (23/6/28, Sweden.)
16 918 W. Anderson, D. E. Lambert, E. H. Leeson, and A. Reyrolle and Co., Ltd. Electric remote control systems.
16 928 British Thomson-Houston Co., Ltd. Cases for transformers, etc. (2/6/28, Italy.)
16 880 A. E. Chapman. Current interrupters.
16 950 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Device for driving gramophones.
16 951 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric generating installations.
16 919 F. N. Linstow and A. Reyrolle and Co., Ltd. Selective indicating mechanism.
16 288 C. Lorenz Akt.-Ges. Device for influencing radiation of electric waves. (20/10/29, Germany.)
16 968 C. Lorenz Akt.-Ges. Picture telegraphy, etc. (7/6/28, Germany.)
16 952 Roessler and Hasslacher Chemical Co. Electrodes. (1/6/28, U.S.)

June 4th.

16 986 K. S. Adie. Remote control of wireless apparatus, etc.
17 086 Associated Telephone and Telegraph Co. Telephone systems. (24/12/28, U.S.)
17 038 W. E. Barber. Electric condensers, etc.
17 000 T. H. Beckett, Beckett and Wheatley, and J. D. Wheatley. Electric light fittings for ceilings, etc.
17 185 W. E. Bethell and N. E. Paine. Sealed glass envelopes for incandescent lamps, etc.
17 059 J. P. Blair. Supporting device for wireless aerials.
17 140 British Thomson-Houston Co., Ltd. Incandescent lamps. (4/6/28, U.S.)
17 141 British Thomson-Houston Co., Ltd. Protective arrangements for electric circuits. (4/6/28, U.S.)
17 152 Bullers, Ltd. Cotter pins for retaining suspension pin in insulator hoods.
17 095, 17 096 D. A. Christian, and Siemens Bros. and Co., Ltd. Telephone systems.
17 055 L. Coatalen, R. H. Rose, and Sunbeam Motor Car Co., Ltd. Ignition systems.
17 148 H. W. Cowen. Electromagnetic device for windscreen wipers, etc.
17 192 J. A. Crabtree. Electric switch mechanism. (1/3/29.)
17 180 G. W. Croot, P. J. Packman and Plessey Co., Ltd. Change-over switches.
17 136 Day and Night Novelty Ads, Ltd. Electrically-operated apparatus for advertising, etc. (20/6/28, Australia.)
17 079 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Microphone.
17 080 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Vertical aerials.
17 081 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Amplification for electric oscillations.
17 083 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). High frequency amplifiers.
17 084 S. G. S. Dicker (Nederlandsche Seintoestellenfabriek). Coupling elements for volume control in wireless circuits.
16 995, 16 996 Electric Fires, Ltd., and F. L. Newhouse. Electric fires.
16 975 G. S. Foster. Electric mincer.
17 071 H. M. Genese and Pritchett and Gold and E.P.S. Co., Ltd. Vents for electric cells.
17 038 A. L. Gregory and E. Hoyle. Electric condensers, etc.
17 116 F. C. P. Henroteau. Television.
17 137 R. Horn. Preparation of electrolytic writing and drawing paper, etc. (14/6/28, Germany.)
17 103 A. M. Jacobs. Guards for electrical installations.
17 093 L. L. de Kramolin. Vacuum tube sets. (1/6/28, Germany.)
17 074 J. Liebewein and F. Pojer. Crystal detector. (4/6/28, Austria.)
16 993 J. A. MacDermid. Means for electrically controlling steering gear, etc.
17 164 J. E. Pollak (Associated Telephone and Telegraph Co.). Alternating current bells.
17 010 A. P. Rutherford. Electric, etc., lighting fittings.
17 048 Scintilla Akt.-Ges. Magneto electric ignition apparatus. (16/7/28, Germany.)
17 058 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Telephone systems.
16 992 J. H. Stott. Anti-dazzle fittings for electric lamps for vehicles.
16 972 R. Sugden. Electromagnetic amplifiers.
17 126 Telefunken Ges. fur Drahtlose Telegraphie. Electric discharge devices. (25/6/28, Germany.)
16 990 P. G. A. H. Voigt. Electric sound-boxes.
17 026 R. N. Wellington. Wireless receiving sets, etc.
17 254 E. P. G. Wright. Telephone systems.

June 5th.

17 303 Akt.-Ges. Kummler and Matter. Electric heating units. (5/6/28, Switzerland.)
17 305 Associated Electrical Industries, Ltd. (Westinghouse Electric and Mfg. Co.). Circuit interrupters.
17 277 A. Bowen and British Thomson-Houston Co., Ltd. Electromagnetic gramophone pick-ups.
17 295 R. E. H. Carpenter. Electron discharge amplifying apparatus.
17 300 P. B. Cow and Co., Ltd. Portable electric lamps.
17 267 C. E. Dansie. Radio receivers.
17 276 Elektrizitats Akt.-Ges. Hydrawerke. Electric condensers. (5/6/28, Germany.)
17 292 Ferranti, Ltd., F. W. Taylor, and E. E. Wild. Voltage regulation of transformers.
17 206 E. Hanff. Lighting equipment of motor vehicles.
17 242 H. Leben and A. Reyrolle and Co., Ltd. Electric protective systems.
17 300 E. Nesbitt. Portable electric lamps.
17 232 Portable Talking Pictures, Ltd. Sound and talking film synchronising devices.
17 237 C. E. Prince and Radiovisor Parent, Ltd. Operation of light sensitive devices.
17 254 Standard Telephones and Cables, Ltd. Telephone systems.
17 260 H. J. Thomson. Control of electro-mechanical variable speed gearing.
17 219 T. F. Wall. Electromagnetic testing of wire ropes.
17 299 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Electrical conductors.

June 6th.

17 462 J. E. Allan. Motor control. (15/3/28.)
17 463 J. E. Allan. Motor control. (24/8/28.)
17 464 J. E. Allan. Motor control. (18/12/28.)
17 465 J. E. Allan. Control of air supply for motors, etc. (15/3/28.)
17 466 J. E. Allan. Control of air supply for motors, etc. (18/12/28).
17 381 Associated Electrical Industries, Ltd. and T. W. Ross. Alternating current directional relays.
17 382, 17 383 Associated Electrical Industries, Ltd., and T. W. Ross. Electric protective systems.
17 406 Automatic Telephone Manufacturing Co., Ltd., O. A. Pearce and L. M. Simpson. Telephone systems.
17 437 British Thomson-Houston Co., Ltd., D. H. Graham and H. J. Taylor. Dynamo-electric machines.
17 438 British Thomson-Houston Co., Ltd. Electric arc devices. (6/6/28, U.S.)
17 439 British Thomson-Houston Co., Ltd. and G. S. C. Lucas. Thermionic valves.
17 402 Cambridge Instrument Co., Ltd., and W. J. Stallan. Magnification of small movements.
17 427 H. C. Channon, J. N. Dean, H. J. Garnett, B. J. Habgood and W. S. Smith. Insulating material.
17 392 Clarke, Chapman and Co., Ltd., and A. Read. Means for controlling electric motors.
17 459 H. J. Craymer. Electric condensers.
17 460 E. T. G., G. O. and W. Donovan. Cut-outs, etc.
17 424 Electrolux, Ltd. Supporting elements. (1/2/29, Germany.)
17 451 Elektro-Physikalische Ges. and E. Kassner. Television, etc. systems. (19/4/29, Germany.)
17 421 L. Emanueli and Soc. Italiana Pirelli. Electric cables.
17 359 G. E. and G. H. Fry. Overhead insulator.
17 340 General Electric Co., Ltd., M. Kahn and R. Orsettich. Dynamo-electric machines.
17 394 J. G. Hall and A. J. E. Osbourn. Apparatus for magnetising permanent magnets.
17 458 C. F. M. Hayes and Mullard Radio Valve Co., Ltd. Telephone instruments.
17 354 R. I. Kinnear. Electric lampholders.
17 362 E. W. Kuttner. Electrolytically producing insulating layers on aluminium, etc.
17 455 Maschinenfabrik Oerlikon. Electric protection arrangement. (5/4/29, Switzerland.)
17 380 A. R. Nielsen. Mariners' compasses.
17 430 M. Potay. Transmitting and receiving apparatus. (7/6/28, France.
17 323 W. M. Robinson. Synchronising motor and distributor.
17 316 J. Wilson. Starting devices from electrical pick-ups.
17 326 J. Wilson. Talking picture apparatus.

June 7th.

17 501 W. A. Bartlett. Radio receiving apparatus.
17 520 F. J. Chambers. Apparatus for reception of electromagnetic waves.
17 487 H. S. Cooke. Electric lamps.
17 575 H. A. Gill (Steatit-Magnesia A.G.) Fixing insulators.
17 707 S. T. Hall and E. Withers. Wireless direction indicator, etc.
17 573 T. M. W. Jensen. Tuning coils for wireless receivers.
17 525 E. M. Josephi. Electric signalling apparatus for automobiles.
17 563 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Method of producing oscillations from piezo-electric plates.
17 564 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Piezo-electric plates, etc.
17 471 J. Lewis and S. Miskimmin. Electric condensers.
17 572 J. E. Long. Circuit controlling apparatus.
17 609 C. Lorenz Akt.-Ges. Radio broadcasting. (9/6/28, Germany.)
17 610 C. Lorenz Akt.-Ges. Arrangement for indicating position of vessels. (24/1/29, Germany.)
17 611 C. Lorenz Akt.-Ges. Short-wave transmitting arrangements. (27/3/29, Germany.)
17 533 D. M. Phillips. Apparatus for disinfection of telephone mouthpieces, etc.
17 518 O. Schötz and J. Wagner. Electrical pocket lamp pencil. (27/4/29, Austria.)
17 554 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. Apparatus for Röntgen ray investigation. (25/7/28, Germany.)
17 617, 17 618 R. M. Catterson-Smith. Electric furnaces.
17 555 H. Sylvester. Wireless receiving apparatus.
17 548 T. A. B. Ternan. Condensers for wireless signalling.
17 488 J. Wilson. Electromagnetic pick-ups.
17 606 G. Wohlmuth and Co. A.G. Switchboards for galvanic electro-medical apparatus, etc. (6/5/29, Germany.)

June 8th.

17 677 Automatic Telephone Manufacturing Co., Ltd., C. E. Beale and H. S. Deyes. Telephone systems.
17 698 British Thomson-Houston Co., Ltd. Condenser microphones. (13/6/28, U.S.)
17 637 W. Brooke. Earthing of electrical apparatus.
17 706 Cie Lorraine de Charbons pour l'Electricite. Arc carbons, etc. (23/7/28, France.)
17 665 R. Cunningham and H. R. Ross. Electrical driving of machines, etc.
17 663 Electronos, Ltd., and H. B. Cullen. Illuminated signs.
17 662 H. Hartman. Illuminated signs.
17 697 International General Electric Co., Inc. Means for braking textile machine spindles. (9/6/28, Germany.)
17 647, 17 648 G. T. Jones and W. Kemp. Rock-cutting, etc., tool arms for use with electric motors, etc.
17 703 Kabushiki-Kaisha Hitachi-Seisakusho. Motor starters. (20/6/28, Japan.)
17 696 Lignoza Spolka Akcyjna. Protecting fuses against roving currents. (15/6/28, Poland.)
17 704 A. Marr. Telephones, etc.
17 687 Siemens-Schuckertwerke A.G. Searchlights.
17 682 H. Vogt. Electrostatic loud speakers, etc.

COMING EVENTS.

Tuesday, September 3rd.

Electrical Contractors' Association (Bournemouth Branch).—Ordinary meeting.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting 5 *p.m.*

Wednesday, September 4th.

Electrical Contractors' Association (Bath Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting. 2.30 *p.m.*

Thursday, September 5th.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

Saturday, September 7th.

Institution of Electrical Engineers (North Western Students' Section).—Inaugural meeting. Visit to the River Dee Hydro-Electric Station at Chester.

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THE ELECTRICIAN

Vol. CIII.—No. 2675. Friday, September 6, 1929. [Registered at the General Post Office.] Sixpence

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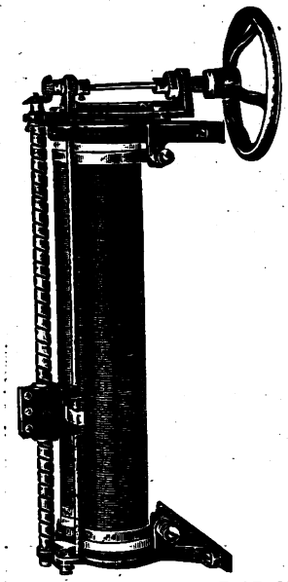

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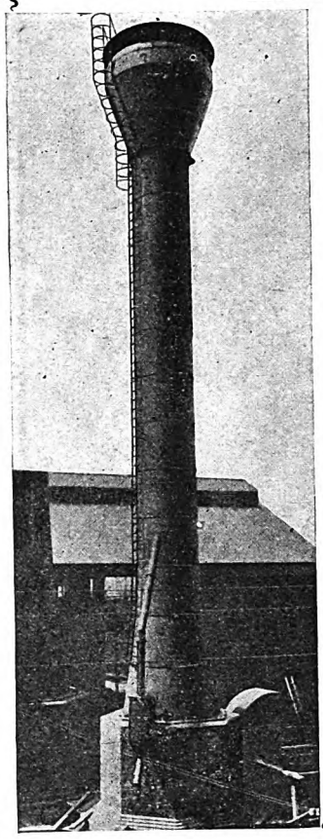

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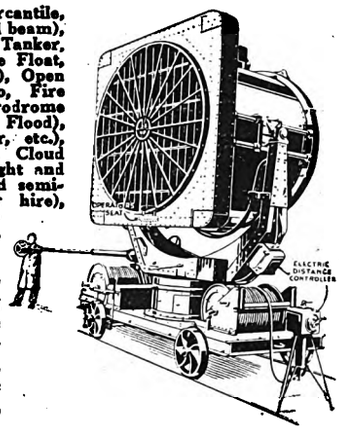

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Current Topics.

The kVA Charge in Two-Part Tariffs.

ALTHOUGH there is in some quarters a tendency to assume that the tariff question is rather overdone at the present time, we do not subscribe to that view, and as recent contributions in these columns have shown, we feel that the subject is even now of sufficient importance and interest to merit treatment from various points of view. In the not far distant future the question of charges for supplies from the "grid" will assume interesting shape for many power supply engineers. While it is impossible at present to visualise in detail the complexity of the charges that will eventually be devised, not only for stations taking a partial supply, but also for those taking the whole of their requirements from the "grid," it is obvious that the last word has not been said on the question of tariffs for this purpose. In anticipation of the "grid" methods of tariff framing a kVA charge is considered to be a probability, and, in view of this, particular interest attaches to Mr. E. V. CLARK'S article on a later page of this issue, in which special attention is devoted to the problem of charges for "grid" supplies. One of the objects of the article is to determine whether a tariff wherein the standing charges are based partly on kW peak and partly on the wattless component of that peak has possibilities of proving a satisfactory one in practice. Although the author makes a good case for the theoretical tariff which he has evolved, he frankly admits that it has practical defects, not the least of which is that where power factor at present is bad, it would offer such immediate inducement for power factor correction that it would encourage far more capital expenditure on plant for this purpose than permanent conditions would warrant. Mr. CLARK, however, thinks a compromise might be arrived at by means of a normal tariff with standing charges based on peak in kVA, to cover undertakings whose peak-load power factors fall within certain limits, coupled with rebates to those whose power factors fall outside this range. Some complexity would arise in metering on this system, but with large amounts of power involved, metering equipment costs would be practically negligible. Readers having helpful views to offer on Mr. CLARK'S thoughtful contribution are invited to communicate them through our correspondence columns.

The Humble Iron.

THERE are still in this country many power station engineers who persistently decline to interest themselves in developing the domestic load, some because they cannot see in it a sizeable load, others because they are afraid of its poor load factor. Those in the second category only need to be shown how their fears dissolve before a determined attempt to increase the period of use by pushing the sales of appropriate apparatus, in conjunction with suitable tariffs, but the first category is not so easily converted. "What," they ask, "is the use to us of a few electric irons, and things of that kind?" An investigation recently completed by the Statistical Research Department of the National Electric Light Association of America furnishes an instructive reply to this question, for the survey showed that, averaging the energy consumption of flat irons at 6 kWh per month, the domestic flat irons of the U.S.A. consumed in 1928 over one billion kWh. This was twice the quantity of electricity supplied by the electric light and power companies to all the electrified railways in the States. Compared with other domestic appliances the flat iron consumption was twice that of the domestic refrigerators, five times that of vacuum cleaners, and six times that of mains-operated radio sets. More interesting still is it to find that while the flat irons consumed 1 044 000 000 kWh, electric cookers used 31 500 000 kWh less, and that electric fires only consumed 52 000 000 kWh, against 153 900 000 kWh used for radio sets. Even in the States, where, in 19 077 000 homes there are approximately 14 500 000 electric irons in use, the future of the despised flat iron is full of promise, for these wired homes represent only two-thirds of the total number of houses, and the electric iron is only found in three-quarters of them. Thus, in 50% of American homes there is no electric iron.

An Electrical Exhibition.

THE question: Why do not we have an annual or biennial British Electrical Exhibition on a scale comparable with the Motor Show? is one that must often occur to many members of the industry. It has been put in these columns, and in those of more than one of our contemporaries, but so far these questionings do not appear to have disclosed any reasonable objection, and apathy alone seems to be the main obstruction. In course of time, perhaps, constant reiteration of the question may provoke serious consideration with a view to definite

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action. The latest attempt to discover why we have no Electrical Exhibition is made in Messrs. Henley's "Distribution of Electricity," which bases its request on dissatisfaction with the facilities at the British Industries Fair, and the growing interest in all things electrical. We agree as to the public interest, but we feel that our contemporary, in common with many people in the industry, does not view the B.I.F. in quite the right perspective. It was, we believe, designed as a purely trade fair to appeal to overseas customers. In recent years, however, the organisers have taken such elaborate steps to arrange visits by the various home associations, and have apparently done so little to encourage the attendance of foreign buyers that the comparatively widely held view that the Castle Bromwich B.I.F. is a home trade show is quite understandable. We maintain that as an exhibition for home trade purposes the B.I.F. is for many reasons unsuitable, and that while it is so regarded there will be little enthusiasm for a real British Electrical Exhibition in London. If, on the other hand, the purpose of the B.I.F. is definitely confined to the improvement of overseas trade—and success in this direction implies a change in date—there should be no difficulty in organising a big electrical exhibition appealing to the home trade and to the general public of Britain. The Faraday celebrations and other events planned to take place in 1931 mark that year as a great one in the electrical world. There is time now to organise an Electrical Exhibition for 1931—if anybody wants one.

Country House Fires.

SOME of the effects of the educational campaign undertaken nearly a year ago by the National Register of Electrical Installation Contractors are becoming visible in the daily Press, and a notable illustration of the effectiveness of this propaganda is seen in Press paragraphs commenting on the eighteen country house fires which have occurred this year. Instead of the bald statements about "fused electric wires," the papers when referring to a fire presumed to be of electrical origin are careful to point out that "in the early days of electricity there were no strict rules, and the wires in a country house were encased in wood or rubber, which rotted with age," or some such explanatory reference. The fire insurance companies, too, seem to be showing more interest in the wiring question. One company informed a newspaper man that they were now insisting on examining the wiring before they would insure a country house, and that they required from the wiring contractor concerned a certificate showing that the work had been properly carried out. With such a certificate they have no hesitation in insuring the house at an ordinary premium, and they "feel easier about a house with electric light where the wiring has been properly done than when there is gas." But where the installation is not up to standard an extra premium is required. References of this sort are of definite service to public and electrical installation engineers alike, and will do much to help in the eradication of faulty wiring.

Economic Rural Service.

THE problem of supplying electrical service to scattered rural districts is occupying considerable attention in this country, and farmers who see transmission lines passing near or over their property do not always realise that, despite its nearness, the cost of transformation prevents the supply authority from giving them a service. The American General Electric Co., however, claims to have overcome the obstacles by means of new and simplified apparatus, which, without sacrificing safety or reliability, lacks several of the expensive parts of the conventional sub-station. After a rural load has been developed with the new equipment, a larger station can be installed, or an existing distribution system extended to that district from a distant point, whereupon the original sub-station equipment can be used in developing another rural section. Instead of the usual oil circuit breaker, relays, current transformer and disconnecting switch, there is substituted a combined disconnecting switch, fusible cut-out and current-limiting resistor unit. This high-speed interrupting device protects the high voltage line against interruption resulting from faults in the step-down transformer, sub-station structure or distribution lines. The transformer is single-phase, oil-insulated, self-cooled, and of the outdoor type. It may be of 15, 25 or 50 kVA capacity. One end of the high-voltage winding is permanently grounded to the tank; the other end is brought out through an oil-filled bushing. The insulation throughout the new type of small-capacity high-voltage sub-station is so designed that its strength against lightning voltage is greater than that of the high-voltage line itself, thus protecting the station. The sub-station is designed for use on 66 000 V lines having an earthed neutral that is solidly and permanently earthed at every power source. It is so made that it will not affect the operation of the high voltage line because of transient over-voltages, overloads or short circuits.

A Pertinent Question.

IN our correspondence columns this week a correspondent asks the pertinent question, "Where are the 'electrics' of yesteryear?" Up to the time of the war increasingly large numbers of electric vehicles were being put into service and central station engineers in particular were buying "electrics" for departmental transport purposes. As we pointed out in a recent issue the Ministry of Transport's returns of new vehicles coming on to the road shows a remarkably small percentage of electric vehicles. There must surely be some important factor holding up progress in this field, and though we do not pretend to be able to diagnose the trouble, we think that time spent in finding answers to the questions of "Battery Electric" will not be spent unprofitably. A necessary preliminary to location of the obstacle or obstacles is to discover what has happened to the many electrics which have gone out of service in recent years, and why they have been discarded. We shall, therefore, be glad to hear from any of our readers, and particularly from power station engineers, who can give enlightenment on this matter.

The Glareless Light Campaign.

WE are glad to see that the slogan, "Glareless Light Preserves the Sight," is to be the basis of a vigorous campaign which will be conducted on national lines throughout the coming lighting season. The strides made in improving lighting efficiency during the past few years have been very encouraging, but there are still many installations which, though adequate so far as luminous intensity is concerned, cause visual discomfort due to glare. Those of us who are in intimate touch with the pulse of the lighting industry, know that in glare we have one of the greatest brakes on development, since it limits the intensities of artificial illumination which can be installed, and thus tends to paralyse progress. Anything, therefore, which can be done to combat glare will automatically widen our markets. The lamp manufacturers have already taken a decisive step in the direction of glareless light by offering special inducements to the purchase of "pearl" and "opal" type lamps, and the E.L.M.A. Lighting Service Bureaux are embarking on a campaign still further to popularise those types. During the autumn months, class periodicals throughout the country will contain informative articles dealing with electric lighting in general, supported by display advertisements, and stressing particularly the necessity of using pearl and opal lamps wherever possible, on the score of eyesight preservation. Trade journals will similarly boost the importance of glareless light, and stress the value of good lighting in commerce. Instructive and informative publications dealing with glareless lamps are in course of preparation, and will be available for distribution to the public by supply undertakings and retailers. During September and early October lecture-demonstrations will be held in different parts of the county to ensure that all sections of the electrical industry are conversant with the "Glareless Light Campaign."

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THE KVA CHARGE IN A.C. TWO-PART TARIFFS.

Part II.—Some of the Possibilities of a New Tariff Based Partly on the kW Peak and Partly on the Wattless Component of that Peak.

By EDWARD V. CLARK, B.Sc., M.Inst.C.E., A.M.I.E.E., M.I.E.Aust.

IN the first part of this article (THE ELECTRICIAN, August 2, 1929), it was deduced that, subject to a number of assumptions, of a kind largely inseparable from the logical establishment of any two-part tariff, the ideal standing charges attributable to a consumer on an a.c. system depend partly on his peak in kilowatts, and partly on the wattless component of that peak; and may be expressed by the formula $£P(Y + Z\cos\theta)/Dp + Q\,Z\sin\theta/Dq$, where P represents the consumer's peak load in kW, Q the lagging wattless component of that peak in kVA, θ the phase angle on the system at the time of its peak load, Dp and Dq the diversity factors of power load and wattless component respectively, $£Y$ the revenue necessary per kW of the station peak to meet the annual charges on that part of the power station whose capital cost may be deemed dependent on capacity in kilowatts, and $£Z$ the revenue necessary per kVA of that peak, to meet the annual charges on that part of the system whose capital cost may be deemed dependent on capacity in kVA.

It was further shown that the ratio of unit charges for wattless component and power component—that is, the ratio of $Z\sin\theta/Dq$ to $(Y+Z\cos\theta)/Dp$,—might be expected to have a range from say 0·2 to 0·8 in different circumstances, being largely influenced by the peak-load power factor of the supply authority. The graph Fig. 1, repeated herewith, shows how this ideal standing charge compares with that based directly on peak load in kVA for consumers of different power factors on systems having this ratio at various values from 0·2 to 0·8.

This theoretical principle being established, the object of the present section is to determine whether a tariff wherein the standing charges are based partly on kW peak and partly on the wattless component of that peak has possibilities of proving a satisfactory one in practice. As in Part I, running costs are entirely ignored, as being outside the scope of the article.

Metering Problems.

A form of tariff must be of limited application unless the requisite meters can be obtained in reliable form and at reasonable prices. The natural suggestion for metering on this tariff would be to instal one maximum demand indicator recording in kilowatts, and a second to record in wattless kVA. Both these instruments, with provision for ignoring overloads of short duration, are readily procurable. But though satisfactory where plain induction motors alone were installed, the use of two separate meters would fall short of requirements in many cases where appreciable phase correcting apparatus was in use. As seen from the formula or from the graph, a consumer taking leading current at the time of his peak load is entitled to a rebate in his standing charge; but evidently this rebate does not necessarily depend on the maximum reading of a wattless component indicator designed to record leading current, since with condenser correction this occurs at time of no load, as also it may with synchronous motors. With some kinds of corrected induction motor, the current taken is lagging at low load, but leading at high; so that even with a wattless demand indicator which recorded both maximum leading and maximum lagging component, there would be nothing to show what reading should be taken in levying the standing charge. It is evident, therefore, that for consumers such as these the two instruments should be combined so as to give a composite reading.

"Biased" Maximum Demand Indicator.

It was shown by the writer* that by adjusting the two elements of an ordinary three-phase watt hour meter so that one if operated alone on a single-phase circuit would run a certain percentage fast, and the other an equal percentage slow, the meter will record accurately on balanced load with sinusoidal wave the total units consumed, plus or minus any desired fraction of the wattless kVA-hours consumed; the relation being that if the elements run respectively x % fast and slow, then the meter records the kW-hours $\pm x/\sqrt{3}$ % of the wattless component, the sign depending on the connection of the instrument with respect to phase sequence, and also on whether the wattless component is lagging or leading.

* "J.I.E.E.", Vol. 64, June 1926.

Similarly, an indicating three-phase wattmeter appropriately biased will indicate at any moment the kW load plus or minus any desired percentage of the wattless component of the load; and hence, if designed as a maximum demand instrument, will give what is required. There is, therefore, no difficulty in providing a single indicating meter from whose reading the consumer's proper standing charges may be directly taken; though there would be this serious objection that any change

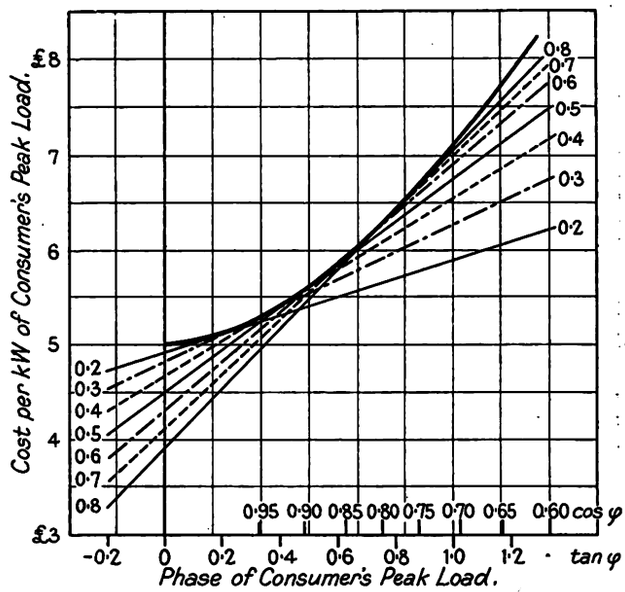

Fig. 1.—Standing Costs of A.C. supply: Comparison of kVA charge with standing costs attributable. Heavy curve represents charge per kW of peak load on a basis of £5 per kVA. Straight lines represent standing costs attributable with ratio cost per wattless kVA/cost per kW ranging from 0·2 to 0·8, each line being tangential to the kVA curve.

in the relative charges for power component and wattless component would neeessitate the readjustment of every meter.

Single-Phase M.D. Indicator for Three-Phase Supply.

If a three-phase maximum demand indicator of the above type is used, and the two elements adjusted to read 100% high and low respectively, then this will record the maximum demand in kW plus or minus 58% of the simultaneous demand in wattless kVA. But evidently, a meter element which is adjusted to be 100% low must at all times be inoperative, and thus may be omitted. Consequently, on a system where the conditions are such that the charge for wattless component should be about 58% of that for power component, a suitable instrument for recording consumers' standing charge is a single-phase maximum demand indicator, recording in kilowatts, connected the series coil in one main, the pressure coil thence to another main with due regard to phase sequence, and scaled to read 100% high. Thus comes the unexpected result, that various undertakings which now use a three-phase kVA maximum demand indicator as a basis on which to levy their standing charges, might use instead a suitably connected single-phase kW indicator, with a nearer approach to the ideal charge.

Practical Considerations.

However, it does not appear to the writer that the adoption of this basis for computing consumers' standing charges, whether by the biased three-phase or the single-phase indicator, is advisable in the case of any supply authority whose conditions are such that the kVA basis is a reasonably fair one for the normal consumer; since although the charges $(Y+Z\cos\theta)/Dp$ per kW of peak load and $Z\sin\theta/Dq$ per wattless kVA of that peak have been shown to be rational for different consumers upon the same system, their values expressed in terms of money only remain correct so long as θ, the peak-load phase angle on the station remains constant. Any improvement in the power factor of the system means an increase in $\cos\theta$, and a decrease in $\sin\theta$; and hence requires an increase in the tariff per kW and a decrease in that per wattless kVA.

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Now, with a tariff on this basis, the bonus for phase correction extends not only to unity power factor, but also to highly leading power factor; and wherever a tariff of this kind assessed the wattless component at half the cost of the power component or more, the financial benefit to the consumer of installing a large bank of condensers would be very great. Consequently, the adoption of a tariff of this type would certainly tend to such speedy improvement of power factor, that within a year or two at the outside, it would need revision.

A further point of considerable importance is this. The straight lines in Fig. 1 representing costs with various relationships of wattless kVA to kW charge were drawn tangential to the common kVA curve, and were not intended to have any direct relation to one another. Nevertheless, if we take an undertaking having a very poor peak-load power factor, and other conditions such that the 0·8 tariff line is appropriate; and then, other conditions remaining unchanged, imagine that the power factor steadily improves, so that the ratio of the charges becomes in turn 0·7, 0·6, etc., we find that the appropriate tariff lines are very close to those drawn on the figure.

Hence, any improvement in power factor beyond that on which the tariff in use was based would mean that those with good power factor no longer pay sufficient in standing charges, and those of poor power factor too much; and the improvement in power factor must mean that the former class preponderates.

It therefore follows that, even though new consumers keep the plant and mains fully loaded, any material improvement in power factor beyond that for which the tariff in use was based would require an immediate adjustment of tariff rates, or the financial returns of the undertaking might suffer a marked decline.

On the other hand, where an undertaking operates on a suitable tariff of the kVA basis, no improvement of power factor can be seriously detrimental to its finances, provided the normal growth of the undertaking suffices to keep the distribution system adequately loaded, despite the better power factor.

Nevertheless, in those cases where a tariff based on kVA is palpably unsuitable, a tariff of the type suggested, the standing charges metered either with separate kW and wattless kVA maximum demand indicators or with a biased indicator, might prove satisfactory. If using two meters, the wattless indicator should record lagging current only; and the method would be reasonably sound for all consumers who made no attempt at phase correction, or who corrected to some extent by means of condensers; though, as has already been pointed out, it would tend to overcharge those who corrected by types of apparatus which gave good power factor at full load, but not at low.

With use of the biased demand indicator, the consumer would receive a rebate if taking leading current at time of peak load; but the amount of rebate would hardly be sufficient to warrant an abnormally large bank of condensers, and the supply authority might protect itself by the stipulation that where leading current was habitually taken it reserved the right to add a kW indicator to the metering equipment, and charge upon that or the biased indicator, whichever were the higher.

Naturally, where the power factor of a system is already good, there is less prospect of its improvement than where it is poor; so that the ratio of charge per kW and per wattless kVA being once determined, there should be no risk of an early change being necessitated.

Bulk Supplies.

Where a large concern, in addition to its normal load, gives supplies in bulk to a number of small distributing authorities, a tariff on the kVA basis is only likely to be rational for such supplies if the peak-load power factors of the distributors are fairly high. Whatever the nature of the other load upon the bulk-supplier's system, the ratio of the ideal wattless kVA charge to that of power will be fairly low, since the capital charges of distribution will not be borne by the supplier. Consequently, if the purchasing authorities' power factors at their peaks have a range only from say 0·95 to 0·85, the kVA charge may hold the scales of justice fairly true; but any such authority who developed a large induction motor load, with consequent marked lowering of its peak-load power factor would be appreciably overcharged on the kVA basis; and again, any purchaser in bulk who converted to d.c., such as a railway or tramway undertaking, would have no inducement on a kVA tariff to operate at leading power factor. In cases like these, a biased maximum demand indicator and corresponding tariff might prove useful. However, in many cases, the conditions of bulk supply are better met by a tariff in which the standing charges are based on the peak load contracted for, rather than on the maximum demand, as they usually require a special transformer station, and frequently special mains; and then meters are needed chiefly as a check that the stipulated peak is not being greatly exceeded, and as a guide for determining when the time has arrived for its increase. For such checking purposes, if graphic instruments were not warranted, it would be well to instal meters recording both kW and total kVA peaks, since the contracted maximum load would doubtless be specified as at not less than a named power factor.

Supplies from the Grid.

The ultimate condition of supply in Great Britain when the Electricity Commissioners' "grid" extends through a great part of the country is hard to visualise. Tariffs to those undertakings which are encouraged to retain existing generating stations to assist in carrying their peak loads will undoubtedly be of a complex nature, if the most economic mutual assistance between base load stations and such auxiliary but less efficient stations is to be afforded; and it is useless to touch upon them here. But there will be a vast number of smaller undertakings which will draw the whole of their supplies from the "grid," and these may be expected to differ markedly in power factor, according as they are chiefly industrial or residential in nature.

Despite the great extent of the "grid" as planned, one may expect that the ratio of the ideal charge for wattless component to that for power will not be high, since there will undoubtedly be much capital spent on the steam ends of the main stations, in striving after high thermal efficiency; and it may be expected, too, that the peak-load power factor of the system will be kept up by alternators now coupled to steam turbines in non-selected stations being retained for use as synchronous condensers. It would seem therefore that a tariff with the standing charges based on peak load in kVA, as has apparently been suggested, will prove unduly harsh on undertakings whose peak load power factor is low.

It would appear that national economy, apart entirely from any academic striving after theoretical justice, will require that the cost of supplying low power factor energy from the "grid" should be determined with some degree of accuracy, and tariffs framed accordingly. For it may mean a very considerable waste of money to the nation, if each comparatively small distributing authority should find that on the tariff offering it pays to go to considerable expense in installing local plant for the improvement of power factor, when the national benefit derived from such phase improvement might be secured at much less cost by greater concentration of the requisite plant.

As pointed out in Part I of this article, kVA loads are to be added vectorially, and this fact is ignored in the kVA tariff. With increasing loads, owing to the diminishing unit cost of apparatus with size, and the lessening importance of wages, it becomes increasingly profitable to improve power factors, and for the same reasons it is more economical to overcorrect at some places and leave uncorrected at others than partially to correct at all.

Yet the kVA tariff markedly encourages partial correction, and discourages any attempt at correction to the neighbourhood of unity or beyond. This certainly is the most vital defect of the kVA charge in two-part tariffs, where large amounts of power are involved.

The "theoretical" tariff evolved in this article also has serious practical defects, chief of which undoubtedly is that where power factor at present is bad, it would offer such immediate inducement for power factor correction that it would encourage far more capital expenditure on plant for this purpose than permanent conditions would warrant.

A possible compromise might be a normal tariff with standing charges based on peak in kVA, to cover undertakings whose peak-load power factors fell within certain limits, coupled with rebates to those whose power factors fell outside this range. If, for example, those who correct their power factors considerably have the benefit of a rebate based on the line marked 0.2 on Fig. 1, they would have some inducement to correct up to the neighbourhood of unity or even beyond, if conditions were such that they could correct at little cost; while if those of low power factor who did not correct at all received a rebate based on the line marked 0.5, they would in many cases realise that correction for them was unjustifiable. A rebate, far more than the main tariff,

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may be regarded as a thing to be adjusted from time to time as circumstances may dictate; and no hardship would be entailed if it were stipulated that such rebates were liable to annual or periodic revision, in accordance with the conditions upon the Commissioners' lines, nor would there be any incongruity in having different rebates in different parts of the country.

Metering on this system would involve a little complexity; but with large amounts of power, cost of metering equipment is negligible. For all undertakings kVA and kW maximum demand indicators would be desirable; and where the power factor was low, the rebate might be calculated from the readings of these, though the provision of a wattless kVA indicator would give greater accuracy, and enable the standing charges inclusive of the rebate to be taken direct from the instruments. For those of high power factor, a biased indicator or its equivalent would be necessary, to enable the actual conditions of the peak load to be determined.

BOOK REVIEWS.

Electrical Engineering Problems. Part II. Alternating Current Circuits and Apparatus. By J. G. PERTSCH, JUNR. (London: McGraw-Hill Publishing Co.) Pp. 105. 7s. net.

Since this book—a companion to "Electrical Engineering Problems. Part I—Direct Current Circuits and Apparatus," by the same author—was written, Prof. Pertsch lost his life in saving the life of another while swimming in a lake.

Those who are familiar with Part I will recollect that the purpose of the work is to provide a classified series of concrete problems for the benefit of students wishing to practice their application. In order to stimulate interest, the problems have been designed to typify actual engineering practice wherever possible.

The problems are divided into chapters devoted to alternating voltage and current; effective value; sinusoidal voltages and currents; power in alternating-current circuits; inductance; inductive and capacity circuits; single-phase transmission line; alternator construction and polyphase electromotive forces; three-phase relations; power measurement in polyphase circuits; three-phase transmission line; alternator characteristics; the synchronous motor; power factor correction; transformer relations and connections; polyphase induction motor; induction motor startors and controllers; and alternating current projects.

L. C. W.

Theory and Design of Electrical Machines. By F. CREEDY. (London: Sir Isaac Pitman and Sons.) Pp. xvi + 349. 30s. net.

Mr. Creedy has a reputation for giving his readers something in advance of current thought and practice, and his latest effort is a notable example of foresightedness. Realising that the possible types of dynamo-electric machine are almost endless in number, he attempts in the present work to classify these possibilities in such a way as to indicate fresh lines of advance. To map out the necessary permanent lines of future advance before they are realised in practice would obviously save time and money which would otherwise be spent in developing apparatus lacking the fundamental advantages of other possible types. Such ordered progress has hitherto been considered impossible, but Mr. Creedy not only believes it to be possible, but proceeds to show how it can be carried out. In explaining his method he starts from the most abstract point of view, where the general machine is treated merely as a special case of Maxwell's general equations of the electromagnetic field. He then gradually introduces limitations, one after the other, with a critical explanation of the functions and necessity of each limitation of generality, thereby dividing the machine into different classes, which are then described in detail. He thus ensures that practically all possible types are described in principle, thus leaving only the permutations and combinations of individual parts to be developed as occasion requires.

By the author's principles of classification he divides the machines into six classes: (1) fundamental types without commutator or variable pole pitch; (2) commutator motors operating from fixed frequency generators; (3) machines operating from variable and multiple frequency generators; (4) cascade sets of various types; (5) multiple polarity machines (including cascade machines and machines with multiple polarity windings in general); and (6) variable polarity apparatus, in which the speed of a motor or the frequency of a generator is changed by changing the number of poles. As there are great gaps in our knowledge of classes 4, 5 and 6, a large part of the book is devoted to an attempt to fill them up.

The author contends that by developing, by theoretical criticism, a number of solutions to each problem in a form suitable for experimental trial, the development of electrical apparatus might be reduced to a scientific form instead of being left to the haphazard efforts of individual inventors. At first glance this attempt at rationalisation of design sounds impossibly idealistic, but sufficiently general methods of design are described in Part VI of the work to render it possible to carry out a critical comparison of the possibilities of different types in advance of experiment. While some special problems, such as the relation of the leakage coefficient to the different pole combinations in the internal cascade machine, remain, the author's methods of designing serve to throw their existence into relief, so that experimental research can be concentrated on them.

Mr. Creedy claims above and beyond these applications, that the main advantage of these methods of design is that they separate the use of engineering judgment from the necessity of numerical calculation so that this latter may be handed over to a calculating machine operator without engineering knowledge, and the whole of the drudgery of designing lifted from the engineer's shoulders. The book is one which cannot fail to provoke thought along new lines, and careful study of its pages is definitely to be recommended to all who are interested in the theory and design of electrical machines.

H. G.

Public Cleansing: Collection Treatment and Utilisation of Town Refuse. By THE "JAMES JACKSON" STUDY CIRCLE OF THE BIRMINGHAM CORPORATION SALVAGE DEPARTMENT. (London: Ernest Benn, Ltd.) Pp. xix+251. 18s. net.

Written by sixteen present or past members of the Birmingham Corporation Salvage Department, under the general supervision of Mr. James Jackson, the general manager, this volume is intended to fill the need for a complete text book for those sitting for the examinations of the Institute of Public Cleansing. Besides the legal and administrative aspects the practical side of the cleansing service is dealt with from all angles.

It is interesting to note in the chapter on methods of transport that, contrary to the generally accepted view, experience at Birmingham has not only proved that the horse cannot compete with mechanically propelled vehicles on the longer hauls, but also indicates that the superiority of the horse is challenged even on short hauls. Tests were carried out with two 2-ton electric vehicles specially designed for the purpose of contesting the previously accepted sphere of horse drawn wagons, and in addition to a lower loading line, the electrics possessed greater carrying capacity than the horse wagons. These electrics were put to work in areas previously cleared by horse-drawn wagons, and during the twelve months ended June, 1928, they proved superior to horse wagons on all counts. The test results showed:—reduction in total expenses, 8·43%; increase in weight collected, 3·29%; increase in visits made, 5·5%; reduction in men days worked, 14·38%. Needless to say these tests have led to the adoption of a policy of gradual replacement of the horse transport. Experience at Birmingham with a fleet of 86 electric vehicles has shown them to be extremely reliable, the percentage of running efficiency obtained being 93 in the year 1928.

There is a very concise section on the generation, distribution and utilisation of electricity for power and lighting purposes at refuse disposal works, and there is a practical chapter on electric vehicles. In the first part batteries of both the lead plate and Edison types are examined. Then follows a passage on charging methods, and the chapter ends with a short section on motors and controllers.

G. C.

BOOKS RECEIVED.

"The History of the Incandescent Lamp." By John W. Howell and Henry Schroeder. (New York: The Maqua Co.) Pp. 208.

"Maste und Türme in Stahl." By P. Sturzenegger. (Berlin: Wilhelm Ernst & Sohn). Pp. 219. 23 marks.

List of Members of the Institution of Civil Engineers. (Addresses corrected to July 1st, 1929.) (Westminster: The Institution.) Pp. 339.

Scientific Papers of the Institute of Physical and Chemical Research. No. 192. "Experimental Studies on Form and Structure of Sparks, Part VI." By T. Terada, U. Nakaya and R. Yamamoto. (Tokyo: Institute of Physical and Chemical Research.)

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LARGE WATER-COOLED TRANSFORMERS.

Some Unusual Features and Proportions in a 33 000 kVA 145 000 V Bank—Overcoming Transport Difficulties.

AMONG recent transformer shipments from the Metropolitan-Vickers works is a 33 000 kVA bank of water-cooled high voltage outdoor transformers for the Parahyba power station of the Brazilian Hydro-Electric Co., Ltd. These transformers, which are illustrated in the accompanying photographs, have a number of interesting features, especially with regard to the provision of water-cooling for such large units, and the unusual proportions of the units necessitated by the requirements of transport within the restricted loading gauge of the railway to the site.

The Parahyba power station is situated on the Parahyba River, about 100 miles north-east of Rio de Janeiro. The new transformers are to constitute the third three-phase bank, and will operate in conjunction with a third 33 000 kVA generator. The output of the three generators will be stepped up by the transformer banks and transmitted approximately 95 miles over three high tension circuits in parallel to the Cascadura sub-station, where the system is linked with lines from the Lages power station.

The transformers have been designed to operate in parallel with two existing 25 000 kVA banks supplied by the Westinghouse Co. The full winding ratio, with delta/star connection, is 6 600/145 000 V, and full capacity taps are provided on the high voltage side for 138 500 and 132 000 V, an externally operated off-load tap-changing switch being fitted to each transformer.

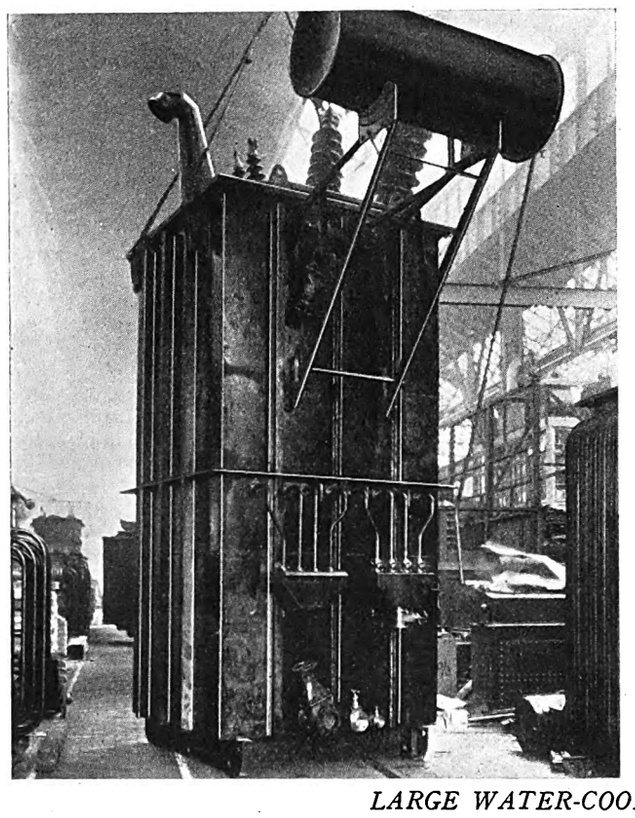
The bank is designed to operate with the high-voltage neutral ungrounded, and the windings were tested at a specified pressure of 304 600 V for one minute from the high voltage windings to the low voltage windings and earth. The high voltage bushings, which are of the condenser type, were tested at 440 kV dry, and 400 kV wet. The transformers were also subjected to a specified test consisting of a dead short circuit across the secondary terminals with the rated voltage maintained at the primary terminals for two seconds.

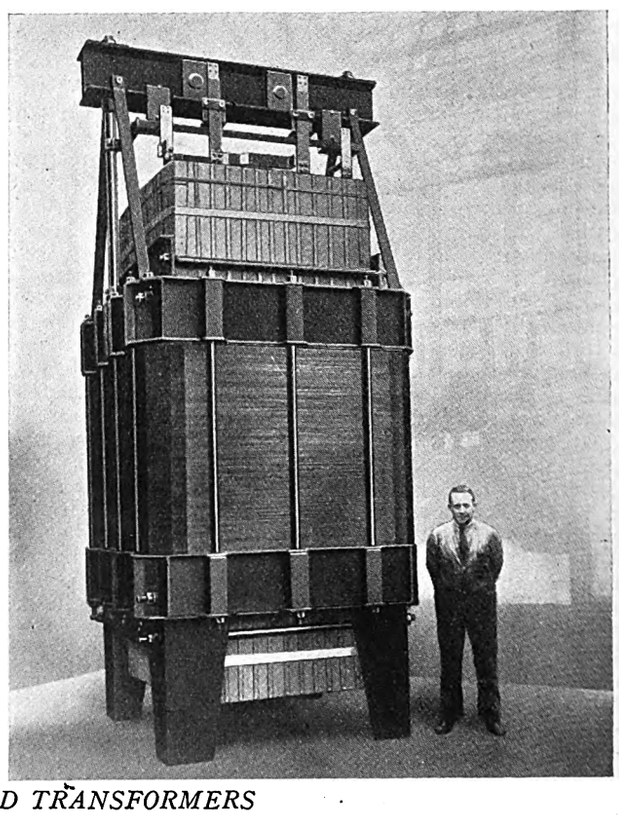
The water-cooling coil of seamless copper tubing, arranged in sections, is located inside the upper portion of the tank, and is so mounted that the transformer may be withdrawn from its tank without in any way disturbing the coil. A valve is fitted on the inlet side of each coil to regulate the flow of water, and a sight flow indicator is provided at the outlet of each coil. The flow indicators are of the bucket type, and are fitted with electrical alarm contacts so that warning is given in the event of the water supply falling below a predetermined limit. Both inlet and outlet ends of each section are arranged at the bottom so that the water may be completely drained out when necessary.

The temperature rise of the transformers at any voltage is not to exceed 55 deg. C. above the temperature of the cooling water when the supply of water is maintained at 36 U.S. gall. per min. Each transformer unit is fitted with two temperature indicators of the type in which the temperature of the hottest part of the winding is reproduced in an element, external to the winding itself, by means of a current which is proportional to the load current. In the case of one indicator of each unit, the heating current, supplied from a current transformer, flows through the metal bulb of a vapour-pressure thermometer. The bulb is mounted in the oil near the top of the tank, and is surrounded by a suitable insulating tube so that the drop in temperature between the bulb and the oil is the same as that between the main transformer windings and the oil.

The temperature of the bulb is shown in a dial indicator, calibrated in degrees Centigrade, mounted on the transformer tank. In the case of the other temperature indicator of each transformer, the heating current passes through a heating coil in which is embedded a copper resistance element, the temperature being measured by the change of resistance of the element, the latter being arranged for connection to the existing station equipment of Wheatstone-bridge type recorders, which are also calibrated in degrees Centigrade.

Owing to railway clearance restrictions in Brazil, it was necessary to limit the length and breadth of the transformer tanks, each unit being transported to site on its side. The floor space occupied is therefore relatively small and the transformers are abnormally high; the tank is approximately 8 ft. square, and the height from bottom of truck to top of high-voltage bushing is 24 ft. Each transformer, mounted in its tank, was conveyed from the Trafford Park works to the Liverpool Docks by road on a 60-ton rubber-tyred truck.





LARGE WATER-COOLED TRANSFORMERS

THESE views of some of the equipment described in the accompanying article depict (left) a single-phase unit in its tank, showing the water-cooling connections; and (right) one of the single-phase units for the 145 000 V bank.

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POPULATION AS AN INDEX TO ELECTRICAL DEVELOPMENT.*

A Practical Method for Forecasting Future Demand and Plant Requirements.

By N. B. HINSON, Mem., A.M.I.E.E.

IN making plans for the future in the electrical utility business it is necessary to make estimates of future growth. Various methods have been used. The usual method is to plot growth of one kind or another against time. This gives an upward curve which is difficult to project mathematically, and usually is misleading if projected ahead more than two or three years in a rapidly growing territory.

In the electrical utility field various values have been plotted against the number of consumers or meters. This is all right for past data but for the future the number of meters or consumers would have to be estimated, and this would depend upon the increase in population, especially if all the present population now had service.

This led to the use of population as the abscissa rather than time or consumers with any of the values desired as ordinates. This gives a straight line for practically all present values, and the future is a straight line projection with a simple formula. The lower end of the line does not usually cross both zero points, and this fact gives the changing values per unit of population.

The various values at the very beginning of the industry do not give the correct trend, as only a small number of people had service, but the business is now, and has been for the last ten or fifteen years, developing very uniformly and consistently, and these later values give the correct past trend.

Population for the past, at least up to the last census date for any city, town, or county, is easy to obtain, and in many locations accurate estimates up to 1928 are available.

However, when it comes to projecting these values for ten or fifteen years into the future quite a problem arises, particularly in rapidly growing territory such as is found in numerous locations in the United States.

Raymond Pearl in his book, " Studies in Human Biology," has developed a theory of population growth which gives a curve of population for various cities and countries that describes past growth with great precision and fidelity, and predicts future growth in a more satisfactory manner than the usual method of projecting ahead with the same percentage increase as the place under consideration has had for a number of years back. This type of curve Mr. Pearl calls the " Logistic " type curve, though it has come to be known in our territory as the " Fly Curve " from one of the experiments he performed

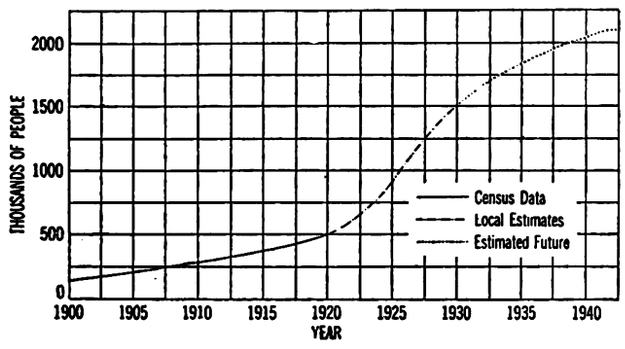

Fig. 1.

and describes in an article entitled the " Biology of Population Increase."

The population curves used for the territory which will be described were compiled from the census data for 1900, 1910, and 1920, and from estimated values of various Chambers of Commerce, local and state officials, statistical bureaux, etc. for the years 1921 to 1928. These curves were then projected ahead from the known data, the rate of growth, according to Mr. Pearl's conclusions, decreasing as the saturation point is approached. See Figs. 1 and 2.

The system on which these studies have been made is that of the Southern California Edison Co. serving in Central and Southern California. Southern California, in which most of the small towns and cities are located, is one of the fastest growing communities in America. More than 99% of all the houses in the territory covered have electric service, and this value has been more than 90% for ten years. Also the Southern California Edison Co. supplies 62% of the total kilowatt-hours direct to their own retail consumers, and 38% wholesale to other companies and cities for redistribution, and to the railways.

In considering gross revenue, kilowatt-hours generated, and kilowatt peak, the total population in the territory served

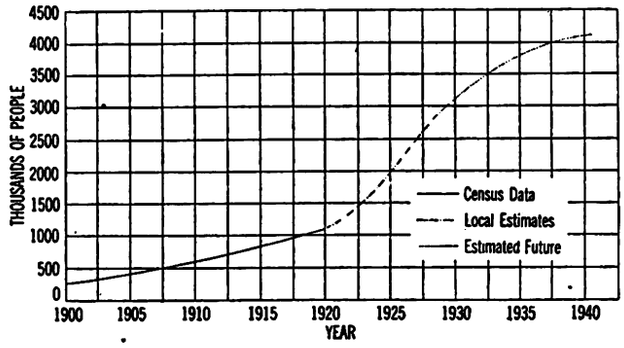

Fig. 2.

direct and indirect were used, and for horsepower connected, number of meters, and system betterment budget, the population served direct was used. These are illustrated in Figs. 3 and 4.

As will be seen, the population served is plotted uniformly, and the date at which so many people were in the territory, or it is estimated from the population curve will be in the territory, is set opposite that number of people. The values of kilowatt-hours or horsepower, or whatever is being plotted, are set opposite the year in which they occurred. These points lie in such a position that in all cases a straight line can be drawn through the group, and this line, projected ahead, gives values for the future.

Since the values for the future are dependent on population, which is an estimation, such future values for more than five years are liable to be in considerable error, but it supplies a means of getting values which can be calculated, and is much better than projecting curves which are changing their shape from year to year. Figs. 5 and 6 illustrate the same data plotted against time. This will illustrate the difference in the two methods.

Also, as additional data are available, such as the census for 1930, the population curve may change, but it is only necessary to move the date to its correct position on the various studies. In other words, the straight line values are such that they show the value when there is a given number of people, irrespective of the date on which it occurs.

The foregoing are all with regard to the system in general, and assist in forecasting so far as generation and transmission are concerned. A study was made of the load on small stations supplying cities and towns so as to be able to forecast the transformer capacity necessary in the future, particularly when new stations are contemplated, so as to instal transformers that will not have to be changed within a year or two.

These studies were started on a load density basis of kVA per square mile. These studies were made on ninety cities and towns in Southern California, ranging from 1 500 to 150 000 in population, the average being 10 000. The original study was made in 1925. This same study was made for the year 1928, using seventy cities which are incorporated, and on which it is possible to get a fairly accurate estimate at this time of population.

The maximum kVA demand for the year 1928 was used and the area in square miles of the developed territory, that is, the territory actually built up, including all vacant lots. This gave a value of kVA demand per square mile which varied from 270 to 2 700. There seemed no logical relation between areas, so the population for each city was taken and the cities grouped according to size, that is, average values

* Paper presented at Pacific Coast Convention of the A.I.E.E., Santa Monica, Calif., September 3rd-6th, 1929.

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POPULATION AS AN INDEX TO ELECTRICAL DEVELOPMENT.

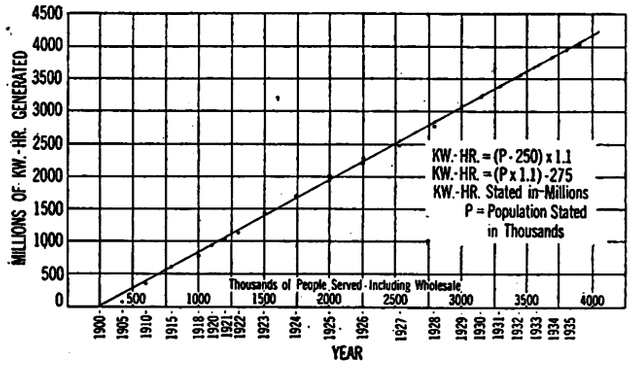

Fig. 3.

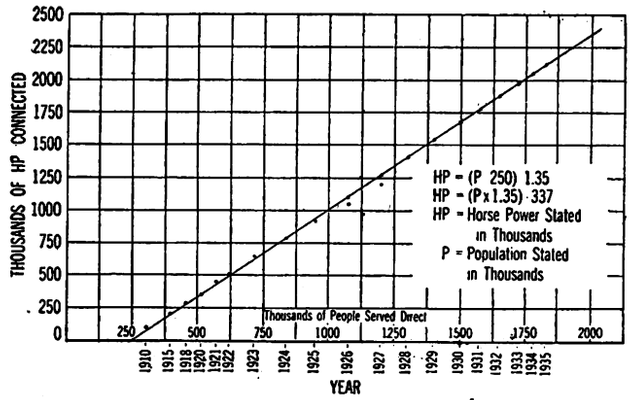

Fig. 4.

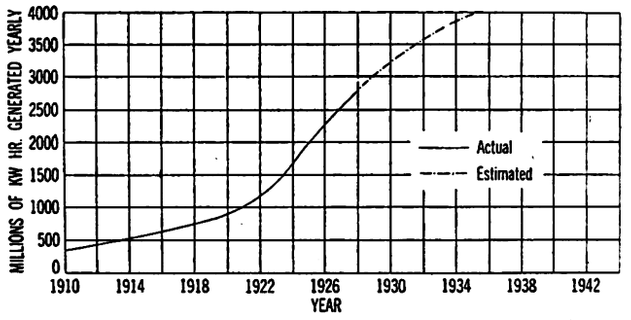

Fig. 5.

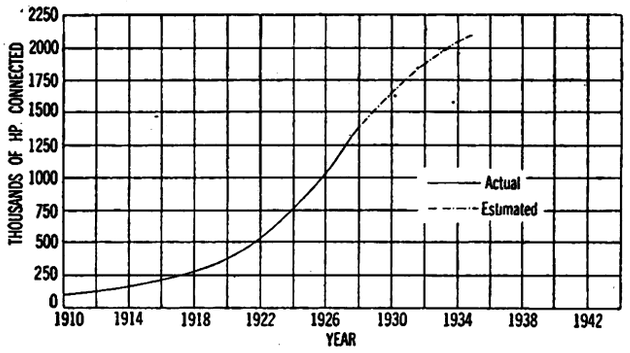

Fig. 6.

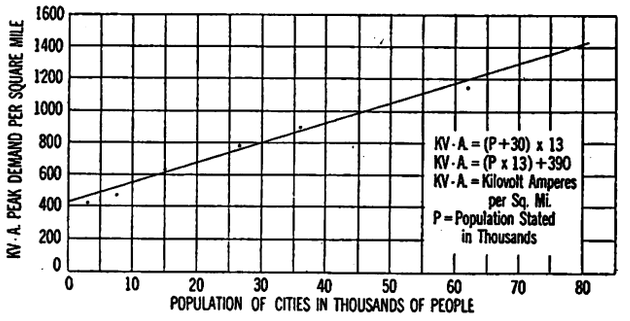

Fig. 7.

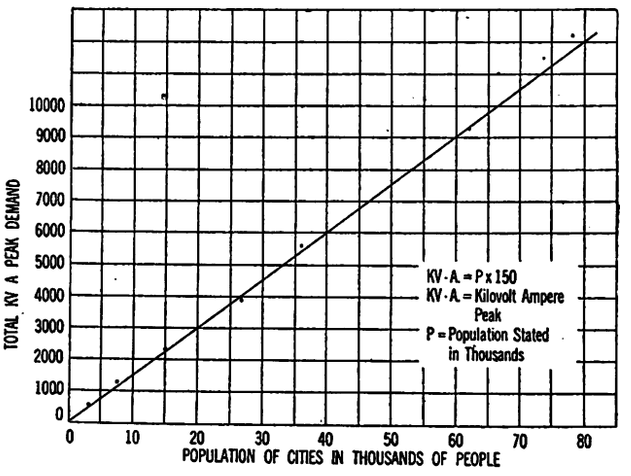

Fig. 8.

for all cities 1 000 to 5 000, 6 000 to 10 000, 11 000 to 21 000, 21 000 to 30 000, 31 000 to 40 000, and 41 000 to 150 000, the last group including only five cities.

The values of kVA per square mile for each group, plotted against the average population for each group, gave practically a straight line, as shown on Fig. 7. Spotting all seventy of the cities shows how close they follow the average. This gives a simple formula for kVA per square mile for various sized cities, and this time the developed area in square miles gives the peak demand. This has been applied to several cities for which the data are available for five or ten years in the past, and they check very satisfactorily.

These apply only to a unit city ; if two cities have combined and each had its own business district, the combined city will give values of kVA per square mile that are too high ; that is, a city of 25 000 people developed as a unit has a greater load density per square mile than two cities, each of 12 500, combined as one city. This system of future peak load projection has been used to set up the probable demand for all cities five years in the future. There has been some increase in the kVA demand per square mile during the last three years for any sized city, so that it will be necessary to check these data again after the 1930 census. However, it gives a fairly accurate check on the probable future demands.

Fig. 8 shows the peak demand of the various cities plotted against the population. This value has been increasing yearly due to the increased use *per capita* of electric energy ; it was 110 kVA per 1 000 people in 1920, 125 in 1925, and 150 in 1928. For the smaller cities the peak demand is higher due to less diversity of load. This is also seen in the kVA per square mile being lower for the smaller cities, as the development is not as uniform as the larger cities.

For making forecasts for the future no hard and fast rules will apply, and all these means are used to check, from as many angles as possible, the future value. The regular daily and monthly peak load readings on each station which have been kept for a number of years can be projected ahead as a check on future loads. The distribution system is divided into thirty-two districts with an average of 13 000 customers, the minimum being 3 000 and the maximum 50 000. Each of these districts has separate records, and is set up similar to a small company. Any data that check up satisfactorily

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for all the districts may be used for such a distribution system.

From these data yearly average values of people per meter, per distribution transformer, per distribution transformer kVA rating, per pole, per mile of line, per sub-station, kVA capacity, per sub-station peak kVA, per kWh per year consumed, can be determined. These values change from year to year, but only slightly, and these changes can be determined.

These data would not be the same in various parts of the country, as the saturation is different and the character of the territory is different. Such values worked out for a particular territory enable fairly accurate estimates to be made of many of the factors entering into its electric utility business. In a territory in which practically every house has electrical service and has had for a period of approximately ten years, the various factors are perhaps more nearly related to the number of people in the city or territory.

This system of using population as a means of determining values of electrical development has been of great assistance in a rapidly growing territory, and has enabled the mathematical determination of values in the future which otherwise would be pure guesswork.

ELECTRICAL PROGRESS IN ONTARIO.

Increase of Rural Supply Facilities in the Province.

IN submitting the 21st annual report of the Ontario Hydro-Electric Commission to the Lieutenant-Governor of the Province, Mr. C. A. Magrath, chairman of the Commission says the endeavour of that body is not the concentration of industry at a few larger power sites, but rather to make as widespread a distribution of electrical energy as is economically possible. At the date of the report, October 31st, 1928, the Commission had 4 103·54 miles of rural line in operation, 956·47 miles of which were added during the preceding twelve months. The number of consumers supplied was 31 063, 12 994 of which were farms, while the number added during the year was 5 918. Arrangements are in hand for the construction of 850 miles of additional line. This development has been greatly stimulated by propaganda work, by financial assistance and by improvements, which have enabled a service to be given when three farms or their equivalent can be connected per mile of line. The growth of the total load was encouraging, though a reduction was experienced in the Thunder Bay area, owing to the shutting down of a number of large mills. The total energy generated in the twenty-two stations of the Commission was 4 104 537 584 kWh, an increase of 200 000 000 kWh, while, in addition, 236 961 050 kWh was purchased, an increase of 35 000 000 kWh. It is stated that all the stations were at times heavily loaded, the output of the Queenston station increasing by 1 000 000kWh and that of the Ontario power plant at Niagara by 23 000 000 kWh. This was rendered possible by the system of dispatching adopted, which enabled the load to be distributed, so as to secure the maximum output from the water available. Favourable water conditions played a part in the achievement of the increased output, since for the first time in recent years the stream flow was higher than normal.

THURY TRANSMISSION.

Proposed Revival of System for Hydro-electric Network in Egypt.

ACCORDING to a report in "The Electrical World," the Thury system of direct-current transmission at high tension, examples of which are to be found in France and Switzerland, is being considered in connection with the plan for transmitting hydro-electric energy from the Assouan dam in Egypt, over a distance of 570 miles.

The reason for considering d.c. transmission is that 300 000 V can be employed as the operating difference of potential, and yet the insulation need not exceed that required for 150 000 V to earth, since the middle point will be earthed.

Although nearly all of the original Thury installations are still operating, no new direct-current transmission lines have been installed for twenty years or more, three-phase, alternating current having been accepted as standard. Within recent years, Brown, Boveri of Baden, Switzerland, proposed a direct current high-tension transmission line for transmitting hydro-electric energy from Norway to Denmark, but so far nothing has come of the proposal.

SYDNEY POWER SCHEME.

Mr. Forbes Mackay to See Latest British Power Station Practice.

MR. H. R. Forbes Mackay, general manager of the Sydney (N.S.W.) Electricity Department, will, THE ELECTRICIAN learns, shortly pay a visit to Great Britain, the Continent, and probably the U.S.A.

The object of Mr. Mackay's visit is to acquire information to be used in designing the third section of the Sydney power station at Bunnerong. The first section of Bunnerong, comprising six 25 000 kW turbo-alternators, eighteen 100 000 to 120 000 lb. per hour boilers, step-up transformers and a large installation of 30 000 V switchgear, will be entirely completed before the end of the present year.

The first units of the plant have been in commercial operation since January last. In July last the station was generating at the rate of five million units per week.

To provide for the growth in demand, it has been decided to add one 25 000 kW turbo-alternator to the plant to come into commercial operation early in 1932; this turbine will draw its steam from the existing boiler house plant.

By the winter of 1933 further additions must be made to the generating plant. The shape proposed for these additions is two 50 000 kW turbo-alternators, the first to be completed in 1933, and the second in 1934, with the necessary boiler house plant, step-up transformers, e.h.t. switchgear, etc.

It is in order to ensure that the specifications covering this plant may be up to date that Mr. Mackay is undertaking his visit.

Sydney Electricity Department has grown rapidly in the last few years. The department supplies no electricity for traction, as the Government Railway Department has its own generating stations supplying the suburban railways and tramways. Nevertheless, the department sold in the year 1928 300 million kWh, and will sell in 1929 approximately 350 million kWh. It supplies electricity direct to over 170 000 separate consumers, besides giving bulk supplies to eight municipal and shire councils which have connected to their supply mains an aggregate of 17 100 separate consumers.

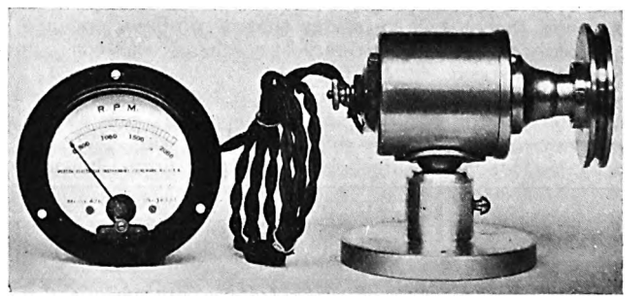
We understand that Mr, Mackay will arrive in London about October 21st, and that he may sail for America eight weeks later. His address, while in England, will be c/o Messrs. Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1.

SPEED INDICATION.

Greater Accuracy Claimed for Electrical Type Instrument.

THE accompanying illustration shows an electrical speed indicator, a recent production of Messrs. F. A. Wilkinson and Partners, Ltd., of Hatfield, Herts.

It comprises a small dynamo that generates a voltage directly proportional to its speed, connected to an indicating



A new electrical speed indicator.

instrument by means of a cable. It is claimed that the electrical type of speed indicator is more lastingly accurate than mechanical and other types.

The indicating instrument is of the dead-beat type made by the Weston Electrical Instrument Co., Ltd., and is calibrated in revolutions per minute which can be read at any moment without the aid of a stop watch.

The generator is driven by means of a round belt, or direct-connected to the device whose speed is to be measured.

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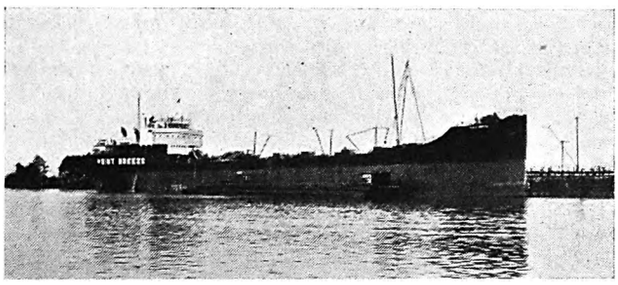
MARINE ELECTRICITY.

Sixty Electric Ships Now in the Register Book—Turbo versus Diesel Electricity—Many New Orders and Contracts—Application of Electricity to Harbour Craft—An Electrical Ship of 180 000 S.H.P.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ships Types," etc.).

ATTENTION was called in these notes recently to the extraordinarily rigid schedule of cruising to be undertaken during the summer months by the new P. and O. electric liner "Viceroy of India." She made in all no fewer than five cruises, totalling 22 800 miles, and only spent 24 hours in port after each cruise. She is reported by the P. and O. Co. to have completed this work without a hitch, and to have manœuvred throughout like a tug.



A big electrically-propelled tanker with a 2 550 h.p. electric propulsion motor. Two ships of this type have recently been ordered from a British shipyard.

On the completion of her cruise programme she arrived at Tilbury on August 23rd, and left for Bombay on the 30th. Thus after five cruises she had only six clear days in port for any adjustments which might be necessary to the whole of her repair plant. The indent for repairs and cleaning, I am informed, over a total running mileage of 37 000 miles in five months from her completion, consisted only of repairs to a few electrical instruments, the renewal of several broken thermometers, and the cleaning of boilers; which, it may be safely said, certainly constitutes a record for a new ship with an entirely new type of propelling machinery. This vessel has also been reported as consuming very little stores, and her consumption of lubricating oil is also light, amounting to only between 1½–2 gallons per day.

Electric Liners for Britain.

It is a well-known fact in shipping circles that the performance of this vessel during her cruise, and during her first voyage on the Bombay mail line, has been watched very jealously by many ship companies, and while in America, as might be expected, there has been, since the last article of this series was written, a very gratifying increase in the number of electric ships ordered and laid down, it is much more important to note that in this country it seems almost certain that orders will be given for two or three large electric passenger liners within the very near future. As is usual in such matters, rumour has been busy, and if such rumours are to be regarded with even a modicum of suspicion, then it is impossible to pass over the one which states that a company engaged in South American trade is to build two electric passenger liners of 25 knots speed.

It is indeed of extreme importance, because from a power, and from a propulsion point of view, the new ships will represent a considerable difference from the "Viceroy of India." This latter ship is built to steam normally at about 16 knots, and actually she is able to make about 16·5 knots, with one alternator developing about 11 600 H.P., and her two main shafts turning at just over 90 revolutions. At full speed she is able to make just over 18 knots, but, even taking this into consideration, there is a considerable jump between an 18-knot ship and a 25-knot ship in the way of power requirements, and should the rumour materialise into a definite order, then we shall have something which will be of tremendous importance to the electrical industry.

Two New Electric Tankers.

Additional interest is also given to electric propulsion in this country by the recent order of the Atlantic Refining Co. for two further electric tankers, which will be very similar to the "Brunswick" completed last year by Scotts, of Greenock, for the Atlantic Refining Co. While not of the largest type, these tankers are nevertheless definitely ocean-going ships, and will once more afford British shipowners an opportunity of examining the merits of the Diesel-electric system of propulsion. The electrical side of the order is being carried out by the British Thomson-Houston Co., of Rugby, which so far has had the greatest marine experience of any company in this country, on the propulsion side. This company then, has on order at the present time, not only the turbo-electric propulsion equipment for three ships, but also the propulsion equipment for the two Diesel-electric tankers mentioned above. In addition, new turbo-generating machinery is being built for a fruit carrier now under conversion at Belfast. A further important branch of the B.T.H. Co.'s activities is the order which they have for six equipments in which the exhaust steam from reciprocating engines is used in low pressure turbines driving generators which supply electrical power to motors on the propeller shaft, and also to further generators supplying current for electric light, heating, cooking, and other auxiliary services. The additional power thus made available for propulsion purposes, it is claimed, can be used either to increase the speed of the vessel, or to maintain the existing speed at greater economy.

All this activity surely justifies the feeling that marine electricity is now coming into its own as a definite industry, and that the electric ship is steadily occupying a position of increasing importance.

The latest edition of Lloyd's Register Book, in fact, lists some 60 all-electric ships, with a total tonnage of 259 467 tons, and when it is considered that ten years ago the electric ship scarcely existed outside the minds of a few enthusiasts (in this country at any rate) and that even the use of electricity for the many shipboard purposes to which it is now applied was relatively small, we can see, not only how important marine electricity is at the moment, but also how far it is likely to go in the near future.

Electric Ship Developments.

No longer can electric propulsion be considered entirely an American idea. Developments, it is true, are proceeding apace in that country, but this is only to be expected, because, as I have frequently pointed out, of the power and activities of the two large electrical groups in the United States of America.

Be that as it may, America is giving us some extraordinarily

RECENT ELECTRIC SHIPS BUILT, ORDERED AND COMPLETED.

Ship.	Type or Duty.	Size or Tons.	Power.	Speed.	Type of Drive.
"La Marea"	Fruit ship ..	325·2 × 48·1 × 28·3 ft.	Conversion from Diesel-electric to turbo-electric with lengthening of about 30 ft.		
"——"*	Australian Coast	220 × 36 × 16 ft.	1 300 S.H.P.	11 Kts.	Diesel-electric with horizontal Diesels for generator drive.
"——"†	Firefloat	130 × 26 × 7·5 ft. (draft)	—	10 Kts.	Diesel-electric
"Georges de Jollie" ..	Bouyage ship ..	165 × 31·25 × 10·75 ft.	—	8 Kts.	Diesel-electric
"——"	Dredger	295 × 25·61 × **	2 500 kW	10 Kts.	Diesel-electric
"——"*	Liner	—	—	25 Kts.	Turbo-electric
"——"	Tankers (2) ..	8 900 tons	2 800 S.H.P.	11 Kts.	Diesel-electric
"——"	Floating crane ..	(30 tons) 116·8 × 66·8 × 8·25 ft.	700 H.P.	7 Kts.	Diesel-electric
"——"	Tanker	(2 350 tons) 255 × 44 × 18·5	1 000 H.P.	10½ Kts.	Diesel-electric

* Signifies proposed ship. † Signifies new ship ordered and laid down.

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interesting, and almost classic electric ships. Where, for example, can you find a more economical and efficient vessel than the United States Coast Guard cutter of "Chalen" class, discussed in these notes last month? Where, too, can you find a better example to the naval architect of the way in which the marine engineer can give him just the right number of propeller revolutions to suit his propeller, his stern, and his rudder, than the arrangement of Diesel-electric propulsion adopted on the three United States Shipping Board conversions—"Courageous," 'Defiance" and "Triumph"? Some fast vessels have just been laid down for the American Ward line operating between New York and Havana, and it is understood that these will have a speed of 20 knots with about 16 000 shaft horse power.

As a designer of coastwise vessels America is well to the fore, and it may be assumed that the new ships, to which reference has just been made, will be quite high grade examples of new architecture.

Large and Small Electric Ships.

A further point may be noted in the development of electric propulsion, and that is that so far there has been very little rivalry between the respective merits of turbo-generators and Diesel-generators. It is gratifying that concentration should have been made rather on the development of propulsion than that, as a house divided against itself, the technique of electric propulsion should have been weakened by dissension between the two methods of propagating current. It would seem, indeed, that matters are settling down to a realisation that for powers of the passenger liner type the turbo-generator has a great many advantages, while for smaller vessels from, say, tankers downwards, the economy and flexibility of the Diesel engine for driving generators is becoming generally recognised, while, when we get down to small craft like tugs and ferries, the Diesel engine is practically without a rival. In the first place it can be of high speed, and therefore of light weight type. Also it can be of non-reversing type, which means that there is no need for large manœuvring air compressors and air storage bottles. In this country we still have to see a Diesel-electric tug ordered, but it is fairly certain that such will be the case before long. In Europe, generally, small Diesel-electric ships of harbour auxiliary type are definitely on the increase, and among such ships may be mentioned a 1 300 H.P. buoy and harbour duty vessel 165 ft. in length, built for the Port of Brest. This vessel has two main electric sets, each set being driven by a six-cylinder Diesel engine. Then, too, another French port has recently taken delivery of some electrically propelled and operated floating cranes, which are much cheaper to operate, and much more flexible than a corresponding steam crane.

Returning to large passenger liners, it is unquestionably plain that turbo-electricity here has much to offer, because of the fact that while in a general way two turbo-generators are fitted for normal cruising speeds, one only of them needs to be in constant use, thus cutting down the wear and tear on the machinery.

On the other hand, of course, it might be assumed that a system where the total electrical power could be split up into a large number of small units, is much better, not only for economy, but also for speed. On this latter point, of course, the Diesel-electric arrangement scores, in addition to the fact that in the largest of ships this lower fuel consumption may make a very considerable difference in the bunker space required.

Diesel Manufacturers' Activities.

Although as yet no large Diesel-electric passenger liner has been laid down, in spite of repeated rumours that the new White Star mammoth is to be a Diesel electric unit, it may be placed on record that Diesel engine building firms have not been inactive as far as the preparation of layouts are concerned. I have already commented in these notes on one layout for 100 000 H.P. Diesel-electric drive. It is interesting to note that the German M.A.N. Co. has now produced a layout for a liner of as much as 180 000 S.H.P., driven by electric motors in which there are only 16 generator sets, each driven by a 10-cylinder double-acting two-cycle engine of about 11 500 H.P.

So that, whichever way we look at the problem, or whichever way our inclinations lead us, as far as the generation of electricity is concerned, it would appear that a great deal of thought is being given to the question, and that a great deal of development work is going on.

(To be continued.)

SHIP EQUIPMENT.

Alterations and Additions to I.E.E. Electrical Regulations.

A NUMBER of alterations and additions to the second edition of the I.E.E. Regulations for the Electrical Equipment of Ships have been approved by the Council of the Institution of Electrical Engineers, and have been issued in pamphlet form.

Comparison of the old and new regulations is facilitated in the pamphlet by printing the new wording in italics.

An addition to the clause on standard pressures recognises as standard pressures 12, 50, and 110 V, d.c., on tugs, trawlers, small yachts, fishing and similar small vessels.

Switchboards are to be constructed wholly of durable, non-ignitable non-absorbent materials, and if insulating wax be used for the base, it shall be of permanently high dielectric strength and insulator resistance, and shall comply with the requirements of a specification set out in an appendix.

With regard to fusible cut-outs, the fuse shall be of such a size that it would be melted in one minute or less (two minutes or less in the case of a lead-tin alloy fuse) by a current equal to twice the rating of the smallest cable protected by it, provided that no fuse smaller than one rated to blow at 7A need be inserted in any final sub-circuit and that, for the purposes of this regulation, the current-carrying capacity on flexible cord or cable shall be considered to be equal to that of a rubber-insulated cable of equal cross-section.

Proportioning of Conductors.

An amendment to the rule relating to the proportioning of conductors allows a maximum pressure drop of 1V plus 1% of the busbar pressure for wireless mains when carrying the main and battery loads simultaneously.

Tough rubber-sheathed cable with or without braiding over the sheathing, and lead covered with or without braiding over the lead are added to the types of permitted cables. Although the use of cables insulated with varnished cambric is not recommended conditions are set out under which their use is allowed. If it is desired to use types of cables insulated otherwise than specified, sample lengths shall first be submitted for approval by the I.E.E., each sample being accompanied by a report from a recognised testing authority that the requirements of the I.E.E. as to behaviour, prospects and life of the insulating materials employed have been complied with.

Requirements for lead covered cables now provide that the sheath shall be either of commercially pure lead or of such lead alloy as shall from time to time be considered satisfactory by the I.E.E. The use of lead alloy is strongly recommended, particularly when the sheath of a cable is unprotected by an outer braiding or armouring, and the composition of suitable alloys is indicated.

With regard to the installation of cables, ventilating outlets shall be provided, preferably at their highest and lowest points, to allow circulation of air and to ensure that no water can lodge in any part of the conduit. All open ends of conduits shall be bushed, to avoid abrasion of the cable covering, and all openings shall be protected against the direct access of salt water. Cables in machinery spaces or where unavoidably exposed to the weather or to the action of sea water, shall either be lead covered with or without further protection, or be run in conduit.

In cold storage chambers cables shall be supported by clips made of porcelain, hard wood, or other non-metallic and non-hygroscopic material. Every lead-covered cable whether armoured or not, and every armoured cable, shall have its lead covering and/or armouring efficiently earthed at both ends, except in the case of such cables forming final sub-circuits, which shall be earthed at the supply end only. Effectual means shall be taken to ensure that all metallic envelopes of cables are made electrically continuous throughout their length. All earthing connections shall be effected by means of soldered joints or clamps, or alternatively by glands specially designed for the purpose of forming part of joint boxes or similar fittings in which cables terminate.

Carbon or metal filament vacuum lamps of 32 c.p. with bayonet socket caps are to be used in navigation lamps.

The rule providing that all connections within a battery room shall be either of bare metal or lead-covered cables, now applies solely to an acid battery room.

Motors essential to the safety of the ship in the event of damage shall be so installed as to be capable of running for a reasonable period after the compartment in which they are situated has been flooded.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Where *is* that Battery?"

[To the Editor.]

Sir,—Friend "Battery Electric" cannot see the wood for trees. He actually complains that motor cars now generally use batteries, and in consequence the battery trade flourishes.

To this extent he has apparently got his heart's desire, since it is a fact that the operation of every starter battery converts each car so equipped into a partial electric.

The judgment of the buying public on motor cars as a whole is sound. It wants the maximum possible amount of transport (i.e. useful ton-miles) out of a specific machine in a given period and at a reasonable expenditure of trouble and cash. This means the maximum safe speed and twenty-four hours' running, when desired, and while these factors may not be so important in some classes of transport as in others, I assert that they are essential and fundamental in all classes.

Certainly better and cheaper batteries would enlarge the scope of pure battery electric applications, but even as matters stand there is enormous scope for increasing the battery equipment of "stink wagons." In commercial applications, I venture to assert that a mixture of internal combustion engine with battery propulsion will ultimately supersede all other types and will cut out the "stink" just as completely as the electric crawler when used in towns.

Why not come down to earth and get busy?—I am, etc.,

August 24th. "Cynicus."

"Concrete Pole Designs and Costs."

[To the Editor.]

Sir,—It is interesting to note from Mr. W. T. Taylor's letter published in your issue of August 30th that Mr. Taylor is prepared to build a line of poles at his estimated figures. But even so, it is not an unheard of event for a contractor to lose on a contract, and until the work has actually been done and the costs verified, Mr. Taylor should be more cautious in his clalms.

Mr. Taylor also fails to deal with my point that it is possible to use wood for any span which could be dealt with by ferro-concrete. A wood pole long span line is now being erected in Mid-Cheshire. I maintain, therefore, that the pole cost is the proper basis for comparison, and not a short span wood pole line compared with a long span steel or ferro-concrete line.

I hold no brief for wood, steel or ferro-concrete, but I do know that of all the methods of construction ferro-concrete is the least adaptable to local conditions, and the most doubtful as to its cost basis and construction details. I repeat my advice to your readers—namely, that they should be very cautious when accepting a statement made in advance of even experimental construction.—I am, etc.,

W. Fennell,
General Manager and Engineer,
Mid-Cheshire Electricity Supply Co., Ltd.

"Where are the 'Electrics' of Yesteryear?"

[To the Editor.]

Sir,—Your editorial note in The Electrician dated August 9th calls attention to the return by the Ministry of Transport of licensed motor vehicles in this country, and it remarks upon these in respect of the small numbers of "electrics" as "a reproach and a challenge."

Can the Ministry of Transport state how many battery vehicles have gone out of service during the past 10 years, and give reasons other than the cheapening of the first cost of the petrol vehicle?

In other words, "Where are the electrics of yesteryear?" For there certainly have been plenty more in service than there are to-day. What is the reason for their disappearance? Traffic conditions have not changed in ten years to discount the undoubted superiority of "the electric in its field." The electric motor and controller have, if anything, improved rather than otherwise, and they certainly cannot be worn out in ten years of the class of duty to which the comparatively slow moving "electric" is daily subjected. Much the same applies to tyres, chassis, springs, etc. The trouble, therefore, must be sought in the battery.

Assuming that to be the case, the natural question arises—seeing there are two types of battery—nickel-iron-alkaline and lead-acid—whether one or both of these can be brought under the reproach of which you speak? Has the lead battery, despite the service attention it receives from its makers, completely disgusted the electric vehicle users with its incipient defects of short life, excessive weight, internal weakness, sulphation, and messy acids? Are not the lead battery makers, well knowing that the lead-acid cell is meant for stationary service, now sorry that they rushed into the traction field at all? Or has the steel-acid battery failed to justify the claims of its sponsors for long life, light weight, robust construction and guarantee of maintenance of capacity?

If the Ministry of Transport cannot tell us "where are the electrics of yesteryear," will the vehicle manufacturers state the reasons for the absence of renewal orders?

I repeat that the case for the "electric in its field" has not in any way changed, despite the enormous growth of the commercial and industrial petrol driven machine during the past ten years.—I am, etc.,

August 31st. "Battery Electric."

"The 'Circle' Movement."

[To the Editor.]

Sir,—As one of those who originated the idea of the Electric Circle movement, I am particularly interested in the editorial on this subject in your last issue.

The fundamental idea of the E.D.A. Circles is that wherever a statutory authority exists a Circle should be formed whereby all local people interested in the development of electricity throughout that area may get together, with a view to working together, rather than confusing the public by adopting competitive policies.

Whereas there are still some 640 supply authorities in this country, only 100 E.D.A. Circles exist to-day, and, as stated in your article, some of these are somewhat inactive.

I am of the opinion that the best way to initiate additional Circles throughout the country is for the manager of each supply authority to inaugurate a meeting advocating the formation of a Circle, and I think it would be very helpful if your correspondence columns were opened to a candid expression of opinion from those who have experience in the working of the E.D.A. Circles, and as to why Circles have not yet been formed in so many areas.—I am, etc.,

C. W. Sully,
Director, The Electric Lamp Manufacturers' Association of Great Britain, Ltd.

[Space in this column will be gladly afforded for expressions of opinion on the points raised by Mr. Sully.—Ed.]

[To the Editor.]

Sir,—The note on this matter in your last issue was written under a misapprehension, as the programme of this year's E.D.A. Campaign had not reached you.

This Campaign is to deal specially with the question of adequate wiring in the home, and will be known as "The E.D.A. Electric Home Campaign," while within the industry the word "Outlet" will be added to the title to show that we are following up the work which has been done by the Electrical Association for Women.

The programme of this Campaign will be circulated generally on the 10th inst.; it has been designed for operation in conjunction with E.D.A. Area Committees and Circles, and those Committees and Circles who have considered the programme have in all cases expressed their unqualified approval, and the desire to co-operate to the fullest extent possible in making this a success.

A very definite effort is to be made this year to increase the number of E.D.A. Circles with a view to operating this Campaign, and generally to increase the development work carried on by the electrical industry.

A number of E.D.A. Circles are not only in existence, but are doing excellent work for the development of electricity in their areas, and the maximum of success is being obtained where the supply undertaking, manufacturers and the contractors are working together with the greatest harmony.—I am, etc.,

W. A. Vignoles,
Director and Secretary, The British Electrical Development Association.

A MOTOR QUERY.

If the writer of the letter containing questions as to the running of electric motors, and signed "Puzzled, Manchester," will send us his name and address the points he raised will be answered.—Ed.

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NEWS IN BRIEF.

Special Illumination for Sea-Fronts—Western Student's Section of the I.E.E.—Transatlantic Telephone Cables—Electric Heating at Rotherham—Liverpool's Fire Alarms.

ACCESS to the top of a new type gasholder to be built for the York Gas Co., will be by means of an electric hoist.

An electric clock, with a hand-painted dial, which was made for the basilica at the British Empire Exhibition, has been placed in Wembley Parish Church.

Rhyl Electricity Committee is drawing up a scheme of electric illuminations for the end of September and the beginning of October. The whole of the sea-front is to be lighted.

As a result of rearrangement by the Italian Administration of their telephone zones, the charges for a call from London to Turin are now 10s. 9d. (day), and 6s. 6d. (night).

It is announced that the automatic telephone system is to be installed at Cardiff at a cost of £500 000, and it is hoped later to extend the automatic system to other districts in South Wales.

The Transatlantic telephone service has been extended in Canada to Moose Jaw and Saskatoon, in the Province of Saskatchewan. The charges are the same as those to other places in the 4th Canadian zone.

The new Metropolitan automatic telephone exchange in Wood Street, Cheapside, London, E.C., was inaugurated on August 31st. Within the space of five minutes 3 300 subscribers were transferred from the manual to the dial system.

The Post Office is extending telephone facilities throughout the West Highlands. A rural automatic exchange was opened recently at Onich, and last week a similar exchange was brought into operation at Corpach. Automatic exchanges are to be opened shortly at Ballachulish and Kinlochleven.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated September 6th, 1879 :—*

The desirability of installing electric light in lighthouses was being discussed.

The India Rubber, Gutta Percha and Telegraph Works Co.'s c.s. "Dacia" left Greenhithe to lay a submarine cable between Marseilles and Algiers. Mr. Robert K. Gray was in charge of the expedition.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *dated September 9th, 1904, stated that :*

A 10 000 line automdtic telephone exchange was at work in Chicago.

Huddersfield Corporation was experimenting in the haulage of coal on its tramways system.

* * *

FIFTEEN years ago it was stated in THE ELECTRICIAN *dated September 4th, 1914, that :*

The Board of Trade received authority to suspend patents held in this country by enemy subjects.

Nearly 10% of the total number of employees of the G.E.C. had joined the colours.

* * *

TEN years ago, THE ELECTRICIAN *for September 5th, 1919, reported that :*

Increased coal costs were responsible for many increases in charges for electrical energy.

The c.s. "Colonia" had completed the laying of a new submarine cable from Ascension, via St. Vincent and Fayal, to Rio de Janeiro.

The salary of the engineer-in-chief of the Post Office was only £1 000, rising by increments of £50 to £1 200. This scale had been operative from 1887.

With the opening, on August 30th, of the two hundredth street fire alarm box, Liverpool's system of signals at strategic points on important roads is now complete. The boxes are fitted with telephones as well as fire alarms, but in most cases the former are only available for use by the police.

The inaugural meeting of the next session of the North Western Students' Section of the Institution of Electrical Engineers will take the form of a visit to the River Dee hydro-electric station at Chester, on Saturday, September 7th, and a subsequent trip by motor launch to Ecclestone Ferry. Further particulars from Mr. D. B. Williamson, Metropolitan-Vickers Electrical Co., Trafford Park, Manchester.

The Minister of Transport has approved a scheme of improvements to be made by the Great Western Railway Co., equal in cost to the capitalised value of the railway passenger duty. The scheme, which is estimated to cost about £900 000, includes the substitution of electric for gas lighting in the remainder of the passenger train corridor coaches and some of the non-corridor coaches which at present have gas lighting.

The autumn meeting of the Iron and Steel Institute will take place in the Festival Hall of the North-East Coast Exhibition, Newcastle-on-Tyne, on September 10th to 12th, inclusive. Amongst the papers to be read and discussed is one by Messrs. E. Diepschlag and F. Wulfestieg on "Electrical Conductivity of Magnesite and Some other Refractory Materials in relation to the Temperature and their Other Properties." Additional meetings will be held at Scunthorpe on September 17th and at Birmingham on September 26th. Further particulars from the Secretary, 28, Victoria Street, London, S.W.1.

X-ray apparatus, to cost about £500, is to be installed at Monaghan County Hospital.

Watlington (Oxfordshire) P.C. has called a public meeting on September 10th, to decide whether the street lamps shall be lighted electrically.

Morecambe's autumn illuminations were switched on last week by the Mayor. Ten thousand multi-coloured electric lamps are being used in this decorative lighting, which comprises some artistic designs and which will be continued for a month.

It is stated that the committee appointed about two years ago to consider the subject of automatic control on railways will shortly issue its report.

The data of telephone development of the five largest telephone-using countries at the end of 1928 are given in the current issue of the "Telegraph and Telephone Journal." The numbers of telephones in use were: United States, 19 341 000; Germany, 2 950 430; Great Britain, 1 759 686; Canada, 1 341 219; France, 965 519. The number of telephone stations working in this country at the end of May was 1 775 870, an increase during the month of 13 246.

The prospectus of the Wimbledon Technical Institute for the 1929–1930 session (which begins on September 23rd) contains information regarding fees, and conditions of entry, a list of the teaching staff, a calendar of classes, particulars as to the days and times of classes in specified subjects, etc. There are electrical engineering (National certificate), electrical installation, special subjects (extra-electrician's certificate) and Post Office employees' (telephony) courses, as well as other engineering sections.

It has been decided to instal equipment for electric heating throughout the large technical college building now in course of erection at Rotherham. It is stated that this will be the largest building in the country heated by electricity alone.

The Tyne Improvement Commission has almost completed arrangements for establishing direct telephonic communication with vessels using its docks and staiths on the river. Direct telephone wires are to be laid from the North Shields telephone exchange to each of the five Whitehill Point staiths and the two coaling berths at the Albert Edward Dock.

The prospectus of University Courses in the Municipal College of Technology, Manchester, for the 1929–1930 session consists of 325 pages, and contains information regarding the conditions of admission of students, fees, examinations, scholarships and prizes, summaries of courses, syllabuses of classes, various associations connected with the College, etc.

The first transatlantic telephone cable, connecting London and New York by land and deep-sea lines, is now in course of active preparation, and, as reported in our last issue, the American Telegraph and Telephone Co. has completed the purchase of land in the West of Ireland for the site of the Irish terminal station. The difficulty of excessive diffusion of the signals has been overcome by the use of a new series of alloys as loading material and a new substance known as "paragutta" for insulating the conductor. It is also stated that the British Post Office has started conversations about a new Atlantic cable and is experimenting in the Atlantic with short lengths of cable designed for telegraph and telephone purposes.

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PERSONAL.

MR. L. G. Griffiths has been appointed sales manager to Ultra Electric, Ltd.

Sir Hugo and Lady Hirst have left Aix-les-Bains and are travelling on the Continent. They are expected to return to London at the week end.

Mr. B. W. J. Bryan-Rennell, the London manager for Clarith Reproducers, Ltd., will as a result of a serious operation be absent from business for two or three weeks.

The late Mr. W. S. Toplis, whose association with the electrification of the Burma Oilfields was referred to last week.

Mr. H. P. Stokes, engineer and manager of Plymouth Corporation tramways, has resigned, and has accepted an appointment with the British United Automobile Services, Ltd.

Mr. Thomas A. Edison has been confined to his house, suffering from pneumonia, but a bulletin issued on Monday stated that he was out of danger, and in a convalescent stage.

After his recent serious illness, Sir Max Muspratt, a director of the Automatic Telephone Manufacturing Co., Ltd., was again able to preside over the meeting of the Finance Committee of Liverpool Corporation last week.

The marriage was solemnised at the Parish Church, Harringworth, on August 10th, of Mr. W. Collinson, electrical engineer, of Wandsworth, London, and Miss Francis Rudkin, of Harringworth.

Sir Walter Raine, president of the Association of British Chambers of Commerce, has been appointed a member of the Grand Council in Great Britain of the Empire Trade Exhibition at Buenos Aires in 1931.

The salary of Mr. Wm. Marsh, manager and engineer of the Brighton tramways, has been increased to £1 000, rising by annual increments of £50 to £1 100, and that of Mr. F. N. Hudson, deputy engineer and manager, to £525.

Ald. H. J. Galliers, the well-known Sussex electrical installation engineer, who is this year Mayor of Brighton, is playing an active part in a campaign to stop the reckless driving of cars on the London-Brighton road at week-ends.

Messrs. Owen Young, Gerard Swope, Clarke Mirior, Arthur Baldwin and J. Edmonds, have been elected directors of the Allgemeine Elektricitäts Gesellschaft, of Berlin. Mr. Young is chairman of the General Electric Co. of New York.

Sir Austen Chamberlain and Sir Laming Worthington-Evans have accepted invitations to join the board of the Greater London and Counties Trust, Ltd., which controls a number of electricity undertakings in the South of England.

Mr. J. B. Hood, who has been for some time engaged in the South Shields electricity department, has been appointed electrical engineer to Richmond (Yorks) Corporation, in succession to Mr. W. L. Wickwar, who has secured an appointment at Bingley.

Mr. I. F. Baker was recently appointed European sales manager of the Westinghouse Electric International Co., and will have his headquarters at 2, Norfolk Street, Strand, London. Until his recent appointment, his position was power division sales manager of the Westinghouse International Co., with offices in New York. Previous to this, he was acting in the capacity of managing director of the Westinghouse Electric Co. of Japan.

Mr. J. H. Whitehead, for several years lecturer in engineering science at Bacup and Rawtenstall Technical School, is taking up the duties of lecturer in electrical engineering at the Constantine Technical College, Middlesbrough. For six years he has been a transformer engineer with Messrs. Ferranti, Ltd., Hollinwood, and has been a part time demonstrator and instructor at Manchester College of Technology.

Lieut.-Col. Norman H. Firmin is leaving Newcastle to take up an appointment with the Central Electricity Board. We understand that he will be chiefly engaged upon wayleave work. Lieut.-Col. Firmin joined the staff of the Newcastle-upon-Tyne Electric Supply Co. 24 years ago, and during the last ten years has been personal assistant to Mr. R. P. Sloan, chairman and managing director. Four years ago he assumed the command of the Tyne Electrical Engineers (T.A.).

W.R.A. MEETING.

Appointment of New Chairman—Exhibition Arrangements.

AT a meeting of the Council of the Wireless Retailers' Association on August 28th, with Mr. Betambeau in the chair, a full agenda was discussed.

Mr. Betambeau reported the result of conversations he had instituted with Mr. Edgar Houghton, of the Radio Wholesalers' Federation, and Mr. J. T. Mould, chairman of the Radio Manufacturers' Association. He had tried to arrange a meeting with a view to co-operation between the three Associations, and it was almost certain that a meeting would be fixed at an early date. Mr. Betambeau mentioned that he had had an informal meeting with Mr. Mould, who had expressed himself as being in agreement with many of the W.R.A.'s objects. Mr. Betambeau again emphasised the importance of the growing membership of the W.R.A., which, he said, must be such as to compel action by the R.M.A.

Mr. Clifford mentioned a suggestion received from Mr. G. S. Wright, of Bradford, to the effect that, at the forthcoming informal meeting, arrangements should be pressed forward for the calling of a formal meeting during the National Radio Exhibition.

During the meeting, Mr. Betambeau was nominated as chairman and this proposal was seconded by Mr. Willard.

Mr. Gilbert said he was authorised by the Bucks Branch of the Association to propose Mr. Chidsey as chairman, and failing him, Mr. S. L. Wright. Upon Mr. Chidsey declining the offer, his nomination was withdrawn and Mr. Wright was proposed, seconded by Mr. Burnett. Nominations were then put to the meeting, and Mr. Betambeau was elected chairman, with Mr. Wright as vice-chairman.

Arrangements were made regarding the attendance of members at the stand which the Association intended to occupy at the National Radio Exhibition. The Council then formally accepted the application of the following new members, who had already been accepted by the Committees of the branches concerned—Bucks., ten members; Birmingham, four; and North London, twelve new members. These were accepted as members as from the date of their application. Formal approval was also given to the new Southampton Branch formed by six existing members in that area. The secretary also reported that a successful meeting had been held in Liverpool and that formal application has been received for the promotion of a branch.

Following Mr. Hornsey's resignation from the Election Committee, Mr. Betambeau was elected in his place.

The chairman then reported that application for membership had been received from certain bodies, mentioning specifically the Regent Street Polytechnic and St. Dunstan's. Both these, he pointed out, were granted preferential terms by radio manufacturers, and since these concerns did not buy for re-sale and were both established for worthy objects, he felt that a special class of membership might be created for them. The proposal was opposed—principally by Messrs. Gilbert and Turner—and it was suggested that it would antagonise other traders and would also tend to legalise what was really an illegal position. The case of multiple shops as members was then discussed, and Mr. Gilbert reported that his branch had endeavoured to enrol Curry's, Ltd. This firm had six shops in his area, and, in the absence of a Council ruling, he had offered them membership on the basis of £1 1s. for the first shop, and 10s. 6d. each for the others. As the firm had in all 200 shops all over the country, he suggested that the Secretaries invite the firm to become members at an inclusive subscription of £5 5s. From correspondence he had received he had reason to believe that such an offer would be accepted. On learning that the Secretaries had also written two letters to Curry's, the Council decided to let the matter stand over until the next meeting.

An investigation is being made in Japan to decide whether it is advisable to transfer the present Government ownership of telephone business to private enterprise. There are at present 591 800 subscribers, 2 450 exchange stations, 4 552 telephone stations and 1 800 public telephones, and a capital approaching a billion yen is needed for the transfer of the entire business. Government business is criticised to be dilatory in every direction, and the transfer to private enterprise would, it is claimed, create effectiveness and promptness in installation and service.

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BUSINESS ITEMS.

MR. F. E. TAYLOR is closing down his radio business at 121, Etnam Street, Leominster.

The EPOCH RADIO MANUFACTURING CO., LTD., has removed to 3, Farringdon Avenue, London, E.C.4.

PHILIPS' LAMPS, LTD., have opened a new depot for the sale of lamps and fittings at 62, Union Street, Plymouth.

Mr. A. PILLING has removed his radio business from 27, Normandy Street, Bolton, to 177, St. Helen's Road.

The London telephone number of the SUN ELECTRICAL CO., LTD., on and after September 9th, will be: Temple Bar 3 500 (10 lines).

The telephone number of the MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, London, W.C.2, has been changed to Temple Bar 4321.

The telephone number of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has been changed from Regent 7050 to Temple Bar 8000 (70 lines).

Mr. M. R. CARLISLE has been appointed Midland agent for FERRANTI, LTD., in succession to Mr. H. S. Cooke, who has resigned. Mr. Carlisle will reside in Birmingham.

Mr. C. T. CLAPHAM, who recently took over the radio business of Mr. A. R. Aske at 53a, Hunslet Road, Leeds, has opened additional premises at 35, Church Street, Balm Road.

It is reported that the Russian Government has placed an order amounting to nearly £200 000 with SIEMENS-SCHUCKERTWERKE for equipment for the Schterovka electricity works.

Mr. W. NEWTON, electrical engineer, late of Bourbon Street and Ardenham Street, Aylesbury, has transferred his business to more commodious premises at 8, Silver Street, Aylesbury.

The registered office of the WESSEX ELECTRICITY Co. has been changed from 14, Waterloo Place, London, S.W.1, to Broad Sanctuary Chambers, 11, Tothill Street, Westminster, S.W.1.

The telephone number of Messrs. HIGGINS AND GRIFFITHS, LTD., electrical and general engineers, 21, Orchard Street, Portman Square, London, W.1, is now: Welbeck 1651 (3 lines).

Mr. James Porter Brown has retired from the firm of MARTIN AND BROWN, wireless and electrical engineers, 48, Chapel Street, Hamilton, and the business will be continued by his partner, Mr. David Hope Martin.

PERTRIX, LTD., have extended the territory covered by their agent Mr. R. C. Wood, and he is now their sole wholesale distributor in South Wales and in part of Monmouthshire. His address is 34, Windsor Place, Cardiff.

Messrs. WRIGHT BROS., who trade as the Radio Maintenance Service, have removed from 16, Wood Green Road, Birmingham, and are carrying on their business at 87, Winson Green Road and 393, Dudley Road, Birmingham. Communications to the latter address.

With reference to the notice which appeared in our last issue relative to the address of the new branch of T. BEADLE AND CO., LTD., at Nottingham, we are asked to point out that this should have read 34, Heathcoat Street, and not Heathcote, as stated.

An interesting conversion contract from gas to electricity has just been carried out in the Mossley Town Hall. Mr. S. J. HOWARD, of Mossley, executed the wiring contract, and the WHOLESALE FITTINGS Co., of Manchester, converted the existing chandeliers.

The GENERAL ELECTRIC CO., LTD., "Magnet" House, Kingsway, W.C.2, is exhibiting on Stand 21, at the Bakers' Exhibition, a double deck ½-sack electric drawplate oven. As at the two previous exhibitions, bread baking will be continuously carried out by the Aerated Bread Co., Ltd., and the bread baked will be utilised in the grill room and buffets during the period of the exhibition.

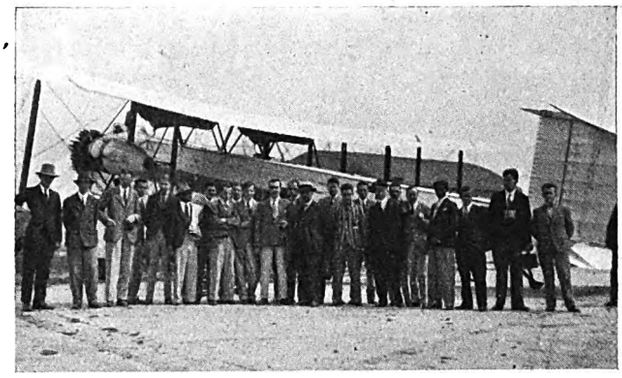
With reference to the notice which appeared in our last issue regarding the Kennington motor coach station, Philips' Lamps, Ltd,, regret that the owners of the station were incorrectly described by them as Southern Coastal Services, Ltd. The correct owners are COACH TRAVELS, LTD., under the directorship of Messrs. R. Toms and T. Boon, whilst the station goes by the name of The London Terminal Coach Station.

The GENERAL ELECTRIC CO., LTD., is engaging in a publicity campaign with new "Gecophone" products. The campaign has been subdivided into four distinct groups, i.e., a.c. mains sets, battery operated sets, loud speakers, and h.t. power units and components, and the national advertising will embrace each of them in separate channels. These advertisements will appear in daily and weekly newspapers. Sales should be greatly assisted, too, as a result of the distribution of the booklets and folders which have been prepared.

I.E.E. STUDENTS.

Tour Includes Visits to Electrical Systems in Northern France.

A PARTY of 26 students of the Institution of Electrical Engineers left London on August 3rd to spend 10 days in visiting places of electrical interest in Paris and Northern France. The week-end was spent at Malo Terminus, and on the Sunday the party went to Ostend and visited the battlefields around Nieuport.



The I.E.E. London students at Le Bourget aerodrome on the occasion of their tour in Northern France.

Monday and Tuesday, August 5th and 6th, were spent in visiting the systems laid out by the Société Bethunoise for the electrification of the rural areas around Calais and Dunkirk. After visiting the port installations at Dunkirk and a substation in the town, the party saw a 100 000 V stepdown station of the Société Electrique du Nord-Ouest and the Diesel engine generating station at Coudekerque-Branche. From here the party visited Cassel, saw a stepdown station at Hazlebrouck and proceeded to Bethune. The next day a visit was paid to the pulveriser plant at Gorsnay and the headquarters of the company at Châteaux Labuissière, returning to Bethune.

From Bethune the party proceeded to Rheims, where visits were made to the high tension laboratories of Verreries Charbonneaux, Ltd., and the cellars of Messrs. Heidsieck, where the party sampled the local products. From Rheims a trip was made to the battlefields around Berry au Bac.

Proceeding to Paris, the party visited the power station of the Electricité de la Seine Corporation at Ivry Port, on Thursday, August 8th. On Friday they were shown over the factory of the Electro Mecanique Co. at Le Bourget, and on the same day a visit was paid to the aerodrome.

Next day the party was entertained by the International Standards Electric Corporation. The research laboratories and the experimental radio station at Versailles were visited in the morning, and the afternoon was spent in visiting the factory of the associated company, Le Materiel Telephonique.

Visits were also made to the Eiffel Tower radio station, where telegraphy and telephone plant of both ancient and modern design were inspected; and to the repair shops of the Paris-Orleans Railway at Vitry. Here the visitors saw electric locomotives in every stage of déshabille.

The party returned to London on Tuesday, August 13th, after a most interesting and enjoyable tour. The success of the tour was largely due to the hospitality shown by all the firms concerned, and the trouble taken to make the visits interesting and enjoyable.

ELECTRIC PROPULSION.

Considerable publicity has been given to the successful results obtained by the P. & O. twin-screw turbo-electric liner "Viceroy of India," and it is interesting to note that the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, which manufactured the propulsion equipment, has on order at the present time not only turbo-electric propulsion equipments for three other ships, but also propulsion equipments for two Diesel-electric oil tankers. The latter equipments are similar to that which the company manufactured for the Atlantic Refining Co.'s oil tanker "Brunswick," the largest Diesel-electric ship so far built in this country. The B.T.H. Co. has also on order six equipments for older vessels in which the exhaust steam from reciprocating engines is used in turbines driving generators which supply power to motors on the propeller shafts, and generators for lighting, heating, cooking, &c.

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"EVER-READY" WEEK.

THE success of the "Ever-Ready Selling Week" last year has ensured a similar scheme in the sales programme of the Ever-Ready Co. (Great Britain), Ltd., for the coming season. The selling week has been fixed for October 7th-12th, as this

Illustrating the special material which has been prepared in connection with "Ever-Ready" week.

follows the change to official Winter Time, when the public begin to feel the necessity of a good torch and replacement batteries for their portable lamps and wireless sets. Window displays are a feature of the week, and the company is allocating £800 for prizes which will be distributed to the most worthy displays in the four areas as follows:—Southern Counties, London and Eastern Counties, Midland Counties and Wales, and Northern Counties, Scotland and Ireland. To each area will be allotted—(*a*) windows having a frontage of over 7 ft. and (*b*) windows of a smaller frontage—a first (£50), second (£25), and five consolation prizes (£5) in each class. Retailers only will be eligible for prizes.

Window displays must be devoted exclusively to "Ever-Ready" manufactures. The managing director of the Ever-Ready Company will be the sole judge in awarding the prizes, and it will be necessary for competitors to send a photograph of their display not later than Wednesday, October 9th, to enable the judge to visit the displays that are selected as being likely prize-winners through examination of the photographs.

During the week an "Ever-Ready" man will distribute sixty £3 notes (15 in each area) to purchasers of "Ever-Ready" goods throughout the country, and the week will be widely advertised throughout the country. A large quantity of display material is available, and this may be arranged according to personal tastes and requirements.

AMERICAN DIESEL ENGINE MANUFACTURERS' ASSOCIATION.

REALISING the need for closer contact with each other and with the problems of the user, a group of the leading manufacturers of Diesel engines in the United States have formed the Diesel Engine Manufacturers' Association, with offices at 30, Church Street, New York, N.Y. Twelve of the leading builders, representing practically the entire output of Diesel engines in the United States, are responsible for the organisation. The association states as its primary object the advancement of Diesel power in America and a broad programme of co-operation with users of this power.

The following manufacturers are members of the association: New London Ship and Engine Works, Electric Boat Co., Worthington Pump and Machinery Corporation, Fulton Iron Works, Ingersoll-Rand Co., Fairbanks-Morse and Co., Nordberg Manufacturing Co., I. P. Morris and De La Vergne, Inc., Winton Engine Co., Cooper-Bessemer Corporation, McIntosh and Seymour Corporation, Busch-Sulzer Brothers Diesel Engine Co., Hooven, Owens, Rentschler Co.

The president of the association is Mr. Henry R. Sutphen, president of the Electric Boat Co. Mr. E. T. Fishwick, vice-president of the Worthington Pump and Machinery Corporation, is vice-president of the association, and Mr. Harlan A. Pratt, manager oil and gas engine department, Ingersoll-Rand Co,, is secretary-treasurer. The association also employs Mr. M. J. Reed as research engineer.

ELECTRIC TRACTION.

Purchase of Scarborough Tramway Undertaking—The Dublin Strike.

THE Town Clerk has reported to Scarborough T.C. in Committee the result of an interview with Mr. A. E. Hoare in London with reference to the proposed purchase of the Scarborough tramway undertaking. It was decided to inform Mr. Hoare that the difference between the price suggested and that which the Committee was prepared to recommend the Council to pay was such as to make further negotiations at this stage of no useful purpose.

As soon as a new agreement between Metropolitan Electric Tramways, Ltd., and Middlesex County Council is reached, the company will proceed with the gradual replacement of the old cars by cars of a modern and improved type. The new cars, which have been designed and are being built by the Union Construction Co., of Feltham, are low built, only one step having to be ascended before entering the car. The fittings are chromium plated, the floors are covered in cork carpet, and each car is illuminated by fifty electric lamps. There is a lobby providing standing room for short distance passengers. The equipment comprises four 35 H.P. motors, magnetic track brakes and emergency hand brakes.

The Court of Inquiry set up by the Irish Free State Government to inquire into and report upon the strike of the Dublin United Tramways Co.'s employees commenced its sittings on Monday. In a recent letter, the Ministry of Industry and Commerce expressed the view that the company, by its refusal to restore the tram services pending the conclusion of the inquiry, has acted with complete disregard of the public interest. Mr. G. M. Harris, manager of the company, in reply, says the Board is surprised that its decision should be called "a complete disregard of the public convenience," and suggests that "if that remark had been applied to those who, without reservation, declined arbitration, even though it would bring about an immediate resumption of services, it would have been more appropriate." Mr. Harris also says the Court of Inquiry still appears to the company to be insufficient justification for indefinite reversion to excessive expense which the company's financial position does not warrant.

LEGAL INTELLIGENCE.

Successful Prosecution under Merchandise Marks Act.

AT Hull Police Court, on August 26th, Henry Tattersall, trading as the Thornton Trading Co., Laurel Bank, Thornton-le-Fylde, near Blackpool, was summoned under four counts under the Merchandise Marks Act, 1887.

Mr. L. A. Byrne, who prosecuted on behalf of the General Electric Co., Ltd., stated that his clients had the sole right to use the trade mark "Osram" in this country. The defendant had sold to a firm of electrical contractors in Hull some spurious lamps which were in cartons printed with the words "Osram—Made in Italy." Evidence was given which showed that the defendant supplied half dozen of such spurious lamps in cartons wrongfully marked with the "Osram" trade mark, and that he had offered to supply further such lamps, and if need be to stamp the lamps themselves with the word "Osram." The Stipendiary found the defendant "guilty" on all four summonses, and imposed a fine of £10 and £10 10s. costs on the first two summonses, or in the alternative, 51 days imprisonment and a further £10 and £10 10s. costs, or 51 days imprisonment on the remaining summonses. Should the defendant not find the £41 for the fines and costs, the terms of imprisonment were to run consecutively and not concurrently, making therefore in all 102 days imprisonment.

Fraudulent Conversion Charge.

At the London Sessions, William James Cole, formerly a canvasser for Fulham Borough Council's electricity department was charged with fraudulently converting a sum of £8 to his own use. He visited a Mrs. Power, of Beryl Street, who signed an application form for a supply of electricity. She paid him £8, and he said the work would be done by Mr. H. A. Lever, wiring contractor. Mr. Lever said he had agreed to pay the accused commission on all jobs which he secured, but did not arrange for him to collect the money. He had not received a penny of the £8. It was stated that the department did not authorise defendant to take orders for work to be done by contractors. The accused promised to refund the £8 to Mrs. Power, and he was bound over for 12 months.

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"BRIDGE-MEG" TESTER.

Portable Testing Set for Measuring Insulation and Conductor Resistances.

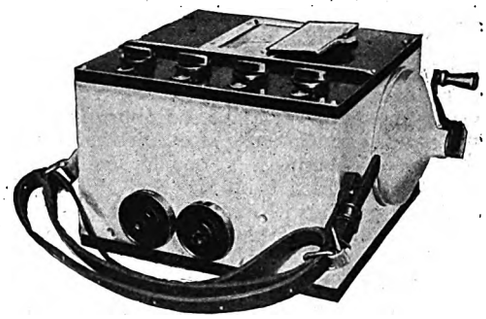
A NEW instrument, called the "Bridge-Meg" resistance tester, is being made by Messrs. Evershed and Vignoles, Ltd., at their works at Acton Lane, Chiswick, and has been put on the market this week. The instrument permits a change to be made from the "Meg" setting, used for testing insulation to the "Bridge" setting, used for measuring low resistances, by a turn of the change-over switch, without altering external connections. Just as the "Meg" insulation tester, which was introduced in 1922, does not overlap to any extent the field of utility of the "Megger" testing set, (the former not being supplied for testing at pressures above 500 V or with scale maxima above 100 MΩ) the new "Bridge-Meg", which bears the same relat on to the "Bridge-Megger" as the "Meg" bears to the "Megger," is a useful addition to the company's products, especially as its price is about half that of the "Bridge-Megger."

The new set is a combined ohmmeter and generator built into one case with a set of adjustable resistances, and by the turn of a single switch it serves for measuring high resistances or for determining conductor resistances by the Wheatstone bridge method.

For insulation tests the change-over switch is set to "Meg," the two terminals connected to the lines (or line and earth), the handle turned at about 150 r.p.m., and the reading taken directly on the scale in ohms or megohms. A test takes from 5 to 10 seconds. For low resistance measurements by "Bridge" method, the change-over switch is set to "Bridge," and the two terminals connected to the resistance under test. The handle is turned, while the resistance knobs (and if necessary the ratio switch) are adjusted until the pointer stands at the infinity mark on the scale, showing that balance has been obtained. The value in ohms of the resistance measured is shown by the figures appearing under the windows, multiplied or divided by the factor shown by the ratio switch. A measurement can easily be made in 15–30 seconds.

The range of resistance readings is continuous from 100MΩ down to 0·01Ω (100 MΩ to 10 000 Ω on "Meg" and 999 900 Ω to 0·01 Ω on "Bridge"). For testing insulation one must set to "Meg," turn the generator handle, and read the resistance on the scale in megohms or ohms. For testing low resistance (conductor) it is necessary to set to "Bridge"; turn the generator handle, adjust for balance (infinity reading on the scale), read under windows and multiply or divide by factor on the ratio switch. The result is in ohms.

The ratio switch is of the plate type, and has two arms sliding between two sets of studs. The ratio corresponding to a given setting is indicated externally by engraving on the handle. The adjustable resistances are of novel design, and, while considerably lighter and smaller than those employed in the resistance box of the "Bridge-Megger" set, are equally efficient in their operation. There are four sets of adjustable resistances: units, tens, hundreds and thousands, giving values from 1 to 9 999, in steps of one unit. The value corresponding to a given setting of the dials can be read by numbers seen through small windows in the case.

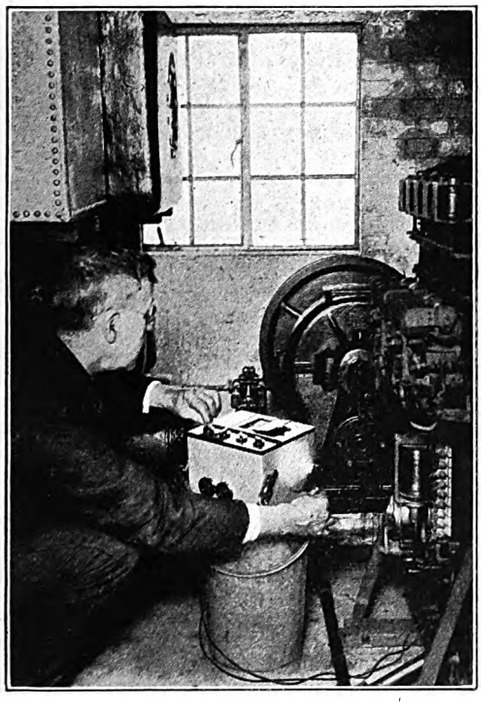


The Bridge-Meg may be carried in one hand or slung from the shoulder, leaving the hands free.

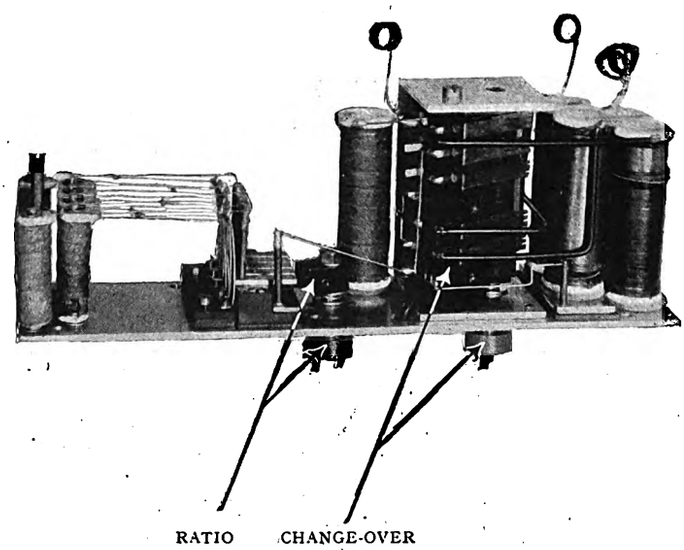
The generator is a self-contained unit. It has two windings connected in series for tests of insulation, and in parallel for bridge measurements, the voltage generated being 500 for meg tests and about 250 for bridge tests. The drive is transmitted from the turning handle to the armature through steel cut gears enclosed in an oil-tight casing. A free wheel interposed between handle and armature allows the latter to come to rest slowly when the handle is released, so that it is impossible to damage the generator by stopping it suddenly. A constant-speed clutch of simple design is also interposed between the handle and the armature shaft, so that the speed of the armature remains constant whatever the rate at which the handle is turned above the speed at which the clutch slips.

With regard to the construction of the ohmmeter movement, the moving-coil element is mounted on an axle pivoted in spring-supported jewels carried in a cast aluminium frame, which also directly supports the dial plate. An index adjuster is provided, operated by a small screw accessible from the outside of the case. This is a simple device, by means of which the field surrounding the pressure coil can be slightly distorted by movement of a small piece of soft iron. The index adjuster has no physical connection with the moving-coils, the control being entirely magnetic, and cannot therefore be used to injure the instrument.

This new set, which weighs 12¾ lbs., should prove useful in many industries where electrical apparatus has to be installed or maintained, as it is easy to operate and gives the desired results quickly.



Testing lift control gear with the Bridge-Meg.



Illustrating the positions of the change-over and ratio switches.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

EDINBURGH CORPORATION, September 7th.—Electric lighting installation in 52 dwelling houses at Featherhall, Corstorphine. Specifications, etc., from the Engineer, Electricity Department, Dewar Place, Edinburgh; deposit £1 1s.

HARROGATE CORPORATION, September 7th.—Supply and erection of overhead 11 000 V lines and 346/200 V lines. Specification, etc., from Mr. Neil McLean, borough electrical engineer, 33, Swan Road, Harrogate.

SCARBOROUGH CORPORATION, September 7th.—Supply and erection of e.h.t. and l.t. overhead lines (spec. 8/29); and supply of e.h.t. and l.t. paper insulated cable (spec. 9/29). Specifications, etc., from Mr. E. J. Jarvis, 89, Westborough, Scarborough.

ARBROATH INFIRMARY, September 9th.—Electrical work, in connection with extension of buildings. Schedules, etc., from Messrs. Clark and Blyth, 4, Herald Buildings, Arbroath.

Electrical Fittings.

BRIGHTON GUARDIANS, September 9th.—Supply of electrical fittings, etc., to the Institution and to Warren Farm Schools. Forms of tender from the clerk, Mr. H. Burfield, Princes Street, Brighton.

CHARLTON KINGS CLUB, September 9th.—Electric light installation. Specification from the Steward; deposit £10.

KETTERING URBAN DISTRICT COUNCIL, September 9th.—Supply of h.t. armoured cable. Specification from Mr. W. A. Walker, Electricity Works, Kettering; deposit £1 1s.

LONDON COUNTY COUNCIL, September 9th.—Supply and erection of e.h.t. switchgear, etc., for tramways sub-stations. Specifications, etc., from the General Manager of Tramways, 23, Belvedere Road, S.E.1; deposit £2.

LOUTH CORPORATION, September 9th.—(1) Mains and street work, and (2) sub-station equipment. Specifications from Messrs. Burstall and Monkhouse, 14, Old Queen Street, Westminster, S.W.1; deposit £3 for each contract.

NEW MILLS URBAN DISTRICT COUNCIL, September 9th.—Electrical equipments, including e.h.t. and l.t. switchgear, transformers, transformer kiosk, e.h.t. and l.t. cables, feeder pillars, etc. Specification, etc., from the clerk, Mr. D. Bennett.

OLDHAM GUARDIANS, September 9th.—Electrical lamps and fittings. Particulars from the clerk, Mr. F. W. Fletcher.

WEST RIDING EDUCATION AUTHORITY, September 9th.—Electric lighting installation at the Sanatorium, Bingley Training College. Specification from the Education Officer, County Hall, Wakefield.

ISLINGTON (LONDON) GUARDIANS, September 10th.—Six months' electrical supplies. Forms of tender from the clerk, Mr. Albert King, St. John's Road, Upper Holloway, N.19; stamped addressed envelope to be sent.

LEXDEN AND WINSTREE GUARDIANS, September 10th.—Electric light installation at the Children's Homes, Stanway. Particulars from the master, Mr. A. H. Gosling.

LIVERPOOL CORPORATION, September 10th.—Electric power and lighting installation for new abattoir, Stanley, Liverpool. Specification, etc., from Land Steward and Surveyor, Municipal Buildings, Liverpool; deposit £3 3s.

SLEAFORD URBAN DISTRICT COUNCIL, September 10th.—Supply and laying of 500 yards of four-core, 0·5, and 500 yards of four-core, 0·06 armoured cable, with necessary boxes. Specification from Mr. W. H. Wilson, Electricity Works, Sleaford.

BROMLEY (KENT) CORPORATION, September 11th.—Electric wiring of 63 houses on Southborough estate. Particulars from Mr. Harold Cliffe, borough engineer; deposit £1 1s.

CENTRAL ELECTRICITY BOARD, September 11th.—Supply, delivery and erection of 132 kV overhead transmission lines (approach to Clarence Dock, Liverpool). Specification (No. N.W.E.-P.L.3) from Mr. R. H. Fox, secretary, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s. for first copy, and £1 1s. for each subsequent copy.

CROYDON GUARDIANS, September 11th.—Six months' supply of electrical fittings and appliances, etc. Forms of tender from the Clerk, Mayday Road, Thornton Heath; stamped, addressed envelope to be sent.

STOKE-ON-TRENT CORPORATION, September 11th.—Replacement of (1) four superheaters, and (2) two economisers for water-tube boilers at the central power house, Hanley. Specifications from the City Electrical Engineer, St. George's Chambers, Kingsway Stoke-on-Trent; deposit £2 for each.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 12th.—Supply and erection of an electric passenger lift at Natural History Museum, South Kensington, London, S.W. Specifications, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

REIGATE CORPORATION, September 12th.—Supply, laying, etc., of 1 800 yards of 0·2 sq.in. h.t., concentric, paper-insulated, lead-cove e1 and armoured cable. Specification, etc., from Messrs. Handcock and Dykes, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

DUNDEE EDUCATION AUTHORITY, September 13th.—Electric lighting work in connection with erection of new Primary School at Rockwell, Lawton Road, Dundee. Specifications, etc., from Messrs. Allan and Friskin, 26, Castle Street, Dundee.

LEYTON CORPORATION, September 13th.—Electric light installation at Canterbury Road Schools. Particulars from the architect, Mr. John H. Jacques, 61, West Ham Lane, Stratford, London, E.; deposit £1.

WORKSOP GUARDIANS, September 13th.—Re-wiring Kilton Hill Infirmary. Specifications from Mr. J. Haslam, Ryton Chambers, Bridge Street, Worksop.

BELFAST CORPORATION, September 16th.—Overhead travelling cranes, for the electricity department. Specification (W. 95), etc., from Mr. F. H. Whysall, city electrical engineer and manager, East Bridge Street, Belfast; deposit £2 2s.

EDMONTON GUARDIANS, September 16th.—Six months' supply of electric lamps. Forms of tender from the clerk, Mr. E. Ridley, 77, Bridport Road, Edmonton, London, N.18; stamped addressed envelope to be sent.

HOLBORN (LONDON) GUARDIANS, September 18th.—Six months' supply of electrical fittings. Forms of tender from the Clerk, 53, Clerkenwell Road, E.C.1; stamped, addressed envelope to be sent.

WARRINGTON GUARDIANS, September 21st.—Twelve months' electrical supplies to Whitecross Institution, Warrington, or Cottage Homes, Padgate. Tenders (separate for the two places), to Mr. Arthur Bottomley, clerk, Union Offices, Museum Street, Warrington.

SALFORD CORPORATION, September 23rd.—Supply of 10 000 kVA, 33 kV/6·6kV transformers for outdoor service. Specification from the City Electrical Engineer.

COMMISSIONERS OF H.M. WORKS, ETC., September 24th.—Steam generating set, control panel and modification of existing electric generator, at the State Institution, Rampton, Retford. Specification, etc., from the Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1; deposit £1 1s.

STAFFORD COUNTY EDUCATION AUTHORITY, September 26th.—Electric light and power installation in new wing of Wolverhampton Grammar School. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £3 3s.

EAST LOTHIAN EDUCATION AUTHORITY, September 27th.—Electrical work in connection with erection of public schools at Longniddry and Aberlady. Forms of tender, etc., from Messrs. Morham and Brotchie, 29, Hanover Street, Edinburgh.

Overhead Lines.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, September 27th.—Supply and erection of a double circuit, 33 000 V, three-phase, 50 cycle, overhead (steel towers) transmission line. Specification (No. 33/T/1), from Mr. E. F. Hetherington, chief engineer and manager, at the offices of the Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

METROPOLITAN ASYLUMS BOARD, October 2nd.—Installation of electric bells at Paddington Casual Ward (Contract No. 6): new storage battery for t.s. "Exmouth" (No. 7); and alterations to electric lighting in "X" block at Eastern Fever Hospital (No. 8). Specifications from the Board's Office, Victoria Embankment, E.C.4; deposit £1 for each.

HALIFAX CORPORATION, October 7th.—Electricians' work in connection with erection of filter house, etc., for the waterworks department. Specifications, etc., on and after September 16th, from the Borough Engineer; deposit £2 2s.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc.

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in connection with electrification of Madras suburban services. Specifications, etc. (£1) from the company's offices, 91, Petty France, Westminster, S.W.1.

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Electrical control and traction equipment for suburban services. Specifications, etc. (£1, not returnable), from the Company's Offices, 91, Petty France, Westminster, S.W.1.

AUCKLAND ELECTRIC POWER BOARD, September 23rd.—Supply of pilot cable and joint boxes. (Reference B.X. 5 643.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 23rd.—Electric light installation and distribution system for the town of Kafr-el-Cheikh (Gharbieh Province). (Reference B.X. 5 502.)

INVERCARGILL (N.Z.) CORPORATION, September 23rd.—Supply and delivery of switchboard, to be directly operated and suitable for controlling 11 000 V, three-phase, 50-cycle current, it may be either of the draw-out truck type or totally armour clad, and will at first consist of seven units. (Reference B.X. 5 507.)

Generating Plant.

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 23rd.—Crude oil engine-driven 150 kW electric generating plant. (Tender No. 1 528.) (Reference B.X. 5 566.)

INDIA STORE DEPARTMENT, September 24th.—Supply of 31 000 yards of dry core electric cable. Schedule (No. 4) (5s.) from the Director-General, Belvedere Road, London, S.E.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 24th.—Supply of condensers (schedule C. 461.) (Reference B.X. 5 488.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 26th.—Two 100 kVA motor-alternators (tender No. 1 521). (Reference B.X. 5 564.)

DURBAN CORPORATION, September 27th.—Supply of three-phase ironclad, compound filled switch panels (specification S.778). (Reference B.X. 5 505.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Supply and erection of electric power station for the town of Samaunoud (Gharbieh Province). (Reference B.X. 5 596.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Machine tools, Diesel and semi-Diesel engines, boilers, electric batteries, etc., for the Prisons Administration. (Reference A.X. 8 245.)

MARLBOROUGH (N.Z.) ELECTRIC POWER BOARD, September 28th.—Supply and erection of 600 B.H.P. Diesel-driven generating plant and switchgear. (Reference B.X. 5 556.)

COMPANHIA DOS CAMINHOS DE FERRO PORTUGUESES, September 30th (extension of time). — Signalling apparatus. (Reference A. 8 427.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 30th.—Supply and erection of electric power station, with overhead and underground networks, for the town of Deirout. (Reference B.X. 5 598.)

STATE ELECTRICITY COMMISSION, VICTORIA, September 30th.—Supply and delivery of three 3 000 kVA 50 cycle, oil immersed, self-cooled, outdoor type single-phase transformers and spare coils and bushings. (Reference B.X. 5 523.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 30th.—Twelve months' supply of electric lamps (tender No. 1 526). (Reference B.X. 5 590.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Three 3 000 kVA transformers and spares. (Reference B.X. 5 523.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £2 2s.

WELLINGTON CORPORATION, September 30th.—Electric motors, starters and switchgear, for the Milk Department. (Reference B.X. 5 508.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 1st.—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B.X. 5 567.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—Supply of electric lamp standards. (Reference A.X. 8 251.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 1st.—Supply and delivery of switchboard cords. (Reference B.X. 5 515.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 1st.—Supply of bolts, brackets, screws, springs, etc., for British Post Office No. 121 wall telephones and No. 2 receiver switch. (Tender No. P. and T., 151/1 700.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 2nd.—Supply and erection of electric power station for Dessouk Town (Gharbieh Province). (Reference B.X. 5 597.)

VICTORIAN RAILWAY COMMISSION, October 2nd.—Supply of a.c. line relays for power signalling. (Reference B.X. 5 563.)

SOUTH AFRICAN POLICE, October 3rd.*—Supply of electric torches, etc. (local indent No. 50). (Reference C.X. 3 118.)

BULAWAYO MUNICIPALITY, October 4th (extension of time).—High tension overhead lines, with appurtenant gear and step-down transformers; pumps and motors with starters, etc. (contract No. 6/29). (Reference A. 8 462.)

SOUTH INDIAN RAILWAY CO., LTD., October 4th.—Supply of convertor equipment for sub-stations (specification No. 6); transformer switchgear and accessories (No. 7); and overhead transmission line (No. 8). Specifications, etc., from the company's offices, 91, Petty France, Westminster, S.W.1. A charge of £1 (not returnable) will be made for each specification.

MONTEVIDEO PORT ADMINISTRATION, October 7th.—Electric trucks, for load of 1 500 to 2 000 kilos, with generating sets for charging batteries, etc. (Reference A.X. 8 353.)

VICTORIAN ELECTRICITY COMMISSION, October 7th.—Supply and delivery of 11 000 V three-core cable. (Reference B.X. 5 539)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 8th.—Electric ranges, radiators and water heaters, for Waitaki power scheme (section 38). (Reference B.X. 5 642.)

ANTWERP MUNICIPALITY, October 10th.—Supply of 32 portal type electric travelling cranes (cahier des charge No. 800). (Reference A.X. 8 447.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 10th.—Supply and erection of electric generating station for Tala. (Reference B.X. 5 647.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Condensers (P. and T. 151/1 733.) (Reference B.X. 5 602.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Supply of B.P.O. type resistances. (No. P and T., 151/1 712.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single-phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 15th.—Switchboard instruments, test plugs and sleeves (schedule C. 472). (Reference B.X. 5 541.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type resistances. (Reference B.X. 5 551.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type retardation coils. (Reference B.X. 5 552.)

CAPE TOWN MUNICIPALITY, October 16th.—Supply of paper insulated cables (specification No. 474). (Reference B.X. 5 640.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 16th.—Electric motors, pumps, filters, and artesian well. (Reference A.X. 8 373.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic wall and table telephones. (Reference B.X. 5 509.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic telephone dials (P. and T. 151/1 734.) (Reference 5605.)

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Turbo-alternators, steam piping, crane and switchgear (contract 52.) (Reference B.X. 5 607.)

H.T. Cables and Transformers.

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Supply of h.t. cables, transformers and sundries, in connection with extensions of the electricity undertaking (contract 53.) (Reference B.X. 5 604.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 17th.—One 10-ton electric overhead travelling crane (tender No. 1 533). (Reference A.X. 8 463.)

WELLINGTON CORPORATION, October 21st.—High and low tension switchgear (contract No. 449). (Reference B.X. 5 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Supply of insulated wire (schedule C. 475). (Reference B.X. 5 580.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Telephone transformers (schedule C. 474). (Reference B.X. 5 581.)

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VICTORIAN RAILWAY COMMISSION, October 23rd.—Dry-core telephone cable (contract No. 43 384). (Reference B.X. 5 638.)

MELBOURNE CITY COUNCIL, October 30th.—Two 2 500 kW motor-convertors and accessories, or two 2 500 kW rotary convertors, with transformers and accessories. (Reference B.X. 5 570.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 30th.—Head receivers (P. and T. 151/1 725). (Reference B.X. 5 603.)

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Low tension porcelain insulators, etc. (Reference B.X. 5 648.)

VICTORIAN ELECTRICITY COMMISSION, November 4th.—Supply of 6 600 V automatic voltage regulators and spares (specification 29/83). (Reference B.X. 5 637.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General, Savoy House, Strand, London, W.C.2.

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote, metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92.) (Reference B.X. 5 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 10th.—Three single phase, oil insulated, water-cooled transformers, with accessories (section 295). (Reference B.X. 5 600.)

Tenders Accepted.

WAR OFFICE.—Stella Lamp Co., Ltd., supply of gasfilled and vacuum lamps.

ADMIRALTY.—Edison Swan Electric Co., Ltd., switch sockets, plugs and springs.

GENERAL POST OFFICE.—Stella Lamp Co., Ltd., supply of gasfilled and vacuum lamps.

GUILDFORD CORPORATION.—Hart Accumulator Co., Ltd., overhauling electric vehicle, £170 2s. 4d.

BIRKENHEAD CORPORATION.—Supply of cable, Hackbridge Cable Co., Ltd., £2 053, and Macintosh Cable Co., Ltd., £2 783 10s.

POPLAR (LONDON) BOROUGH COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., supply of eight 1 000 kW truck type hand controller oil switches.

GENERAL POST OFFICE.—Siemens Electric Lamps and Supplies, Ltd., 12 months supply of Siemens gasfilled standard vacuum and traction type lamps.

METROPOLITAN WATER BOARD.—Worthington-Simpson LTD., two sets of centrifugal pumps, one water driven and one electrically driven, £364 (recommended).

GLASGOW CORPORATION.—A. Reyrolle and Co., Ltd., supply of 20 000 V switchgear for Dalmarnock and Port Dundas; General Electric Co., Ltd., rewinding rotor, £227. (Both recommended).

LONDON COUNTY COUNCIL.—Express Lift Co., Ltd., supply and erection of electric lift at Greenwich power station, £723. Also tendered: Medway's Safety Lift Co., Ltd., £830; A. and P. Steven, Ltd., £835.

METROPOLITAN WATER BOARD.—Supply of electric lamps, normal vacuum type and normal gas filled type, General Electric Co., Ltd.; vacuum traction type, Siemen's Electric Lamps and Supplies, Ltd.

SALFORD CORPORATION.—Nederlandsche Kabelfabriek (Delft, Holland), supply of 24 000 yds. of l.t., paper insulated, lead-covered cable of varying sizes, for working pressure up to 660 V, £8 428 19s. (recommended).

SOWERBY P.C.—Northern Counties Electricity Supply Co., Ltd., public lighting with 78 60 W lamps, alight from half an hour after sunset to 11 p.m., £3 each; one 150 W lamp, £6; and three all night 60 W lamps, £4 18s. each.

SOUTHERN RAILWAY.—Siemens Electric Lamps and Supplies, Ltd., twelve months' supply of Siemens electric lamps; Metro-Vick Supplies, supply of Cosmos metal filament vacuum type and gasfilled lamps for twelve months (part contract).

GENERAL POST OFFICE.—Standard Telephones and Cables, Ltd., radio equipment for London repeater station; Automatic Telephone Mfg. Co., Ltd., equipment for Albert Dock telephone exchange; Siemens Bros. and Co., Ltd., equipment for Eastbourne telephone exchange.

WORK IN PROSPECT.

AMPTHILL.—Additional 52 houses for Rural District Council. Particulars from Surveyor.

AYR.—Nursing home extensions, to cost £2 300, for Misses Neish, 11, Inverkar Road.

BEXLEY HEATH.—Bank, Market Place, for Lloyds Bank Ltd.—Houses (11), for Mr. C. S. Fairman.—Houses (22), Welling, for Mr. J. A. Mills.

BOURNEMOUTH.—Rebuilding pier entrance, with shops, etc., to cost £24 000, for Town Council. Particulars from borough engineer, Mr. F. P. Dolamore.

BRIGHTON.—Operating theatre block, to cost £15 000. Royal Sussex County Hospital. Particulars from Secretary.

BUCKLOW.—Housing scheme (16), Mobberley, for Rural District Council. Particulars from surveyor, Mr. R. C. Cordon, Station Buildings, Altrincham.

CAERPHILLY.—Church, to cost £10 000. Particulars from architects, J. H. Phillips, and Wride, Cardiff.

CARLISLE.—Cinema theatre, to seat 2 000, for Sidney Bacon's Pictures. Particulars from architects, Percy Browne and Sons, London and Newcastle-on-Tyne.

CHARTHAM.—Extensions, Mental Hospital, to cost £17 000, for Kent County Council. Particulars from the clerk, Sessions House, Maidstone.

CONISBOROUGH.—Additional 54 houses, for Urban District Council. Particulars from Surveyor.

DAGENHAM.—Drill hall extensions, for Essex Territorial Army Association. Particulars from architects, Crickmay and Shenstone, 13, Hart Street, London, W.C.

DERBY.—Additional 500 houses, Allestree Park Estate, for Town Council. Particulars from Borough Surveyor.

DONCASTER.—Nurses' Home, for Management Committee of Royal Infirmary. Particulars from Secretary.

EAST GRINSTEAD.—Housing scheme (40 to 50), Sackville Estate, for Urban District Council. Particulars from Surveyor.

FARNBOROUGH.—Nurses' hostel, to cost £15 000, for Bromley Board of Guardians. Particulars from the Clerk.

FULFORD.—Church day schools, to cost £7 000. Particulars from architects, Penty and Thompson, York.

HALSTEAD (ESSEX).—Housing scheme (18), for Urban District Council. Particulars from surveyor, Mr. W. A. Nicholson.

HERTFORD.—Housing scheme, Tewin, for Rural District Council. Particulars from surveyor, Mr. J. W. Riggs.

HOLBEACH.—Extensions, St. Luke's School, for Holland Education Committee. Particulars from contractors, G. Barnsdale and Sons, Donington.

HUDDERSFIELD.—Shops, offices, and warehouses. Particulars from architect, Mr. Norman Culley, 13, John William Street.

HUCKNALL TORKARD.—Extensions, National Schools. Particulars from contractors, Messrs. Harvey, Mansfield.

ILFORD.—School (720 places), Ley Street, for Borough Education Committee. Particulars from clerk, Mr. Adam Partington.

LEEDS.—University gymnasium. Particulars from architects, Lanchester and Lodge, 19, Bedford Square, London, W.C.

LEEK.—Schools (300 places), for St. Luke's Parish. Particulars from vicar, Rev. J. G. Halford.

LOUTH.—Additional housing scheme, for Town Council. Particulars from Borough Surveyor.

LUTTON.—Primitive Methodist Sunday Schools. Particulars from contractors, Messrs. Whatford, Long Sutton.

MARGATE.—School to cost £13 492 for Borough Education Committee. Particulars from contractors, Rice and Son.

MITCHAM.—School (96 places), for Surrey Education Committee. Particulars from secretary, Mr. W. W. Finny, Kingston-on-Thames.

NORTHFLEET.—School (200 places), for Kent Education Committee. Particulars from director of education, Mr. E. Salter Davies, Sessions House, Maidstone.

PAIGNTON.—Extensions, Palace Hotel, including 24 bedrooms. Particulars from Proprietors.—Extensions, Hydro Hotel, including 20 bedrooms. Particulars from Proprietors.

READING.—Extensions, Infirmary, for Board of Guardians, to cost £2 000. Particulars from architect, Mr. W. Roland Howell, 17, Blagrave Street.—Geology block, London Road, for University Authorities.—School, Wardle Crescent, Tilehurst, for Miss K. M. Spencer.

RIPLEY (DERBYSHIRE).—Public baths, for Urban District Council. Particulars from Surveyor.

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ELECTRICITY SUPPLY.

Cavan Electric Light and Power Co. Purchased—Peterhead and Holywood Electricity Schemes—French Supply Statistics—Proposed Mains Extensions at Croydon—Springhead U.D.C. and Overhead Lines.

CROYDON Electricity Committee has obtained sanction to borrow £25 000 for mains extensions and £12 700 for plant.

Seaham Harbour Electricity Committee seeks sanction to borrow a further £6 000 in connection with the assisted wiring scheme.

Sheffield Electricity Committee has obtained sanction for a loan of £50 000 for wiring consumers' installations for hire purchase.

Paddock Wood P.C. has arranged for the public lighting of the village with 33 lamps by the Weald of Kent Electric Supply Co.

Yarmouth Corporation has approved the arrangements made with Electrical Enterprise, Ltd., to supply electricity in bulk to Bungay.

Carlisle City Council is to apply for a Special Order extending the area of supply to parishes within the areas of the Longtown and Brampton Rural District Councils.

Letterkenny U.D.C. has been informed by the Electricity Supply Board that it is hoped to have plant installed for the electric lighting of the town by next October.

Dorchester Abbey, Oxfordshire, is now lighted electrically, a temporary plant having been lent by the Wessex Electricity Co. until a permanent supply is taken to the village.

The application of Norwich Corporation to supply in Erpingham rural district has been refused, and powers for the area have been granted to the East Anglian Electric Supply Co.

The Irish Free State Electricity Supply Board has acquired the Cavan Electric Light and Power Co.'s undertaking for £6 414. This is said to represent a loss of 50% to the shareholders.

Norfolk Education Committee has considered applications for electric lighting installations in schools, and has decided that no general policy be framed, but that each case shall be considered separately.

Springhead U.D.C. has decided not to oppose the application of the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board for permission to erect overhead electric lines in the district.

Upholland U.D.C. has applied for a loan of £2 986 for the electrification of its pumping plant. All the public gas lamps are to be converted to electricity at a cost of £550. Mains are being laid by Wigan Corporation.

Norfolk County Council has prepared plans and specifications of heating apparatus, electric light wiring, bells, telephones, etc., for the mental hospital. Estimates have been submitted to the Board of Control.

The Peterhead electricity scheme has now been completed, and shops and dwelling-houses in the principal streets of the town are now lighted electrically. Many orders have been received from shopkeepers and householders for supplies.

A concession has been granted to the Bolivian Power Co. for the utlisation of the Zongo Falls. The first stage of the scheme will include the construction of a large dam and the installatiion of an electrical generating plant of about 22 250 kW.

A Ministry of Health inquiry was held recently into the application of Birtley P.C. for a loan of £2 600 for the purpose of public lighting by electricity. The application was opposed by the Newcastle and Gateshead Gas Co. and the Birtley Iron Co.

Oldham Corporation has abandoned, for the present, a proposal for effecting saving in connection with the lighting of new streets, etc., by laying only one set of mains, either gas or electric, for street lighting, domestic lighting and heating purposes.

Good progress is being made with the Holywood electricity scheme, which is to obtain its supply by overhead line from Belfast. Many applications have been received from intending consumers, and the positions are being marked for street lighting standards.

Portsmouth Electricity Committee has decided upon a scheme, to cost £16 000, for mains extensions to Sarisbury.—The Committee has decided to erect a sub-station at Portsbridge. The Engineer reports that the cost of the proposed sub-stations at Lee-on-the-Solent, Hayling Island, and Stubbington will be £1 759.

Marylebone (London) Electricity Committee has made an agreement with the North Gate Estate Co., Ltd., to provide for the installation of rising mains at blocks of flats at North Gate, Regents Park, at a cost to the Council of £1 437, and has authorised expenditure of £1 941 distributor cable and services in connection with the scheme.

Cape Town Electricity Committee has entered into an agreement with African Theatres, Ltd., for the supply of electricity in bulk to the Alhambra Theatre, Riebeek Street, the Bio-Vaudeville Theatre, St. George's Street, the adjoining Overflow Bio Theatre, Dock Road, and a new hotel at the corner of Adderley and Riebeek Streets.

Official statistics show that 20 907 communes in France now have electric light and power supplies. During last year the number of consumers in Paris increased by 9 % and the consumption of current by 11 %. The four great light and power companies which supply the Paris district, last year sold to the public 1 800 millions of kWh, representing a consumption of 1 400 000 tons of coal.

Caistor R.D.C. has consented to an application by the Yorkshire Electric Power Co. for a Special Order to supply electricity in the Council's area. At present the parishes of Brocklesby, Keelby, Riby, and Swinhope are included in the Grimsby Corporation Order, and the Clerk has been instructed to request the Commissioners to have these parishes included in the Order of the Yorkshire Electric Power Co.

Herne Bay Pier Committee has considered estimates of the cost of floodlighting the clock tower, Grand Pier Pavilion, and King's Hall, but has decided to make no recommendation with regard to carrying out the work. The cost of floodlighting the clock tower (scheme No. 1) would be £221 3s. 9d., and for scheme No. 2, £196 12s. The committee is obtaining estimates for strip lighting the Grand Pier Pavilion and the King's Hall.

Until Eastbourne Corporation obtains power to extend its area of supply, the Electricity Committee is unable to give a definite reply to an application on behalf of Messrs. Johnson and Phillips for terms for a bulk supply for distribution in the Chailey and Eastbourne Unions south of Ringmer. The Corporation is to seek sanction for loans of £13 552 for laying an 11 000 V feeder to a new sub-station at Upperton Road, and £28 678 for switchgear and transformers for bulk supply.

Godalming T.C. has entered into an agreement with the Urban Electric Supply Co. for supplying the housing estate at Binscombe Lane. The company will lay the services and instal four lighting points, including lamps, shades, etc., at each house, free of cost to the Council or tenants. Electricity will be supplied at a minimum of £3 per annum for 120 kWh, and at 3d. per kWh between 120 and 240, and at 1½d. per kWh beyond, the charges to be collected weekly by the company.

Newry U.D.C. has approved of the recommendation of the Electricity Committee to apply for sanction to pay interest on a loan from the bank, not exceeding £1 000, to March next or till revenue for current sold came in; to apply to the Electricity Commissioners for sanction to the raising of a supplemental loan of £5 000 to defray the cost of extensions of mains already carried out or in hand, as well as further extensions towards which it is estimated a sum of £1 780 will be available, and that sanction be sought to the raising of £2 500 to meet outlay in respect of hire purchase of electrical wiring equipment and appliances, and for the assisted wiring of small dwellings.

Under the agreement for the supply of electricity by Torquay Corporation to Torquay Tramways Co., Ltd., the company has hitherto paid a price based upon the cost of coal delivered to the power station. It is alleged by the company that the installation of a mechanical coal conveyor has removed the occasion for this charge. Negotiations have resulted in an offer by the company to pay a charge, based upon 9d. per ton of coal instead of 1s. 7d., and the Electricity Committee has accepted this offer for the remaining term of the agreement. The discount for prompt payment of accounts for electricity used for power purposes under the special sliding scale are to be at the rate of 5% instead of 2½%.—The Corporation has approved a scheme submitted by the Acting Borough Electrical Engineer for improving the lighting of the town hall ballroom.

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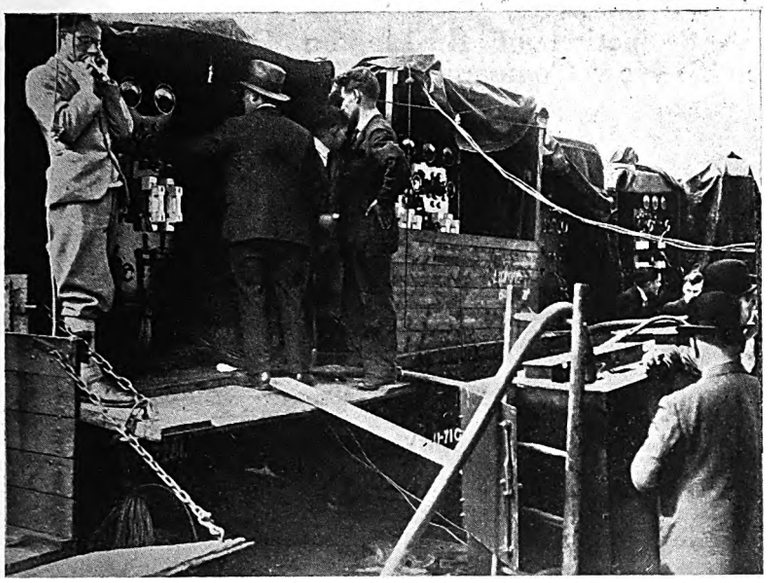
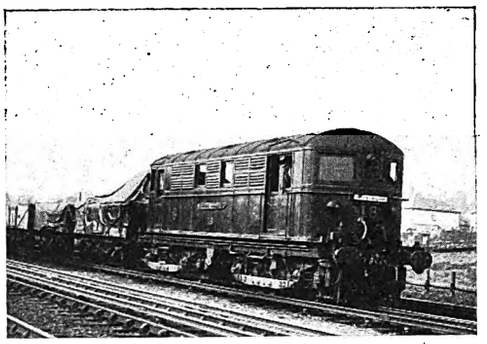
ELECTRICAL NEWS OF THE WEEK IN PICTURES.



Apart from the fact that the " tote " is itself of electrical interest, the plant required in connection with its operation is also worthy of attention. Kept away from the public gaze it is perhaps sometimes overlooked, but this photograph of the switchgear, etc., at Hurst Park, shows that the equipment involved assumes considerable proportions, in spite of its transportability.



One of the first goods trains to be hauled electrically on the Metropolitan (London) Railway. The locomotive is said to be capable of a speed approaching 60 m.p.h. and is used for transporting part of London's meat and milk supplies.

At the Los Angeles Radio Show a large fleet of perambulators was equipped with receiving apparatus in a novel pre-opening demonstration. During the show, with each perambulator tuned-in to a different station, various bedtime story-tellers competed, the winner being the speaker who put his baby to sleep first.

Lessons in the use of the automatic telephone system are being given every afternoon at the Science Museum, London. Classes of school children are brought by their teachers to attend these free lectures. A model automatic exchange has been installed, with six switching centres, and it is claimed by the Post Office to be the most elaborate mechanism of its kind.

A Ministry of Transport inquiry was held at Clitheroe last week into an application by the Corporation for compulsory wayleaves for a transmission line from Chatburn to Grindleton. Several landowners lodged objections. The Corporation offered 2s. 6d. per pole, leg or stay in meadowland, and 1s. elsewhere. Mr. T. Robinson submitted that 2s. 6d. per pole and 1s. per stay wire should be allowed, irrespective of the nature of the land. The Ministry's decision will be announced in due course.

In reference to the Shannon scheme, the Irish Free State Electricity Supply Board forecasts that by the end of 1929 the distribution network in all towns and villages of over 500 inhabitants, within easy reach of the scheme, will be complete. It is expected that the supply will be available by the end of the year, and it will be then possible to supply those towns and villages without further delay. Already some 5 600 posts have been erected, fitted with some 50 000 insulators, carrying about 700 miles of wires and 39 pole transformers, and 25 kiosks are in position. Some of the towns and villages on the Leinster loop of the scheme are receiving temporary current from the Dublin power house.

Oxford Corporation Water Committee has accepted the following terms for the supply of current by the Abingdon Electric Co. to North Hinksey pumping station: The Corporation to take a supply for the whole of its pumping requirements for ten years and to pay a service charge of £100 for l.t. mains; the charge for the first 2 500 kWh or less per quarter to be £18 15s.—additional consumption, 1½d. per kWh. These charges are based on a restricted period—namely, that the supply shall not be taken, except in cases of emergency, between the hours of 3.30 and 6.30 during November and December. Should, however, the current be taken during these two months between such hours, the charges are to be based on a minimum annual consumption of 13 400 kWh, charged at the rate of £25 per quarter, and a coal clause is to apply to all energy consumed.

Hastings Electricity Committee has been negotiating with Messrs. C. J. Banister and Son, Northiam, who have been supplying electricity to consumers in Northiam under a certificate from the Electricity Commissioners, with reference to their claim for compensation in respect of the plant and goodwill of their electricity undertaking. The Committee now recommends that Messrs. Banister be paid £500 as an ex-gratia payment for their undertaking, and consumers in the east end of the village may be supplied by Messrs. Banister until the Council is in a position to do so.—The Corporation electricity department is to extend mains to give supplies to Northiam and Battle.

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COMPANY NEWS.

Advance of English Electric Shares—Reduction of Ruskington Company's Prices—Reports and Dividends—New Companies Registered.

THE feature this week of our usual comparison of electrical share quotations is the advance, the result of steady buying, in the ordinary shares of the English Electric Co. These have risen during the past week from 6s. 3d. to 8s. 9d., or forty per cent. The 6 per cent. preference are 7½d. better in sympathy. Selling of Cables and Wireless "B" has continued, the quotation further relapsing to nearly 65. Marconi's International Marine shares have further declined 3s. 9d. to 55s. In the supply section, County of London ordinary at 57s. 6d. are half-a-crown up, and Metropolitans 1s. 3d. at 45s. London Electric Supply shares have weakened to 27s. 6d.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
(d)	Brompton & Kensington Ord. ..	26/6*	26/–	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/–	26/–	51/–	24/3
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/6	25/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	" " " " 6% C.P.	23/–	23/–	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	57/6	55/–	68/6	25/9
6	" " " " 6% C.P.	23/–	23/–	24/–	21/3
(e)	Kensington & K'bridge Ord. (£1)	26/–	26/–	27/6	23/9
1/9½	Lon. Elec. Sup. Ord. (£1)	27/6*	28/–	37/6	23/–
1/9½	Metro. Elec. Sup. Ord.	45/–	43/9*	53/–	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	26/10½	26/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P.	23/–	23/–	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(c)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/–
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/6	36/–	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	127½	128½	152	117
7·67	" " " " 6% Pf. Stk.	127½	126½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71*	72	72	54
4	" " " 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	76½	77½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97⅞	74
4	Lon. Un. Trams, 1st Deb. ..	57	57	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	59½	60	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	67	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	72½	72½	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	68	68	70	64½
7	Underground Electric Rlys. Ord.	23/6	24/–	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	13/1½	13/9	19/10	4/6
£5	Brit. Insulated Cables Ord. ..	75/–	75/–	86/3	56/–
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	22/6	22/6	24/9	19/7
7	" " " 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	130½	153½	120
£5	Callender's Cable Ord.	75/–	75/–	91/3	66/–
6½	" " 6½% C.P. ..	25/–	25/–	25/9	22/–
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	" " 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/–	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/–	15/–	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/–
—	English Elec. Ord.	8/9	6/3	15/9	5/–
—	" " 6% C.P.	8/1½	7/6	18/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	22/6	22/9	92/3	18/1
6	Ferranti 6% Pref.	18/–	18/–	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord...	57/6	57/6	46/6	26/6
25	W. T. Henley's Ord.	125/–	125/–	120/–	69/3
10	Johnson & Phillips Ord.	40/–	40/–	67/11	34/–
7½	Lon. Elec. Wire & Smith's Pref.	23/9	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	30/–	30/–	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	82½	82½	—	—
	"B" Ord Stk.	65½	72	—	—
	5½% Cum. Pref. Stk. ..	95	95	—	—
3½	Eastern 3½% Pref. Stk.	60½	60½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Gt. Northern Telegraph (£10) ..	31	31	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	55/–	58/9	90/–	16/6
4	Western Tel. 4% Deb. Stk. ..	77½	77½	82	76

(a) 19 5/12d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share.
(d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. * Ex. Dividend.

PENNSYLVANIA GAS AND ELECTRIC CO.—Qrtly. div. on class A common stk. at $0.37½ is announced.

PENNSYLVANIA WATER AND POWER CO.—Div. on common shs. of $⅝ p. sh. for qrtr. endg. Sept. 30 has been declared.

SHAWINIGAN WATER AND POWER CO.—Div. on common shs. of $½ p. sh. for qrtr. endg. Sept. 30 will be payable on Oct. 10.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Qrtrly. div. of 1½% on outstandg. cum. pref. shs. will be payable on Oct. 1.

CLARKE CHAPMAN AND CO., LTD.—Intm. div. of 3%, less tax, on ord. shs. (same rate as last year) will be payable on Sept. 11.

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD.—Intm. div. of 8 annas p. sh. (same rate as last year) free of Indian tax, on ord. shs. will be payable on Oct. 31.

SOCIETE DES TELEPHONES POLONAISES.—It is reported that this co., in which the Swedish Erikson Co. and the Polish Government are interested, is to increase its cap. by 4 000 000 zloty to 27 490 000 zloty.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Ord. sh. transfer books and register of members are closed from Sept. 3 to 14, inclusive, preparatory to paymt. of intm. div. on ord. shs. on acct. of year endg. Dec. 31.

CABLES AND WIRELESS, LTD.—Transfer books of 5½% cum. pref. stk. will be closed from Sept. 16 to 30, inclusive, for preparatn. of warrants for second instalmt. of div. for half-year ended June 30, 1929, payable on Sept. 30.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Ord. sh. transfer books and register of members are closed from Sept. 5 to 14, inclusive, preparatory to paymt. of intm. div. on ord. shs. on acct. of year endg. Dec. 31.

GENERAL ELECTRIC CO., LTD.—The transfer registers of the 7% mtge. deb. stk. are closed from Sept. 1 to 30, inclusive, for the purposes of the annual drawing and of preparing int. warrts. for the six months ending and payable on Sept. 30.

CANADIAN HYDRO-ELECTRIC CORPORATION.—Output in July, 1929, 156 749 000 kWh, increase 66% over July, 1928. In the first seven months of this year the Corporation plant generated 1 140 359 000 kW, 82% more than the output in the corresponding period of last year.

COLUMBIA GRAMOPHONE CO.—Company announces intention to manufacture radio sets in this country on a large scale. Already over £1 000 000 of British capital is invested in the company's radio branch in America, and it is anticipated that a similar sum will be absorbed by its new department here.

DEALINGS IN BRITISH SHARES IN U.S.A.—It is announced that ord. registered shs. of the Underground Electric Railways Co. of London and of the Newcastle-upon-Tyne Electric Supply Co. may now be dealt in on the New York Kerb Exchange, by means of Guaranty Trust Co. of New York American depository receipts.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—It is announced that the Commissioner of internal revenue has agreed that divs. and int. on stk. and bonds are to be regarded, for tax purposes, as income from sources without the United States during the year 1929. Income, when received by non-resident aliens, is not subject to United States income tax during the year 1929.

RADIO CORPORATION OF AMERICA.—Gross income of the Corporation and subsidiary cos. for qrtr. ended June 30, 1929, from sales, communications, real estate operatns. and other income, was $28 796 766. Gen. operatg. and administrative exes., depreciatn., cost of sales, patent amortisatn., Federal income-tax and accrued res. for year-end adjustmts. amtd. to $27 387 467. Surplus for qtr. $1 409 299 and for six months, $4 996 487.

Company Meeting.

RUSKINGTON ELECTRIC SUPPLY CO., LTD.—Dr. J. B. B. Whelan, presiding at the recent annual meeting, said the directors felt justified in conceding a reduction from 1s. 3d. to 1s. per kWh for the six winter months. The directors appealed for more consumers, and a greater consumption of current at the reduced rate. No dividend was declared on the ordinary shares, but it was decided to pay the dividend on the 5% preference shares. The report and accounts were adopted.

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NEW COMPANIES.

CALAMCO, LTD.—Cap., £100. Manufacturers and factors of electrical goods, etc. Reg. office: 7, East Parade, Leeds.

ELECTRICAL ENGINEERS, LTD.—Cap., £2 500. Electrical contractors, etc. Reg. office: 18, Endell Street, London, W.C.2.

MODERN OLD WORLD HOUSES, LTD.—Cap., £100. Engineers, electricians, etc. Solicitor: G. M. Johnson, 12, Lorne Road, Southsea, Portsmouth.

HAYES ENGINEERING CO., LTD.—Cap., £100. Erectors, suppliers, repairers and hirers of electric, or other machinery, electrical engineers, etc. Reg. office: St. Annes, High Road, Hayes, Middlesex.

MIDGET AUTOMATICS, LTD.—Cap., £100. Manufacturers, vendors and letters on hire of automatic machines and similar devices, mechanical and electrical engineers, etc. Reg. office: 269, High Road, Chiswick, London, W.4.

KLEIN BROS. (1929), LTD.—Cap., £500. Manufacturers of and dealers in scientific instruments, electricians, manufacturers of and dealers in wireless and radio apparatus, electrical appliances, etc. Reg. office: 8, Preston Parade, Wembley.

LASERON, LTD.—Cap., £1 000. To carry on, assist and participate in financial, commercial, mercantile, industrial, manufacturing and other businesses, etc., particularly in regard to wireless apparatus. Reg. office: 110, Cannon Street, London, E.C.4.

MAGNETO AND BATTERY SERVICES, LTD.—Cap., £3 000. Agents for and distributors of Bosch magnetos, dynamos, and lighting sets, Exide batteries, and all Bosch and Exide manufactured articles, etc. Reg. office: 14, St. Mary's Place, Newcastle-upon-Tyne.

WHITEHURST MAGNETO AND DYNAMO WORKS, LTD.—Cap., £750. Manufacturers of and dealers in magnetos and dynamos, electrical equipment and accessories, wireless apparatus, general and electrical engineers, etc. Reg. office: 307, London Road, Westcliff-on-Sea.

KNOX GARAGE AND GENERAL ENGINEERING CO., LTD.—Cap., £12 000. To acquire business of electrical, wireless and general engineer now carried on by G. G. Creusen at 210, High Street, Tonbridge, Kent, as "Knox Garage and General Engineering Co."

STONEHAMS (HOVE), LTD.—Cap., £7 500. To acquire the business of motor engineer now carried on by M. P. Stoneham at St. John's Road and Western Road, Hove, and to carry on the said business and that of mechanical, electrical, wireless and general engineers, etc.

PRATCHITT BROTHERS, LTD.—Cap., £20 000. To acquire the business of an engineer, etc., lately carried on by W. M. Pratchitt at Denton Iron Works, Carlisle, as "Pratchitt Brothers," and to carry on same and business of metal founders, welders of metal by electricity, etc.

STEVAL MANUFACTURING CO., LTD.—Cap., £5 000. To sell or let on hire or hire-purchase, wireless apparatus and appliances, to carry on business as manufacturers of and dealers in wireless apparatus, etc. Solicitors: Elwell and Binford Hole, 65, Coleman Street, London, E.C.2.

PORTABLE ELECTROPLATER, LTD.—Cap., £7 500. To acquire from Brakspar Syndicate, Ltd., benefit of a certain existing invention relating to electro-plating apparatus, and to carry on the business of electro-platers, etc. Solicitors: Ashurst, Morris, Crisp and Co., 17, Throgmorton Avenue, London, E.C.

SOUND RECORDERS, LTD.—Cap., £4 000. To acquire from S. Cowper-Coles benefit of certain existing inventions relating to reproduction of sound, to carry on the business of manufacturers of and dealers in radio and television sets and apparatus, etc. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, London, W.C.

MARVERS, LTD.—Cap., £600. To acquire trade mark "Ivric," to manufacture and deal in "Ivric" material and various goods and articles capable of being manufactured therefrom, to acquire and exploit formulas and processes for manufacture of insulating material, etc. Solicitors: Kimbers, Williams and Co., 79, Lombard Street, London, E.C.3.

DANIEL FLYNN AND CO., LTD.—Cap., £2 000. To acquire business of a metal merchant formerly carried on as "Daniel Flynn and Co.," at 10, Great Crosshall Street, and 23, Freemasons Row, Liverpool, and elsewhere by the late Elizabeth Flynn, to adopt an agreement with Rev. J. Scannell and Rev. B. O'Brien, and to carry on said business and that of mechanical and electrical engineers, etc. Reg. office:—23, Freemasons Row, Liverpool.

F. C. SMITH, LTD.—Cap., £100. To acquire business of engineers now carried on at 3/4, Ham Yard, Great Windmill Street, London, W.1; as "A. W. Harris and N. H. Stubbs," and to acquire from A. W. Harris the whole of the rights contained in applications and provisional specifications numbered 22607 to 22611 for improvements in or relating to (*a*) apparatus for driving gramophone records; (*b*) means for regulating speed of electric motors; (*c*) loud speakers; (*d*) loud speakers; and (*e*) sound reproduction.

METRO STORES, LTD.—Cap., £2 000. To acquire business carried on at 302B, Kentish Town Road, London, N.W., as the Metro Stores, to adopt agreement between H. A. Hough and S. E. Boyden, and to carry on the business of manufacturers of and dealers in electric, magnetic, galvanic, wireless and other apparatus, sound and light receiving, recording and reproducing devices, loud speakers, radio transmitting and receiving apparatus, electrical engineers, etc. A first director: S. E. Boyden, 1, Palmeira Avenue, Westcliff-on-Sea, merchant.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by* GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.

Opposition to the Registration of the following Trade Marks can be lodged up to September 21st, 1929.

BIOGRANIC.—504 138. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy. Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, E.C.4; electrical engineers. July 2nd, 1929. To be associated with No. 254 366 (1 316) and others.

501 047. Class 6. Electric vacuum cleaning machines. Excelsior Electric Cleaner Co., Ltd., 112, Strand, London, W.C.2; distributors of electric cleaners. March 18th, 1929. To be associated with No. 461 874 (2 480), 464 892 (2 507). (By consent.)

PYROVERSUM.—501 062. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Viozone, Ltd., 19, Cursitor Street, London, E.C.4; merchants. March 19th, 1929.

MICRO-PEROPHONE.—503 943. Class 8. Sound reproducing apparatus and parts thereof, wireless telephonic apparatus and parts thereof and wireless telephonic apparatus in combination with gramophones. Perophone, Ltd., 76–78, City Road, London, E.C.1; manufacturers. June 25th, 1929. To be associated with No. 421 064 (2 336).

DERITE.—504 120. Class 8. Electric cables. Derby Cables, Ltd., Alfreton Road Derby; cable manufacturers. July 2nd, 1929.

VITENAM.—504 054. Class 13. Gas and electric light fittings, reflectors, shades and parts thereof, enamelled hollow-ware, table tops, bathroom cabinets (not being furniture), towel rails and bathroom fittings, all being metal goods not included in other classes. Elm Works, Ltd., Elm Works, Summerstown Road, Tooting, London, S.W.17; manufacturers. June 28th, 1929. To be associated with No. 502 967 (2 075) xli.

491 855. Class 8. Gramophones, gramophone records and wireless transmitting and receiving apparatus and parts thereof. The Parlophone Co., Ltd., 1, Broad Street Place, London, E.C.2; manufacturers. May 26th, 1928. To be associated with No. 326 673 (1 710).

ELECTRATAP.—502 305. Class 8. Thermostatic, vacuum and other apparatus for controlling electrically heated appliances. Aktiebolaget Birka Regulator (a joint stock company organised under the laws of Sweden), Norway House, 21, Cockspur Street, London, S.W.1, and Surbrunnsgatan 48, Stockholm, Sweden; manufacturers. April 30th, 1929.

REGULECTRA.—504 008. Class 13. Domestic utensils of ordinary metal, not included in other classes, all electrically operated. Aktiebolaget Birka Regulator (a joint stock company organised under the laws of Sweden), Norway House, 21, Cockspur Street, London, S.W.1, and Surbrunnsgatan 48, Stockholm, Sweden; manufacturers. June 27th, 1929.

MELLOWAVE.—501 949. Class 8. Gramophones, electrical pick-ups, sound boxes and parts thereof for talking and like machines, all being goods included in Class 8. William Edward Martin, 17, Claremont Road, Hockley, Birmingham; manufacturer. April 19th, 1929.

GENCAB.—503 622. Class 8. Electric cables. The General Cable Manufacturing Co., Ltd., Kingston Road, Leatherhead, Surrey; manufacturers. June 13th, 1929.

METAL AND CHEMICAL PRICES.

TUESDAY, September 3rd.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£78 15 0	£1 0 0	—
Electro Wirebars .. .. „	£84 15 0	—	—
H.C. Wires, basis .. .. per lb.	11½d.	—	—
Sheet .. .. „	11½d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2½d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet „ .. .. .. „	10¼d.	—	—
Wire „ .. .. .. „	11½d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£25 0 0	10s. 0d.	—
Foreign or Colonial .. .. „	£23 10 0	7s. 6d.	—
Tin—			
Ingot .. .. per ton	£206 10 0	—	£3 0 0
Wire, basis .. .. .. per lb.	2s. 8½d.	—	½d.
Aluminium Ingots .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£24 2 6	—	17s. 6d.
Mercury .. .. per bottle	£22 15 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¼d.
Sodium Bichromate—Per lb. 3½d.

Rubber—Para fine, 10½d.; plantation, 1st latex, 11½d.

*** The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

According to James Forster and Co., the lead market on Monday, August 26th, after a turnover of 1 200 tons, closed unchanged at £23 5s. for September, October and November. On Tuesday, after transactions totalling over 3 000 tons, an advance of 2s. 6d. to 3s. 9d. per ton was registered, nearly all the business being at £23 7s. 6d. and £23 8s. 9d. for November and December shipment. Wednesday's market was unchanged, £23 8s. 9d. being again paid for a few hundred tons. Thursday, with a turnover of nearly 2 000 tons, marked a further advance of 2s. 6d. per ton, whilst Friday's market was quiet, with a few transactions for October and November shipment at £23 11s. 3d.

Closing prices on August 30th were: £23 8s. 9d. for August, £23 10s. for September, and £23 11s. 3d. for October and November, an advance of 6s. 3d. per ton on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

APEX ELECTRICAL CO., Blackpool Street, Burton-on-Trent, electrical dealers. £16 13s. 4d. August 2nd.

BARDSLEY, James, 16, Brownlow Hill, Liverpool, wireless dealer, £10 17s. 8d. July 24th.

BEAUMONT J. W. INGLE AND CO., The Elms, Unthank Road, Norwich, electrical engineers. £10 17s. 9d. July 30th.

BERRY AND HAYWARD, LTD., Granby Street, St. James' Street, Nottingham, electrical engineers. £22 19s. 5d. July 3rd.

CUNNINGHAM AND SLATER, LTD., 146, Kensington High Street, W., electrical contractors. £18 4s. 6d. July 1st.

DUCK, James, High Street, Marlborough, wireless dealer. £26 6s. 5d. July 3rd.

HACKING, Mr. L., 25, Milnshaw Lane, Accrington, wireless dealer, £18 12s. 9d. June 25th.

JENNINGS, Mr. P., 33, Garstang Avenue, Bolton, electrical fittings dealer. £22 7s. 10d. July 17th.

LANSDOWN, Mr. G., 20, Market Place, Chalfont St. Peters, wireless dealer. £11 3s. 9d. July 3rd.

LIGHT-O-DAY ELECTRIC LAMP CO. (1927) LTD., 318A, Euston Road. £42 18s. 8d. July 22nd.

MALLINSON, J. W., AND SON, 120, Padiham Road, Burnley, electrical engineers. £31 16s. July 2nd.

POWER, Mr. O., Universal Stores, Bridgend, electrical engineers. £12 3s. 10d. July 10th.

RADIO DEN, 93, Chertsey Road, Woking, electrical dealers. £29 10s., July 16th.

SIMS, Mr., 160, Bedford Road, Rock Ferry, wireless dealer. £26 19s. 3d. July 24th.

SHAPLAND, Mr. A. E., Chippenham Cottage, Exmouth, wireless dealer. £29 7s. 4d. July 4th.

SQUIRES, S. G., 85, High Street, Billericay, wireless dealer £22 6s. 10d. July 22nd.

WALKER, H. F., Mr., 193C, Balham High Road, S.W., wireless dealer. £18 5s. 5d.. July 4th, and £15 3s. 3d., July 3rd.

YOUNG'S BAZAAR, 6, Royal Victoria Arcade, Union Street, Ryde, I. of W., wireless dealers. £16 6s. 5d., July 26th.

Bills of Sale.

BURGESS, Alfred, 4, Ogwen Street, Everton, electrician. Dated August 29th, filed August 31st, £52.

DURRANT, Joseph, 129, Parish Lane, Penge, electrician. Dated August 23rd, filed August 27th. £40.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

ATLAS CARBON AND BATTERY CO., LTD., London, S.E.—Registered August 20th, debenture to Barclays Bank, Ltd. securing all moneys due or to become due to the Bank; general charge. *£2 400. December 31st, 1928.

BOWMAN (E. J.) (BIRMINGHAM), LTD., radiator manufacturers.—Registered August 19th, £1 000 1st debenture, to W. I. Rodway, Cornwall Street, Birmingham, wood engraver; general charge.

DIONOID BATTERY CO., LTD., Sheffield.—Registered August 26th, £1 000 debentures; general charge. *Nil. March 17th, 1928.

DORIAN WIRELESS CO., LTD., London, W.—Registered August 22nd, £2 100 debenture, to E. L. Lumley, 39, Lombard Street, E.C., insurance broker; general charge.

London Gazette, etc.

Company Winding-up Voluntarily.

CHATWIN (W.), LTD. By reason of its liabilities, August 26th. T. J. Prentice, 31-32, Bayley Lane, Coventry, accountant, appointed as liquidator. Meeting of creditors at the offices of R. A. Rotherham and Co., Solicitors, 38, Bayley Lane, Coventry, on Tuesday, September 10th, at 12 noon.

Bankruptcy Information.

MADDOX, Victor Frederick, 6, Homend Street, Ledbury, Hereford, electrical and wireless engineer. First meeting, September 7th, 12 noon. Official Receiver's Office, 133, Saint Owen Street, Hereford. Public examination, October 7th, 2.30 p.m., Shirehall, Hereford.

Notices of Intended Dividends.

WILMINGTON, Granville, 75, Railway Street, Nelson, electrical and radio engineer. Last day for receiving proofs, September 14th. Trustee, J. W. Carter, District Bank Chambers, Blackburn, Official Receiver.

LITTLER, John, 9, Hoghton Street, Southport, electrical and radio engineer. Last day for receiving proofs, September 14th. Trustee, A. T. Eaves, 47, Mosley Street, Manchester.

RICHARDS, Stanley Wyndham, of the Blackwood Radio and Electrical Supply Depot, High Street, Blackwood, Monmouthshire, radio engineer and electrical contractor. Last day for receiving proofs, September 16th. Trustee, E. Owen, 34, Park Place, Cardiff, Official Receiver.

Partnership Dissolved.

FRANK RIDDIOUGH AND SON (Frank RIDDIOUGH and John William RIDDIOUGH), hardware merchants, at Colonnade, Westgate, and as wireless factors, at 8, Simes Street, Bradford, by mutual consent as from June 30th, 1929. Debts due to and owing by the hardware merchants branch of the late firm will be received and paid by F. Riddiough, who will carry on business as a hardware merchant at Colonnade, Westgate, Bradford, under the style of Frank Riddiough, and all debts due to and owing by the wireless factors branch of the late firm will be received and paid by J. W. Riddiough, who will carry on business as a wireless factor at 8, Simes Street, Bradford, under the style of Frank Riddiough and Son.

Bankruptcy Proceedings.

DAVIES, Harold Walter, and DAVIES, Reginald Albert, 34, Mill Street, Crewe, Cheshire, trading as DAVIES BROTHERS, wireless dealers, etc. The public examination was held at Crewe on August 29th, when a statement of affairs was presented which showed liabilities of £573, against assets of £45. The debtors stated that in November, 1927, they purchased, for £325, a cycle and wireless business at Northwich, borrowing the money from their mother and agreeing to repay at the rate of £5 10s. per month. The takings had averaged £15 per week, and the trade expenses £4. In June, 1928, the premises and stock were destroyed by fire, the loss being estimated at £800, but they were unable to prove this amount to the insurance company, owing to the destruction of the books, and they were paid £503 in settlement of their claim. In September of last year they opened another shop at Crewe, where the takings averaged £18 per week, and the trade expenses £2 10s. They closed the Northwich shop in December, and entered into negotiations with a firm to take the premises for the remainder of the term of the lease on the payment by debtors of £50, which amount they borrowed from their mother, and subsequently repaid her. The business had recently declined, through unemployment in the town, profits being insufficient to meet trade expenses. They did not become aware of their position until May when they were sued. The examination was closed.

TURNER, Oliver Bramwhite, Paddock House, Yeadon, Yorkshire, salesman of electrical apparatus. The receiving order against the above was made on the debtor's own petition on August 12th. At the first meeting of the creditors held on August 29th, at the Official Receiver's office, 24, Lower Bond Street, Leeds, a statement of affairs presented showed liabilities amounting to £114, with no assets. The case, being a summary one, was left with the Official Receiver. The following are creditors:—Inland Revenue, Leeds, £11; Bankers, Sheffield, £20; Sharp and Griffiths, Baildon, £21; West Ham Guardians, West Ham, £10.

READ, Roland Arthur, electrical engineer and wireless goods dealer, 9, The Pavement, Middle Lane, Crouch End. The public examination of this debtor was held on September 3rd, before Mr. Registrar Warmington, at the London Bankruptcy Court, the accounts showing liabilities of £810 and assets valued at £219. In reply to Mr. Armstrong, assistant official receiver, the debtor stated that prior to September, 1926, he was employed as a process inspector to an electrical company. In the following November he borrowed £50, and with £75 capital acquired a twelve years' lease of a lock-up shop at 2a, The Pavement, at a rental of £80 per annum. He began to trade there as an electrical engineer, dealing mainly in wireless goods. After trading fairly successfully for two years, he removed to 9, The Pavement, of which he acquired a 14 years' lease from December, 1928, at a rental of £185 a year. In March, 1929, he realised he was in financial difficulties, and in April he acquainted his principal creditors of the fact, but continued to trade until July 16th, when he presented his petition because three judgments had been obtained against him. The debtor attributed his insolvency to lack of capital, heavy overhead charges, liability under the leases of the business premises and a tenancy of his private house in Topsfield Parade, Crouch End, and to insufficiency of profits to cover drawings. The examination was concluded.

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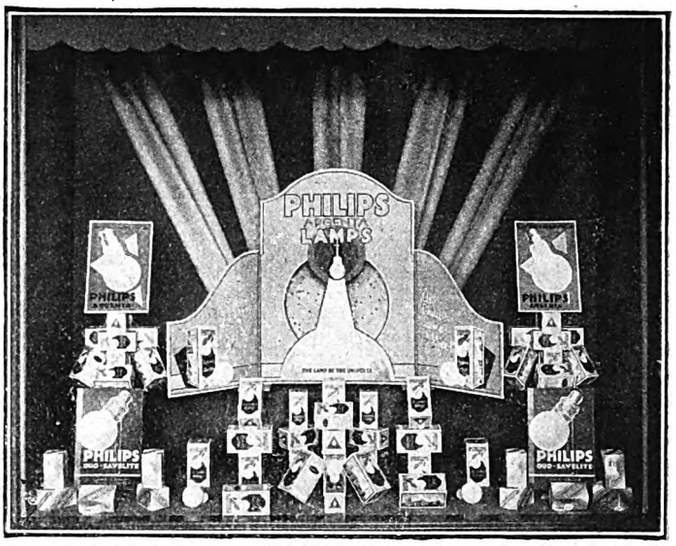
PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

314 196 P. Porzellanfabrik Rosenthal and Co. Akt.-Ges. and O. Becker. Electric insulators. (5/6/28.)
293 380 British Thomson-Houston Co., Ltd. Sound-reproducing apparatus. (5/7/27.)
292 148 International General Electric Co., Inc. Recording-devices. (15/6/27.)
292 475 Associated Electrical Industries, Ltd. Contact fingers for electrical apparatus. (18/6/27.)
314 216 S. W. Hamlyn, L. Dernier and Hamlyn, Ltd. Electric lamp shades and/or fittings. (23/6/28.)
314 226 Benjamin Electric, Ltd., and H. T. Harrison. Reflectors for artificial lighting. (6/7/28.)
293 428 British Thomson-Houston Co., Ltd Electric oil-switches. (6/7/27.)
294 176 Carborundum Co. Manufacture of carbon electrodes and other refractory articles. (19/7/27.)
314 237 F. A. Cortez-Leigh and J. A. Franck. Current-collecting shoes for electric trains. (16/7/28.)
295 331 Associated Electrical Industries, Ltd. Electrical signalling and/or controlling systems. (9/8/27.)
295 934 Siemens-Schuckertwerke A.-G. Electrical switchgear installations. (20/8/27.)
297 108 Siemens-Schuckertwerke A.-G. Electric protective-arrangements for three-phase circuits. (16/9/27.)
296 057 Siemens-Schuckertwerke A.-G. High-power light projectors. (24/8/27.)
296 031 F. Conrad. Electric clocks. (17/3/27.)
314 268 H. S. Walker. Under-floor duct systems for electric distributions. (24/8/28.)
296 102 M. Latour. Electro-capillary devices. (25/8/28.)
296 375 Loewe-Audion Ges. and B. Wienecke. Arrangement of electric-wire leads through glass parts. (30/8/27.)
309 067 Ideal Werke Akt.-Ges. fur Drahtlose Telephonie. Loud-speakers. (4/4/28.)
314 272 T. Smith. Insulator-carriers for overhead electric wires. (12/9/28.)
297 471 British Thomson-Houston Co., Ltd. Induction-voltage regulators. (23/9/27.)
299 316 British Thomson-Houston Co., Ltd. High-frequency electric signalling systems. (21/10/27.)
303 003 Sulzer Freres Soc Anon. Ignition-devices for use with fire-grates burning solid fuels. (24/12/27.)
282 688 J. E. Noeggerath. Electrolytic apparatus. (21/12/26.)
314 591 J. L. Baird and Television, Ltd. Television and like apparatus. (4/1/28.)
291 424 Hermsdorf-Schomburg-Isolatoren Ges. Electrical condensers. (4/6/27.)
314 594 I. Ainstein. Electro-deposited protective coatings for vessels. (4/2/28.)
314 313 Siemens Bros and Co., Ltd., and D. A. Christian. Automatic telephone systems. (25/2/28.)
314 558 Electro-Bleach and By-products, Ltd., and J. Hollins. Electro-deposition of metals. (25/2/28.)
286 229 Akt.-Ges. Brown, Boveri et Cie. Means for balancing rotary casings of refrigerating machines. (28/2/27.)
314 457 P. Grant and Ruston and Hornsby, Ltd. Controlling alternating-current motors. (23/3/28.)
294 563 Naamlooze Vennootschap Hengelosche Electrische en Mechanische Apparaten-Fabriek, and H. A. W. Klinkhamer. Asynchronous motors. (26/3/27.)
291 392 C. S. Ashcraft. Electric arc lamps. (1/6/27.)
301 012 C. S. Ashcraft. Electric arc lamps. (23/11/27.)
289 021 Associated Telephone and Telegraph Co. Electric contacts. (20/4/27.)
314 367 S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). X-ray apparatus for crystallographic examination and like purposes. (26/3/28.)
314 411 Standard Telephones and Cables, Ltd., and T. S. Skillman. Relay arrangements, particularly for use in automatic or semi-automatic telephone systems. (27/3/28.)
289 426 Landis and Gyr Soc. Anon. Electric induction meter. (27/4/27.)
314 463 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic and semi-automatic telephone systems. (28/3/28.)
314 464 Standard Telephones and Cables Ltd. (Western Electric Co., Inc.). Glow discharge lamps. (28/3/28.)
314 465 Standard Telephones and Cables, Ltd., and J. R. Gould. Automatic or semi-automatic telephone systems and apparatus therefor. (28/3/28.)
314 562 Standard Telephones and Cables, Ltd., G. C. Hartley, and A. H. Cameron. Automatic or semi-automatic telephone systems. (29/3/28.)
314 563 Standard Telephones and Cables, Ltd., J. H. E. Baker, A. H. Cameron, and L. B. Haigh. Telephone systems. (29/3/28.)
314 564 Standard Telephones and Cables, Ltd., and W. K. Weston. Electric communication cables. (29/3/28.)
314 565 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Electrolytic condensers. (29/3/28.)
288 149 British Thomson-Houston Co., Ltd. Electric condensers. (1/4/27.)
314 567 J. Dornan. Electric heating devices. (29/3/28.)
314 570 Young, Osmond and Young, Ltd., and C. C. Turner. Electric junction boxes and electric heating apparatus comprising the same. (29/3/28.)
314 575 W. E. Beatty (Bell Telephone Laboratories, Inc.). Method of and apparatus for measuring mechanical impedance. (30/3/28.)
314 576 J. Stone and Co., Ltd., and A. E. Honey. Brush and terminal contact-mechanism of dynamo-electric machines. (30/3/28.)
314 577 Automatic Telephone Manufacturing Co., Ltd., S. R. Smith, and T. P. Preist. Impulse generators for use in telephone or like systems. (30/3/28.)
288 547 Tchoubritch, Derval and Co. Automatic circuit selectors for telephony (11/4/27.)
314 579 S. C. Smith. Electrolytic recovery of metals. (30/3/28.)
314 582 R. L. Rogers, and S. Smith and Son, Ltd. Timing-instruments actuated or controlled by electric impulses. (31/3/28.)
292 528 Electrical Research Products, Inc. Regulators for controlling the speed of electric motors. (21/6/27.)
314 584 A. Matthews. Electrical heaters. (31/3/28.)
288 631 International General Electric Co., Inc. Protective devices for electric circuits. (14/4/27.)
314 603 A. G. Smith. Multiple-filament electric lamps for vehicles. (4/4/28.)
289 049 Associated Telephone and Telegraph Co. Telephone systems. (22/4/27.)
314 605 J. S. C. Salmond and L. S. B. Alder. Methods and means for amplifying in wireless telegraphy and telephony. (4/4/28.)
288 333 British Thomson-Houston Co., Ltd. Purification of alkali or alkaline earth metals, and the production of alloys therefrom. (6/4/27.)
300 620 I. Kitsee and D. C. Law. Loud-speaking telephones and like electro-acoustic devices. (18/11/27.)
314 616 Callender's Cable and Construction Co., Ltd., and J. H. S. Ross. Tensioning arrangements for cables and the like. (14/4/28.)
314 626 M. H. Goldstone and Ward and Goldstone, Ltd. Electrical switch or key lamp holders. (24/4/28.)
289 470 British Thomson-Houston Co., Ltd. Automatic electric switching systems. (28/4/27.)
289 416 C. Chilowsky and A. Guerbilsky. Television methods and apparatus. (26/4/27.)
314 629 Siemens and General Electric Railway Signal Co., Ltd., and F. L. Castle. Electrical signalling systems. (27/4/28.)
314 630 J. C. Petersen, J. Edgar, and A. J. Wares. Electrical boiling and cooking apparatus. (2/5/28.)
314 632 Sun Electrical Co., Ltd., and S. A. Coleman. Holders for electric incandescent lamps. (3/5/28.)
314 640 English Electric Co., Ltd., and F. Morris. Controlling gear for electrically propelled vehicles. (9/5/28.)
291 352 Telefonaktiebolaget L. M. Ericsson. Selector switches for automatic telephone systems. (30/5/27.)



An attractive window display devoted to some of the products of Philips Lamps Ltd.

314 648 Electramonic Co., Ltd., S. J. Tyrrell, D. W. Sayers, and L. N. Tyrrell. Gramophone pick-up devices. (24/5/28.)
314 649 F. J. Wineberg. Electric or imitation fires or radiators. (26/5/28.)
314 655 H. Kindermann. Electric switches for the motors of spinning-pots for the production of artificial silk. (1/6/28.)
314 656 G. Cluley, and Associated Electrical Industries, Ltd. Fault indicators for overhead transmission lines. (1/6/28.)
314 660 British Thomson-Houston Co., Ltd., A. P. Young, and J. H. Butcher. Sound reproducing instruments. (11/6/28.)
292 541 British Thomson-Houston Co., Ltd. Refrigerator cabinets. (21/6/27.)
297 099 E. J. Muller. Contacting device for electric flashing signs. (16/9/27.)
314 675 Walker, Hunter and Co., Ltd., and J. Walker. Terminal connections for electric heating-elements. (2/7/28.)
293 394 British Thomson-Houston Co., Ltd. Refrigerating machines. (5/7/27.)
314 680 E. W. C. Russell (C. B. Sawyer). Method of improving piezo-electric crystals. (6/7/28.)
295 395 J. S. Lottrup. Inductance coils. (11/8/27.)
314 715 A. Baker. Moving-coil loud-speakers. (15/8/28.)
307 702 C. Tourne. Incandescent electric lamps and the like. (9/3/28.)
307 785 Siemens-Reiniger-Veifa Ges. Fur Medizinische Technik. Apparatus for operating Röntgen tubes. (13/3/28.)
297 326 International General Electric Co., Inc. Electric motor controllers. (17/9/27.)
314 728 Associated Electrical Industries, Ltd. (Westinghouse Electric and Manufacturing Co.). Arc welding apparatus. (18/9/28.)
297 435 International General Electric Co., Inc. Protective devices. (21/9/27.)
305 569 Electrometallurgique de Montricher. Poking and stirring apparatus for electric furnaces. (7/2/28.)
298 641 British Thomson-Houston Co., Ltd. Centrifugal electric switches. (13/10/27.)
298 913 H. Lewy and H. Fleig (trading as J. Lewy Gloria-Werke (firm of)). Pocket lamps. (14/10/27.)
314 741 D. L. Chandler. Electric bread toaster. (20/10/28.)
299 398 International General Electric Co., Inc. Enamelling furnaces or the like. (25/10/27.)
299 779 F. Szalay. Device for preventing the tilting movement of the bows of current collectors. (31/10/27.)
299 435 British Thomson-Houston Co., Ltd. Electric switches. (26/10/27.)
301 725 Siemens-Schuckertwerke Akt.-Ges. Means for protecting the separable switch members of withdrawable switchgears from dust, dirt, and the like. (3/12/27.)
300 586 E. Hausdorf. Telephones furnished with amplifying means. (15/11/27.)
302 307 British Thomson-Houston Co., Ltd. Electron discharge apparatus. (14/12/27.)
301 086 M. Charles. Adjustable sockets for electric lamps. (25/11/27.)
301 843 Associated Telephone and Telegraph Co. Telephone systems. (13/8/27.)
302 654 Akt.-Ges. Brown, Boveri et Cie. Mercury-vapour rectifiers. (19/12/27.)
303 352 Akt.-Ges. Brown, Boveri et Cie. Strainers for the overhead lines of electric railways. (31/12/27.)
314 470 Electro Bleach and By-Products, Ltd., and J. Hollins. Electro-deposition of metals. (25/2/28.)
297 723 Hazeltine Corporation. Radio frequency amplifier. (26/9/27.)
314 884 A. H. Marks and P. Russell (legal representatives of E. C. R. Marks (deceased)). (Vreeland Corporation). Selective amplifiers particularly suitable for wireless reception. (3/1/28.)
288 240 Siemens und Halske Akt.-Ges. Arrangement for automatically modifying the relative amplitudes of signal currents. (7/4/27.)
286 277 Pioneer Instrument Co., Inc. Method of and apparatus for counteracting undesirable magnetic fields. (2/3/27.)
286 606 Allmanna Svenska Elektriska Aktiebolaget. Excitation of continuous-current generators. (5/3/27.)
314 915 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Multiphase alternating-current rectifying systems. (5/3/28.)
314 773 L. Zwilling. Electrical gas lighters. (27/3/28.)
314 774 Birmingham Electric Furnaces, Ltd., and A. G. Lobley. Current supply control systems of electric furnaces and analogous electric heating installations. (28/3/28.)
314 775 Birmingham Electric Furnaces, Ltd., and A. G. Lobley. Electric furnaces. (28/3/28.)
302 987 Constructions Electriques de France. Electric circuit-breakers. (24/12/27.)

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314 921 A. H. Marks and P. Russell (legal representatives of E. C. R. Marks (deceased)). (Radio Frequency Laboratories, Inc.) Thermionic amplifier circuits. (30/3/28.)
314 778 A. Reyrolle and Co., Ltd., E. W. M. Scott, and B. H. Leeson. Protective arrangements for sectionalised electric power circuits. (2/4/28.)
314 779 British Thomson-Houston Co., Ltd., L. Griffiths, C. J. Morton, and T. H. Woodfield. Electric headlamps for motor cycles and the like, and switching arrangements therefor. (2/4/28.)
298 621 O. Fulton. Process for the control of electric current impulses for the purpose of remote picture transmission and of television or the like. (13/10/27.)
314 925 S. G. S. Dicker. (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes. (2/4/28.)

Applications for Patents.

June 10th.

17 734 Associated Electrical Industries, Ltd., and E. Y. Robinson. Vacuum electric tube devices.
17 831, 17 832 B. Baxter. Electrical pick-up devices.
17 740 C. B. P. Bell. Supporting electric lampshades.
17 729 Benjamin Electric, Ltd., and G. Campbell. Thermionic valve, etc., holders.
17 769 British Thomson-Houston Co., Ltd. Transformers. (11/6/28, U.S.)
17 828 E. Chipps and P. E. Faith. Electric control devices.
17 826 A. E. Clarke and J. I. Smith. Circuits for amplification of electric impulses
17 816 H. Cousins and G. Levy (F. Aldrovandi). Electric lighting systems.
17 821 Electrical Research Products Inc. Transmission volume control systems. (17/12/28, U.S.)
17 771 J. B. Fagan. Electromagnetic reproduction of sound. (9/6/28, U.S.)
17 747 W. G. Gale. Telephone receivers, etc.
17 789 F. C. Hackett and L. C. Stanley. Electric relays, etc.
17 812 Kolster-Brandes, Ltd. Aerial navigation. (9/6/28, U.S.)
17 712 T. G. Mockridge. Tramcars, omnibuses, etc.
17 809 N. V. Philips' Gloeilampenfabrieken. Incandescent lamps. (27/7/28, Holland.)
17 756 L. H. Peter and Westinghouse Brake and Saxby Signal Co., Ltd. Amplification of electric currents.
17 810 Siemens and Halske A. G. Telephone systems. (23/6/28, Germany.)
17 733 Soc. Chimique de la Seine and V. Szeidon. Electrolytically depositing chromium. (28/7/28.)

June 11th.

17 951 Associated Electrical Industries, Ltd. Electric switches. (16/6/28 U.S.)
17 966 Associated Telephone and Telegraph Co. Cathode ray tubes. (18/6/28 U.S.)
17 942 G. H. Brady. Wire connectors.
17 943 G. H. Brady. Circuit closers.
17 894 British Thomson-Houston Co., Ltd. Electric vehicles. (12/6/28, U.S.)
17 896 British Thomson-Houston Co., Ltd. Vapour electric amplifiers. (13/6/28, U.S.)
17 974 Celestion, Ltd., and C. French. Electromagnetic sound reproducing devices, etc.
17 950 Electrical Research Products, Inc. Electrical transmission systems. (29/12/28, U.S.)
17 954 L. Emanuelo and Soc. Italiana Pirelli. High tension cables.
17 940 H. W. B. Gardiner and General Electric Co., Ltd. Electrical conductors.
17 895 International General Electric Co., Inc. Devices for preventing release of polarised switches on counter current. (13/6/28, Germany.)
17 869 Kolster-Brandes, Ltd. Electrical oscillation circuits. (11/6/28, U.S.)
17 870 Kolster-Brandes, Ltd. Broadcasting systems. (11/6/28, U.S.)
17 964 J. E. Pollak, R. D. Thompson, and G. C. Mills. Electrodes for electrically welding or depositing metals.
17 864 J. Schu. Electric switches.
17 865 J. Schu. Electric fuses.
17 980 K. Tihanyi. Television apparatus. (11/6/28, Germany.)
17 867 Westinghouse Lamp Co. Vacuum electric tube devices. (11/6/28, U.S.)
17 937 L. W. Wild and Wild-Barfield Electric Furnaces, Ltd. Electric ovens.

June 12th.

18 064 C. B. Backer. Electric heating devices.
17 729 Belling and Lee, Ltd. Electric terminals, couplings, etc.
18 067 British Thomson-Houston Co., Ltd. Electric oscillation generators. (12/6/28, U.S.)
18 068 British Thomson-Houston Co., Ltd. Electric circuit interruptors. (14/6/28, U.S.)
18 071 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Mercury arc rectifiers, etc.
18 000 G. H. and H. F. Collins. Connectors for electrically-operated appliances.
18 070 Edison Swan Electric Co., Ltd., and S. Rogers. Electric fittings.
18 101 Gottschalck Elektro Ges. Fitting pieces for electric tubular lamps. (19/7/28, Germany.)
18 082 I.G. Farbenindustrie A.G. Accumulators.
18 005 A. Karolus. Synchronous electric motor systems. (13/6/28, Germany.)
18 048 Kolster-Brandes, Ltd. Aerial navigation. (12/6/28, U.S.)
18 047 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Piezo-electric crystals.
18 109 E. M. Lee. Electric terminals, couplings, etc.
17 995 H. F. McLoughlin and F. W. Osborn. Electric switches.
18 029 M.O. Valve Co., Ltd., and D. A. Rankin. Cathodes for electric discharge tubes.
18 118 E. H. Odell. Violet ray apparatus.
18 062 G. Pedrazzo. Alternating current machines. (12/6/28, Italy.)
17 994 A. Reynolds and Wandsworth Electrical Manufacturing Co., Ltd. Tumbler switches.
18 055 J. Riedl, Siemens Bros. and Co., Ltd., and H. G. Wood. Electric cable joints.
18 119 Rohm and Haas A.G. Manufacture of sheets, etc., permeable to Röntgen, etc., rays.
18 120 Rohm and Haas A.G. Manufacture of alloys for sheets, etc., permeable to Röntgen, etc., rays. (13/6/28, Germany.)
17 995 Simplex Conduits, Ltd. Electric switches.
18 095 L. Thurm. Transmitting and receiving apparatus for television, etc. (8/9/28, France.)
18 105 W. W. Trigos (Aktiebolaget Isoleringsmaterial). Machines for manufacturing insulating webs, etc.
18 065 G. E. Whitehead. Electrical switchgear.
18 066 G. E. Whitehead. Electric switches.
18 122 J. Winfield. Sealing accumulator cells.
18 015 H. F. Yelland. Protective device for electric circuits.

June 13th.

18 212 W. K. Alford and Igranic Electric Co., Ltd. Frame aerials.
18 141 J. A. Crabtree. Boxes for containing electric switches, etc.
18 142 J. A. Crabtree. Electric fuses.
18 199 Crompton, Parkinson, Ltd. and G. Page. Switchgear.
18 242 M. J. Y. Drake del Castillo (*née* Schrambach). Brushes for commutators. (6/12/28, France.)
13 158 Electrical Research Products, Inc. Electromagnetic devices. (23/6/28 U.S.)
18 175 Everlite, Ltd. Galvanic cells.
18 270 C. V. H. Garnett, A. J. Parsons, and W. S. Smith. Electrical adaptors, etc
18 274 Gral Ges. fur Elektro-Industrie. Electric lamps. (28/9/28, Germany.)
18 160 E. V. Hayes-Gratze. Electro-deposition of chromium.
18 134 R. E. Houghton. Switching for tuning wireless circuits.
18 204 International General Electric Co., Inc. Electric resistance seam welding machines. (13/6/28, Germany.)
18 232 Marion Steam Shovel Co. Controlling heating of dynamo-electric machines. (31/8/28, U.S.)
18 209 Maschinenfabrik Oerlikon. Heavy current contact for electric switches. (27/6/28, Switzerland.)
18 235 J. E. Pollak (Associated Telephone and Telegraph Co.). Photoelectric plates. (1/6/28.)
18 268 Siemens Schuckertwerke A.G. Means for switching in automatic switches. (14/6/28, Germany.)
18 277 Siemens-Schuckertwerke A.G. Regenerating process for step transformers. (14/6/28, Germany.)
18 240 Tchoubritch, Derval and Co. Automatic circuit-selectors for telephony. (11/4/27, France.)
18 251 Telefunken Ges. fur Drahtlose Telegraphie. Reproducing sound and talking films. (13/6/28, Germany.)
18 205 Victor X-Ray Corporation Oil-immersed X-ray apparatus. (14/6/28, U.S.)
18 175 A. V. Watson. Galvanic cells.

June 14th.

18 322 Associated Electrical Industries, Ltd., and W. A. Coates. Electrical switches.
18 417 Automatic Coil Winder and Electrical Equipment Co., Ltd. Coil winding machines.
18 418 J. L. Baird and Television, Ltd. Television apparatus, etc.
18 420 K. Baranowski and Einstein's Electro Chemical Process, Ltd. Electro-deposition on non-conducting surfaces.
18 421 K. Baranowski and Einstein's Electro Chemical Process, Ltd. Progressive plating.
18 352 British Thomson-Houston Co., Ltd. and C. G. Garton. Mercury, etc., switches.
18 332 Crauford and Frost (Wireless), Ltd., and C. C. J. Frost. Metallic earthing devices.
18 416 F. Creedy. Alternating current machines.
18 384 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Circuit arrangements for generating high frequency oscillations.
18 366 E. Dobson. Electric switches.
18 319 Electroflo Meters Co., Ltd. Fluid flow meters.
18 325 Electro-Mechanical Brake Co., Ltd., and A. W. Kemp. Tramway vehicles, etc.
18 400 H. A. Ewen. Electric inductances and capacities.
18 312 M. B. Field. Magnetic compasses.
18 415 A. Hall. Magneto ignition systems.
18 351 International General Electric Co., Inc. Frequency convertors. (19/6/28, U.S.)
18 409 N. Japolsky. Synchronous a.c. machines.
18 347 J. Y. Johnson (I.G. Farbenindustrie A.G.) Manufacture of electrodes for accumulators.
18 403 H. J. Osborn. Electrically actuated valves for liquids.
18 423 M. Payne. Electrical measuring instruments, etc.
18 359 T. A. B. Ternan. Wireless receiving apparatus.
18 350 Victor X-Ray Corporation. X-ray fracture tables. (14/6/28, U.S.)
18 372 W. Whiffin. Safety device for electric circuits.

June 15th.

18 485 Associated Electrical Industries, Ltd. Dynamo electric machines. (16/6/28, U.S.)
18 486 Associated Electrical Industries, Ltd. Insulators. (16/6/28, U.S.)
18 448 C. F. S. Bilbrough. Daniell type voltaic cells.
18 501 British Thomson-Houston Co., Ltd. Resistances. (15/6/28, U.S.)
18 487 A. S. Cachemaille (Westinghouse Lamp Co.). Production of carbonaceous filaments on metallic bodies.
18 489 E. N. Elford, and Graham Amplion, Ltd. Wireless transmitting apparatus, etc.
18 481 General Electric Co., Ltd., and R. F. Proctor. Electric furnaces.
18 454 A. Horstmann, Horstmann Gear Co., Ltd., and K. J. Horstmann. Time switches.
18 438 F. A. Lindemann. Device for amplifying currents.
18 520 K. F. T. Oppegard. Electric signalling device. (15/6/28, Germany.)
18 446 W. A. Small. Canopy for suspending lighting glass fittings.
18 455 R. Stehle. Electrical drive for gramophones.
18 496 G. Turner. Tuning coil for wireless receivers.

COMING EVENTS.

Saturday, September 7th.

Institution of Electrical Engineers (North Western Students' Section).—Inaugural meeting. Visit to the River Dee Hydro-Electric Station at Chester.

Monday, September 9th.

Electrical Contractors' Association (Hastings Branch).—Lewcocks' Restaurant. Ordinary meeting.

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting.

Association of Public Lighting Engineers.—Town Hall, Bournemouth. Sixth annual general meeting and conference.

Tuesday, September 10th.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Electrical Contractors' Association (Leicester Branch).—Corridor Chambers. Ordinary meeting. 2.30 *p.m.*

Association of Public Lighting Engineers.—Town Hall, Bournemouth. Conference; paper by Ex-Bailie J. MacDougall on "Lighting and Rating," 10 *a.m.*; paper by Mr. C. H. Woodward on "Compromise in the Use of Illuminants for Public Lighting," 2.30 *p.m.*

Tuesday, September 10th—Thursday, September 12th.

Iron and Steel Institute.—Festival Hall, North-East Coast Exhibition, Newcastle. Autumn meeting, commencing at 10.15 *a.m.* on Tuesday, and 10 *a.m.* on Wednesday and Thursday.

Wednesday, September 11th.

Association of Public Lighting Engineers.—Town Hall, Bournemouth. Conference, 9.30 *a.m.*; papers by Messrs. J. F. Colquhoun and E. J. Stewart on "American Practice in Public Lighting," and Mr. J. S. Dow on "Private Lighting as a Supplement to Public Lighting," 10 *a.m.*

Electrical Contractors' Association (Eastbourne Branch).—South Street. Ordinary meeting.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting. 5.30 *p.m.*

Thursday, September 12th.

Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Thursday, September 12th—Saturday, September 28th.

Shipping, Engineering and Machinery Exhibition.—Olympia, London.

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THE ELECTRICIAN

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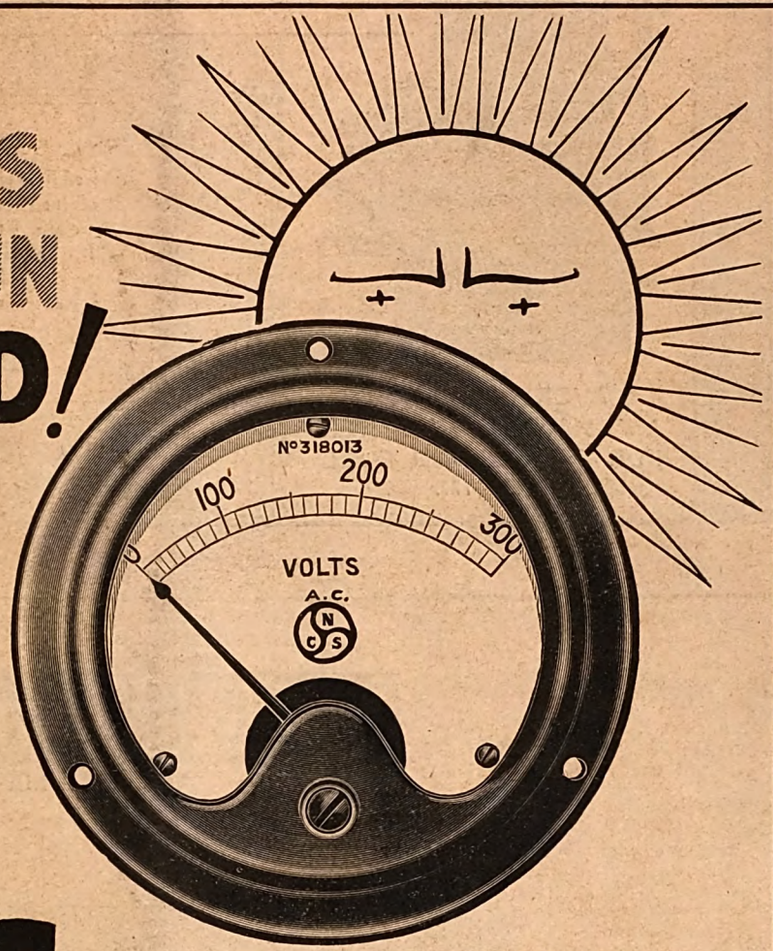

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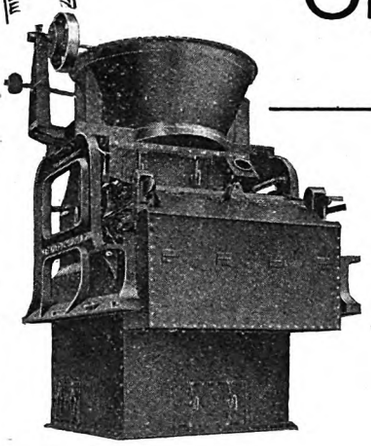

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Current Topics.

Blackburn Again!

READERS, and especially those engaged in the municipal electricity supply field, will remember the remarkable series of pin-pricking experiences through which Mr. P. P. WHEELWRIGHT, the engineer and manager of the Blackburn Electricity Department has passed during the past few years, and will doubtless know what construction to place upon events of still more recent occurrence. The trouble, so far as we are able to judge, started in 1925, when a councillor who set himself up as a critic of the electricity undertaking was prevailed upon to put his criticisms into writing. This he did to the tune of twenty questions or so, to which he received duly suitable answers. These, however, generated seventeen more questions, and as this geometric progression bade fair to become endless, the borough auditors were called upon to prepare a report on the undertaking. Their findings amounted to a vindication of the electrical engineer, but the contention of the critics that in supplying electricity in bulk to Darwen, Blackburn was giving something for nothing, seems to have remained a sore point. The electrical affairs of Blackburn again became public property about the end of 1927, when, following a virtual recapitulation of the former complaints, Messrs. Handcock and Dykes were asked to report on the undertaking. The result again was a complete vindication of the technical efficiency of the undertaking to which Mr. WHEELWRIGHT has devoted 25 years of his life. The inquiry clearly showed that the whole trouble was on the financial side, the interest and sinking fund charges being out of proportion to the output of the station, and the only conclusion to be drawn was that the blame for the position definitely rested with the Electricity Committee, and not with the electrical engineer. The report also drew attention to the unwieldy size of the Electricity Committee—which then numbered 22 members—and to the fact its meetings only occupied 15 minutes a month. The independence of the source of this report naturally ensured its acceptance, and it was hoped that its lessons would be taken to heart. Unfortunately for the public of Blackburn, they were not, for quite recently the old troubles cropped up again, and a special sub-committee was set up by the Electricity Committee to inquire into the organisation and management of the Electricity Department. So far as we have been able to discover, no specific charge was made against the engineer, but this sub-committee recommended, and the Council has agreed, that the organisation and management of the commercial side of the undertaking are unsatisfactory, that the services of Mr. WHEELWRIGHT be dispensed with as from September 30th, and that he be paid one year's salary in lieu of notice. This decision was made despite the strong letters of protest from the Association of Local Government Officers and the Associated Municipal Electrical Engineers, who both asked for a public inquiry, and there the matter apparently ends, for it is obvious that a body which is competent to engage a man is perfectly free to dismiss him for any reason it likes. The question "Is it cricket?" was apparently not worth consideration.

Administration of Municipal Undertakings.

THE position at Blackburn exists, in embryo at least, in certain other towns, and under the present system of municipal administration—if system it can be called—we fear the trouble will spread. Surely the time has come for frank recognition of the fact that unwieldy bodies of laymen, whose opinions are apt to be dictated by considerations of local party politics, are not good enough for a great and developing industry like electricity supply. The suggestion has already been made that the Electricity Committee, as such, should be replaced by a small panel of business men, forming an *ad hoc* body, the executive and administrative board of which would correspond to the boards of directors of private concerns, the local authorities themselves corresponding to the shareholders. In this way, existing geographical difficulties could be overcome by making a single executive responsible to more than one local authority, as shareholders. Membership of these executives would be decided on business and technical efficiency rather than on the representation of interests—consumers' or other—and salaries and other financial considerations would be such as to facilitate the maximum exchange of the officials between different undertakings. There are many difficulties in the way of such a plan, but we do think that something of the kind is definitely needed to place municipal administration on a more businesslike basis. If the Blackburn trouble does nothing more than promote action along these lines, it will not have been altogether valueless.

Water Power in Japan.

THOSE who have studied the Japanese technical Press will probably have noticed the difference of opinion that exists as to the sufficiency or otherwise of existing electricity supply undertakings. We hear, on the one hand, of big

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enterprises going forward to meet demands expected in the near future, and, on the other, of large projects held in abeyance because a sort of glut of electricity is feared. The latest news to hand regarding water power development is of a similar nature. One paper contains a statement that " the five big water power corporations have jointly applied to the authorities to obtain permission to postpone the development of new hydro-electric power for five years, in order to meet the threatening over-supply of electricity." Yet the same paper also records a proposal by the Toho Electric Power Co. to develop five sites along the Kanko River and two sites along the Yokusen River having an aggregate generating capacity of some 200 000 kW.

The Shipping World and Electrification.

If anyone requires to be convinced of the penetration of electricity into the maritime world, then an early visit to the Shipping, Engineering and Machinery Exhibition, at Olympia, is recommended. Steam has for so long claimed attention in the shipping branch of engineering that, with the exception of all-electric ships, the man-in-the-street is inclined to believe that the only application for electricity to shipping in general is that of lighting. For this reason the Olympia show may be regarded from the electrical point of view as a form of propaganda, for there the general public will learn of the many ways in which electricity is supplanting mechanical and steam-operated methods of control afloat. Apart from the obvious uses such as wireless communication, forced draught by electric fans, the driving of winches by electricity, etc., the megaphone has been replaced in many vessels by the " noise-proof " telephone, while the taking of soundings by electrical means is another application. Engine room and bridge are becoming more and more akin to each other, and whereas in the past the engineer and the deck officer have been in many cases social enemies, present day developments are such that the common ground of electrical application will soon produce a type of seafarer who, if need be, could lend a hand both above and below the water line.

Railway Electrification.

The Minister of Transport's decision to appoint a Committee to examine into the economic and other aspects of the electrification of the railway systems in Great Britain, with particular reference to main-line working, is one that we can welcome, even if we are not able, on our present knowledge of the problem, to anticipate an overwhelmingly pro-electrification report at the end of the inquiry. Suburban electrification in practice has more than justified the hopes of those who had the courage to proceed with it in the proper way. But, so far, only one railway has made any real progress in this field and there is much suburban electrification still to be done, and we hope that this localised question will not be lost sight of merely because the Government Committee is investigating main-line electrification. It is officially pointed out that the appointment of the Committee will in no way interfere with or delay any particular schemes of suburban or other electrification which may be otherwise under consideration, so that the railways will have no excuse for shelving the urgently needed suburban conversions which have long been beyond the scope of any inquiry. Anxious as we naturally are to see an extension of electrification to the main-line railways of this country, we are not sufficiently optimistic to believe that this or any Committee will materially speed up progress in this direction. If it does we shall be agreeably surprised. What we do expect, however, is that the work of this Committee will revive interest in main-line electrification, and, if the electrical world can only take advantage of this interest to convince the railways of the economic benefits derivable from an electrification policy, real development will be possible. Although the engineering policy of most of our railways is still, in our view, unduly dominated by mechanical engineers with a more or less pronounced bias against electrical working, the desirability of having an electrified system is more widely acknowledged to-day than it was even five years ago. The chief remaining obstacle is the economic one, and as the railways are now, more than ever, compelled to look first to the financial side, it is to this aspect that the most thorough and dispassionate examination must be directed. The constitution of the Committee is such that suggestions of pro-electrical sympathies are not likely to be made. On the contrary, the failure to include even one expert on railway electrification is one that is difficult to explain.

Building Research.

The building trade is to be congratulated on its appreciation of research work and more particularly on its application of electricity thereto. The latest development with a view to economy in the building of houses is the installation in a special house at Garston, near Watford, of an apparatus consisting mainly of recording instruments which, responding to variations of atmospheric temperature, operate electric heaters through relays. The purpose of the apparatus, we understand, is to permit of observations, in conditions closely resembling those of the interior of a small house, of the effect of sunshine on a roof, the flow of air through an outside wall, the effect of flues, wall ventilators, etc., and the electrical equipment is required to maintain an even temperature, control being obtained by atmospheric variations on a copper cylinder bringing into circuit the remainder of the apparatus. It is stated that the result of these observations will permit of the building of houses which will more effectively insulate their inmates from cold winds, heat waves, etc. It has, we understand, already been discovered that winds approaching 15 miles per hour cause air to pass steadily through a 9 in. outside brick wall at the rate of 8·5 cubic inches per square foot per hour !

Electricity Doomed !

News to hand from New Zealand makes it apparent that before very long electricity will be almost as obsolete as paraffin and gas, for two research workers at Christchurch have discovered a new force called Chromadyne, which is claimed to be " ten times more powerful than electricity." Though this startling discovery is only put forward as being an important feature of work which has led to the development of an electro-magnetic process which transmutes certain elements into gold, its possible effects on the electrical industry would seem so devastating as to suggest that we should all pack up and begin to look around for employment offering more stable prospects. For the moment no details are available beyond those we have given, though the discovery is said to be the subject of investigation by the New Zealand Government. We must therefore await, with such a show of patience as we can assume, a full account of the great new force and the price at which it will be found possible to supply per unit.

Our Youthful Octagenarians.

It is certain that those who originated the " too old at forty " theory were not acquainted with the outstanding exceptions in the electrical industry, which still has as active members a goodly number of men who are nearing or have exceeded twice that age. Some of them are so youthful in appearance and behaviour that it would be a shame to draw attention to their calendar ages by mentioning their names here. The need for discretion is, however, less obvious in the case of Col. Crompton—who has just entered into partnership with Dr. A. Ekstrom, to act as consultants on agricultural electrification problems—as his exact age is well known. That such a pioneer as Col. Crompton, who has been associated with so many important developments right from the earliest days of the electrical industry, should still be able to apply his fund of experience to one of the big problems of the future is a hopeful augury for ultimate success in this field.

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INSULATED MAGNET WIRES.

The Properties, Development and Uses of Enamel, Cotton, Silk, Artificial Silk, Paper and Asbestos Coverings—Some Useful Tests.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR, D.S.O., M.C., B.Sc.

AN examination of some of the earliest examples of electrical apparatus shows clearly that one of the serious difficulties confronting the pioneer designers was that of obtaining suitably insulated conductors. In many instances the only available means was a wrapping of tape. The position to-day is very different, for there exists a large variety of types and grades adequate even to exacting requirements, and from these a suitable selection can usually be made for any particular purpose.

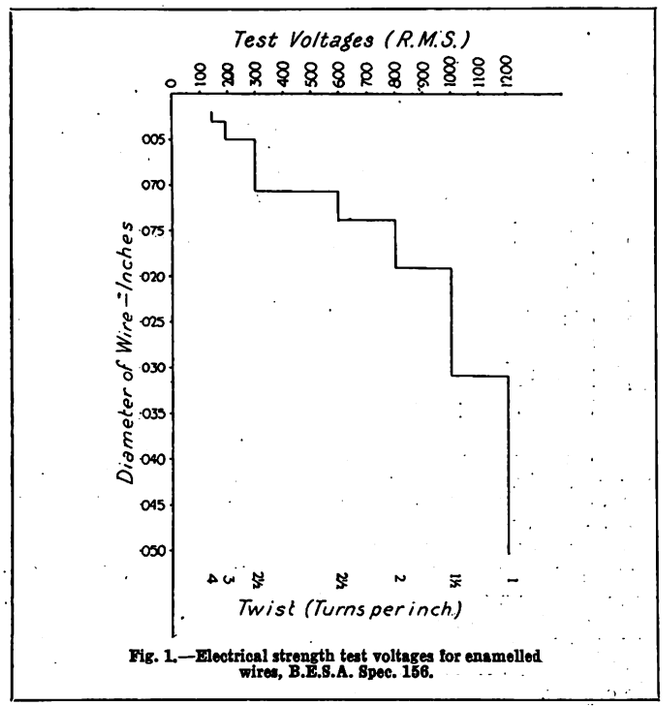

Fig. 1.—Electrical strength test voltages for enamelled wires, B.E.S.A. Spec. 156.

The materials which are commonly used for the insulation of magnet wires, and which are here reviewed, are enamel, cotton, silk, artificial silk, paper and asbestos. The insulation may be in one or more layers according to the space available and the insulation value required. Table I is a list of the insulation coverings most generally recognised, arranged in order of thickness of insulation.

Lack of Standardisation.

In view of the fact that insulated conductors are an essential item in practically all electrical apparatus, it may seem strange that, except in one instance, standard specifications for them do not exist. Some reason for this lies in the large variety of wires available, and the fact that the leading manufacturers are willing to produce almost any size of wire to private specification. In such circumstances it is only natural that electrical designers do not press for standardisation, preferring the free field for selection of special sections with a view to maximum efficiency of apparatus. The preference for special sizes is more marked with regard to the ribbons of rectangular section. With ordinary round conductors there is little excuse for the lack of specifications except the difficulty of selecting for standardisation any one of the existing gauges. These gauges, of which three are in common use in this country and seven or eight more abroad, have designation numbers which bear no direct relation to each other, or, which is more important, to the exact size of wire, and are thus a continual source of confusion.

The only B.E.S.A. specification at present issued for insulated wires (No. 156) is based on B.E.S.A. specification No. 128, which relates to bare annealed copper wire. In these specifications the sizes of wire are designated by their actual diameters expressed in decimals of an inch, a method much preferable to the use of arbitrary numbers.

While the selection of wire sizes remains to be settled at some future date there seems to be no reason why recommendations should not be issued concerning the various coverings and the performance which may be expected of them under various conditions, and it is to be hoped that the preparation of such recommendations may shortly be undertaken. In the following notes an attempt is made to review some of the more important features, and the present state of development of the materials used.

ENAMELLED WIRES.—These find extensive use, especially for work in which the space is very limited, as, for instance, the coils of telephones, meters, relays and very small motors, and to some extent on larger sizes of apparatus. The process of enamelling consists of passing the wire through baths containing the enamel, and thence up through heated towers in which, as it travels, it is baked at a temperature of about 600 deg. C. This high baking temperature, being only slightly below the annealing temperature of copper, is the cause of considerable difficulty, especially on the thinner sizes, because the wire stretches easily during the process, and thus both diameter and electrical resistance are reduced. Another trouble is the liability to formation of pinholes in the coating. This trouble has been attributed in part to the accumulation of small copper particles in the baths, and considerable improvement has been effected by subjecting the enamel to a constant filtering process. In most instances a single coating of enamel is given, but in some cases where an extra thick coating is specified the process is repeated.

TABLE I.—APPROXIMATE INSULATION THICKNESS OF VARIOUS COVERING ON WIRE OF 0·040 IN. DIA.

Type of Insulation.	Radial Thickness of covering (inch).
Enamel	0·0011
Single silk	0·001
,, ,, on enamel	0·0017
Double silk	0·0018
,, ,, on enamel	0·0019
Superfine single cotton	0·002
,, ,, ,, on enamel	0·0025
,, double cotton ,, ,,	0·003
Ordinary single cotton	0·003
,, ,, ,, on enamel	0·0035
Superfine double cotton ,, ,,	0·0035
Ordinary ,, ,,	0·005
,, ,, ,, on enamel	0·0055
Paper	0·0055
Asbestos	0·0055
Triple ordinary cotton	0·007
Asbestos tape and single cotton	0·007

Two electrical tests are required by the B.E.S.A. Specification. In one test two 16 in. lengths of the wire are twisted together, and the test voltage at any frequency between 25 and 100 cycles is applied between the two strands for 30 seconds. The twist and the test voltages for the various sizes of wire are shown in Fig. 1.

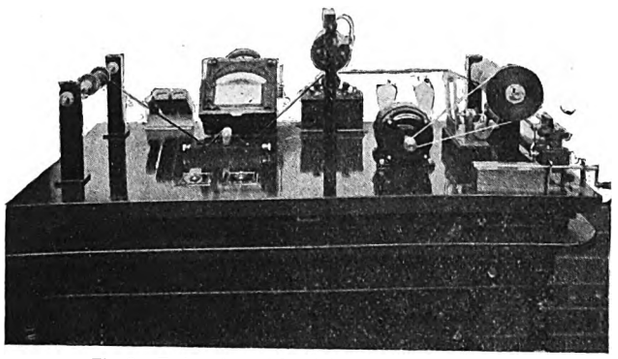

Fig. 2.—Test equipment for pinholes in enamelled wire.

The second specified test is for pinholes or cracks, and calls for a sample of wire not less than 50 yd. long to be drawn through a mercury bath ⅜ in. long, a pressure of 6 V d.c. being applied between the wire and the mercury. Not more than 40 contacts are allowed in any 50 yd. length. An apparatus used by the Automatic Telephone Manufacturing Co. for this test is shown in Fig. 2.

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Great improvements in the manufacture of enamelled wire have taken place since the specification was issued, and the pinhole test is now often made at 50 or even 100 V with satisfactory results, showing that the requirements might well now be strengthened with regard to both the voltage and the number of permissible failures in this test.

An examination of the enamelled wires generally offered

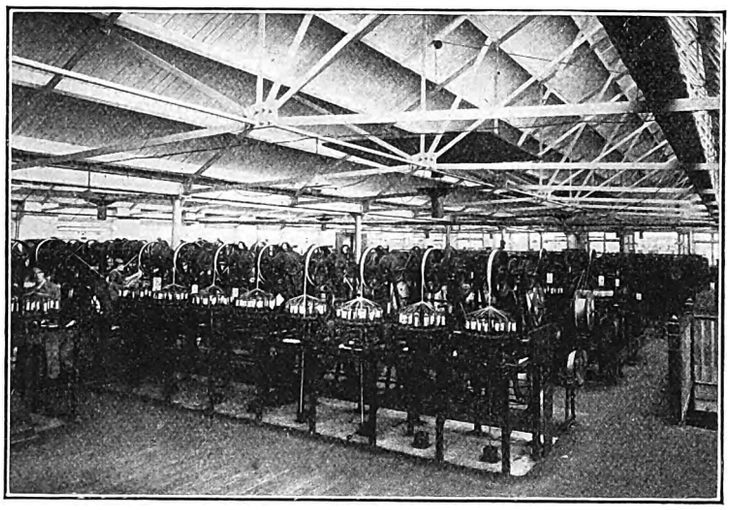

Fig. 3.—The braiding of armature wires at the London Electric Wire Co.'s works.

indicates that two distinct classes of varnish are used, one having a resin base and being distinguished by its lighter colour in comparison with the black of the bitumastic base varnish. The light varnish may, however, appear quite dark in thick coatings. A general preference exists for the lighter coloured covering.

Impregnation Problems.

Impregnation of enamelled wire coils is not often carried out, and it is undesirable without special knowledge of the materials. For this reason it is well in any instance to seek the advice of the wire manufacturers, who will either offer a special enamel or recommend a suitable impregnation. The necessity for impregnation can often be eliminated by using a layer of impregnated paper or varnished silk between layers. Impregnation is often called for when all that is required is a surface protection or seal against the penetration of moisture, as, for instance, for service under tropical conditions.

With regard to the use of enamelled wire a further point of importance is that while " wild " wound coils of this material may often be used satisfactorily on direct current supplies, their use on alternating current supplies is rare and generally undesirable, since in a.c. service a short circuited turn or turns will cause intense local heating through auto-transformer action. When used for such service enamelled wire should be wound in even formation with additional insulation between layers.

Silk-covered Wires.—These are used chiefly where economy of space is essential, together with greater reliability than can be expected with enamelled wires. The silk covering has a radial thickness less than any other fibrous covering, and therefore finds useful application for such items as smaller

Table II.—Variation of Thickness of Silk Coverings, with diameter of wire.

Bare wire diameter (inch).	Radial thickness of insulation. Single silk (inch).	Double silk (inch).
0·0032—0·0076	0·0014—0·0018	0·0028—0·0038
0·0084—0·0048	0·0015—0·002	0·003—0·004

motor windings and other small coils, especially for a.c. service. In most other respects it is inferior to cotton ; it has poor mechanical strength and resistance to abrasion ; it does not withstand temperature so well, and it does not absorb impregnation materials so effectively. This latter point is of some importance, since, like cotton, silk is hydroscopic, and in many applications requires a sealing of varnish.

The silk covering, like the cotton covering, consists of a number of filaments in parallel laid side by side to cover the bare copper or other conductor completely, by one layer in the case of single silk covering or in the case of double covering with the addition of another complete layer applied in the opposite direction. Further to the statement given in Table 1 it should be noted that the radial thickness varies with the diameter of the wire and in the case of silk represents additions to diameter as shown in Table 2.

Most silk coverings are very uniform. The silk is capable of being dyed almost any shade, but a dark green colour is most usually adopted and is preferred by most coil winders as it tends to reduce the eye-strain which often results from the use of fine wires for hand-wound coils. The dyes used are generally soluble in most of the impregnating and coating varnishes, a point which should be considered, if varnished coils of attractive appearance are desired. On account of the deterioration of the silk at high temperatures, any impregnation should be carried out at only moderate temperatures, and drying temperatures should not exceed about 120 deg. C.

Cotton Covered Wires.—Cotton coverings are applied as has been described for silk. Fig. 3 shows one of the factory operations of the London Electric Wire Co., illustrating the use of braiding machines by which an extra protection is given to wires for some special applications such as armature leads. The coverings are of two kinds, ordinary cotton and superfine cotton. With the latter it is possible to obtain a double covering of radial thickness not exceeding that of the ordinary single cotton covering, but the material being finer and specially selected, makes the superfine grade more expensive. The radial thicknesses of the common types of cotton covering, increasing with the diameter of the wire, are shown approximately in Table III. For the most commonly used type, the double (ordinary) cotton covered, Fig. 4 shows the percentage increase of weight to be allowed for the covering, a factor to be considered in cases where large consignment purchases are influenced by fluctuations in the price of copper.

The soft texture of the cotton gives it good covering power and produces a good bedding and cushioning of the windings. Good specimens of cotton-covered wires should be capable of being bent round a diameter equal to ten times that of the bare wire without the strands parting sufficiently to show the copper.

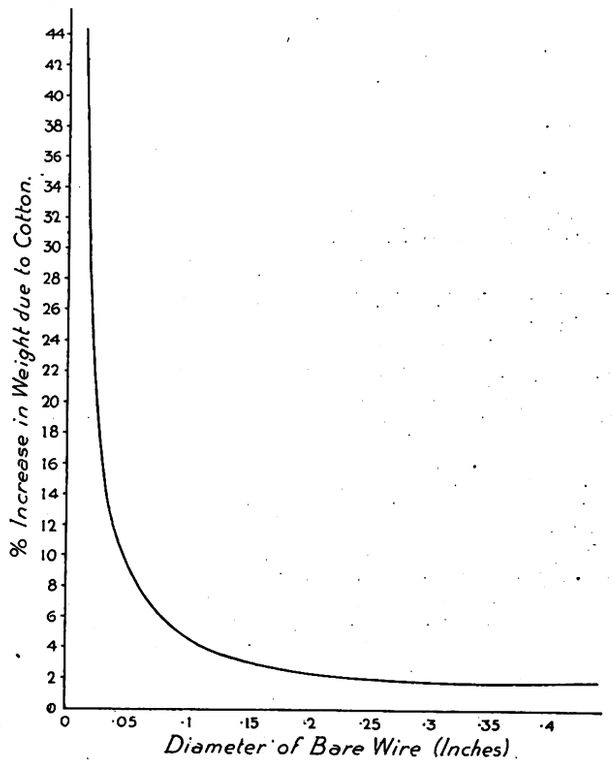

Fig. 4. Indicating increase in weight due to cotton with wires of different diameters.

Cotton-covered wires are the most popular for impregnation purposes owing to the absorbency of this covering for the impregnating varnishes. For many applications a further point of importance is the fact that, with the sole exception of asbestos, the cotton covering withstands most effectively the high temperatures met with in some electrical apparatus.

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ASBESTOS COVERED WIRES.—The main feature of asbestos insulation for this, as for other purposes, is its maintenance of electrical strength under conditions of high temperature.

TABLE III.—VARIATION OF RADIAL THICKNESS OF COTTON COVERINGS, WITH DIAMETER OF WIRE.

Bare wire diameter (inch).	Radial thickness of insulation. Single ordinary or double superfine.	Double ordinary.	Triple ordinary.
0·0032—0·0072	0·0033—0·0043		
0·0076—0·018	0·0035—0·0045	0·007—0·0085	
0·019 —0·08	0·004 —0·005	0·007—0·009	
0·084 —0·092	0·0045—0·0055	0·008—0·010	0·013—0·015
0·096 —0·104	0·005 —0·06	0·009—0·012	0·014—0·015
0·108 —0·116	0·006 —0·007	0·009—0·012	0·015—0·016
0·120 —0·128	0·007 —0·008	0·012—0·015	0·017—0·018
0·132 —0·212			0·018—0·021

There is practically no difference between the results of electric strength tests on asbestos-covered wires under normal conditions at 20 deg. C. and at about 180 deg. C., and while the limit temperature for motors and generators is generally assumed to be 90 deg. C., there are cases on record of machines with asbestos insulation having been run for years under severe overloads at temperatures for which cotton-covered wire would have been quite inadequate.

Considerable improvement has recently been made in asbestos-covered wires, and these can now be obtained in either black or white finish with a radial insulation thickness not greater than that of ordinary double cotton covering. Until recently asbestos coverings usually took the form of thin asbestos tape wrapping, and this process is still used for large conductors and for conductors of rectangular section. For small conductors, however, the radial thickness of the insulation by this method is excessive owing to the overlap of the tape at each turn. In an improved process for producing a thinner covering the wire is first passed through a bath of binding medium and then through a chamber in which finely divided asbestos is kept in a state of agitation by draughts of air. The wire, with the covering of particles which have adhered to its moistened surface, is then passed through dies to compress and smooth the coating, which is sometimes secured by a spaced winding of single cotton thread.

The chief objection to the use of asbestos for wire insulation is its comparatively high cost, which is usually about 50% above that of cotton. There is little doubt however, that, if a more general use were made of the material a great decrease could be made in manufacturing costs, not only of the

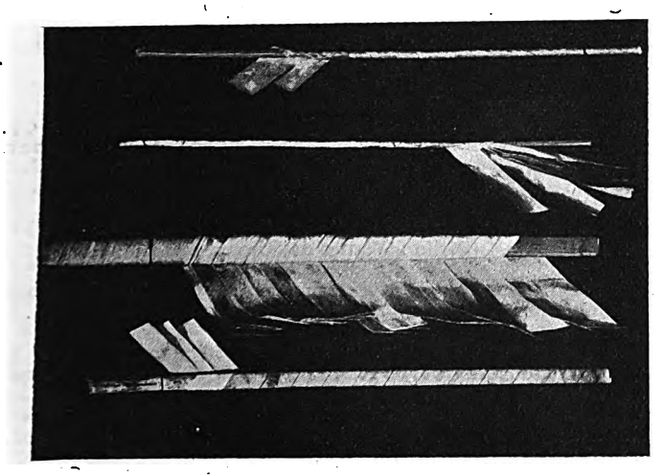

Fig. 5.—Paper insulated wires and ribbons.

insulated wire but also of electrical machines, if the higher operating temperatures which would be practicable with such insulation wire permitted.

PAPER INSULATED WIRES.—At one time the use of paper for the insulating of wires was practically confined to cable manufacture, in which its application has proved very successful. This success, together with the many excellent qualities of the material as a wrapped insulator, have in recent years led to its adoption for small single conductors, especially for use in oil as transformer windings, and especially for high voltages, and its use in this connection may now be regarded as well established.

In using paper-covered wires care should be taken to benefit by the experience of the cable makers, most of whose specifications demand either pure manilla paper or a mixture of pure manilla and a specially selected chemical wood pulp

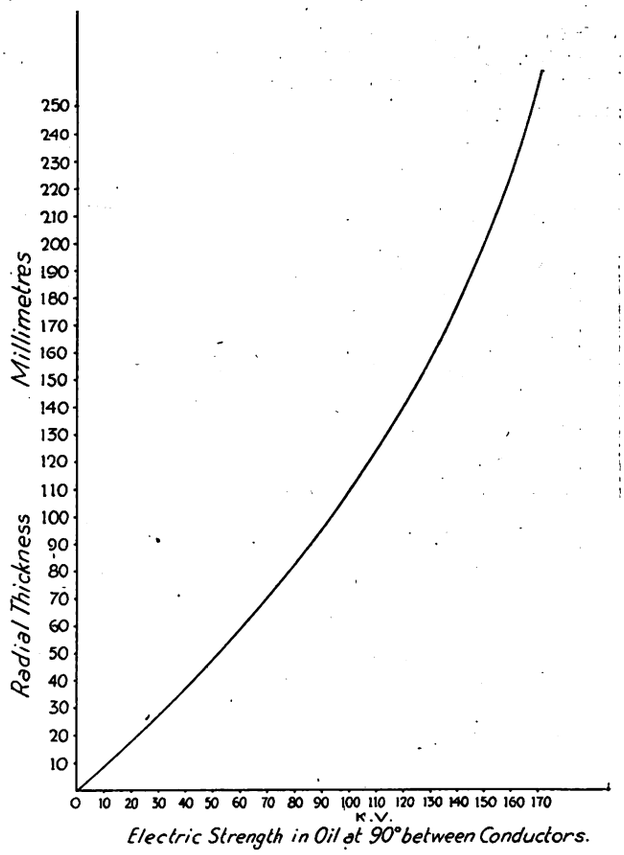

Fig. 6.—Results of electric strength tests on paper insulated wires bent round twice the overall diameter.

paper. A very interesting report has been prepared by the Underground Systems Committee and issued by the National Electric Light Association of America, dealing with the rate of deterioration of impregnated wood pulp paper. The tests recorded in this report cover a period of 48 weeks and show remarkable maintenance of properties—a feature of great importance in view of the fact that much of this type of insulated conductor is being used for large power transformers, including those now being built in this country for the 132 000 V grid schemes.

As illustrated in Fig. 5, the paper insulation is built up to its required thickness by winding a number of paper ribbons from reels which are mounted on a rotating frame or frames through which the wire passes. By this means exact displacement of the turns and the layers is obtained. The paper should be of good non-ageing, mechanically strong, yet absorbent character. Each layer should be staggered with reference to the layers immediately adjacent to it. The turns of the final layer should be overlapped on themselves to prevent the paper unwrapping itself when the wire is cut. The turns of each inner layer should butt exactly without overlap, this being particularly important for the multi-layer varieties. Some of these have as many as 50 or more layers, giving a radial thickness of as much as 0·25 in., and in such cases, or even with fewer layers, the overlapping of inner layers tends to bind the turns and prevent them from giving the slip requisite in bending, with the result that the paper is strained or distorted. For the same reason windings in different directions are undesirable.

Fig. 6 shows the results of electrical strength tests in oil at 90 deg. C. on paper-insulated wires bent round a diameter equal to twice the overall diameter of the insulated wire. For less severe conditions of test an increase of about 18% on these values can be obtained.

The authors' acknowledgements are due to the Metropolitan-Vickers Electrical Co., for permission to use information, and to the Automatic Telephone Mfg. Co. and the London Electric Wire Co. for photographs.

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BOOK REVIEWS.

Speech and Hearing. By HARVEY FLETCHER. With an introduction by H. D. ARNOLD. (London: Macmillan and Co.) Pp. xv+331. 21s. net.

This fascinating book will be of great help to telephone and radio engineers on an aspect of their work which is a closed book to many of those who are engaged in the design of this apparatus. The present volume is really the outcome of a comprehensive survey of speech and hearing inaugurated some fifteen years ago in the research laboratories of the Bell Telephone System, to obtain the fundamental facts on which to base the design of apparatus and systems for telephone use. As the work proceeded it was appreciated that better and more precise instruments must be developed, and thus a large part of the effort was directed to the evolution of devices which would convert sound waves into electrical form and re-convert them again to sound with the least possible distortion. This work brought unexpected rewards in the shape of immediate valuable applications to the telephone and talking machine industries. In any properly visualised fundamental research some unlooked-for applications will usually arise, but the magnitude of the results which followed the adoption of the devices produced by these experiments to the phonograph, to radio, and to the deaf could hardly have been visualised by the most ardent supporter of speculative research.

LIGHTING HOTEL EXTERIORS.

AN attractive exterior lighting scheme adopted by the East African Power and Lighting Co. at a Nairobi hotel. The lighting on the balcony by the use of short standards provides a setting which might well be utilised in the lighting of hotels in England.

The work is not yet complete, though the progress made in some directions has been remarkable, and all interested in the engineering side of problems of speech and hearing will certainly find in this book considerable food for thought. The volume is conveniently divided into four parts:—speech, music and noise; hearing; and the perception of speech and music. R.C.

Electrification of Steam Railroads. By KENT TENNEY HEALY. (London: McGraw-Hill Publishing Co.) Pp. xiii +395. 25s. net.

It is hardly an exaggeration to suggest that one of the greatest obstacles to the spread of railway electrification has been created by some railway electrification enthusiasts with their "electrify at all costs" theories. Such enthusiasts—and the reviewer has been one—have been so concerned with the advantages of electrical working that they have either disregarded or discounted important economic considerations. Mr. Healy's book opportunely comes to put us right on these matters, and his chapters on the general economics of electrification and the economics of motive power are worthy of careful study. As the author himself points out in his introduction, the extreme cases in railway transportation that demand electrification have all been turned over to electrical operation, and further progress must depend upon the presentation of a development that is definite in its results, refined and standardised in its design and reasonable in its cost. As this point is approached the problems of electrification tend to emphasise the economic engineering relationship of the development to transportation rather than the engineering phases of the development itself. The improvements made by competitive means of transport while electrification was in the development stage are also of importance. Improved locomotive design, with better heat utilisation and better conversion of steam power into tractive effort, have helped the railways to increase the return on their capital by investing in improvement of existing methods rather than in electrification. If electrification is to develop further against this competition it will be all the more necessary to effect economies in design and operation with the result that the economic becomes of even greater importance.

The author does not deal entirely with economics; some sixteen chapters are devoted to operational and constructional matters, but through all the economic viewpoint is discernible. After dealing with the source of and contracts for power for electrical operation, the author deals with sub-stations, distribution switching and sectionalising, overhead supporting structures, overhead contact and rail distribution systems, collection of current for the distribution system, traction motors and the control of current thereto, transmission of power from the motors to the driving wheels, and the mechanical elements of locomotives.

There are also useful chapters on the co-ordination of traction, circuit stray electric fields, general problems of motive power, and organisation and personnel for electrical operation.

R. T. L.

Radio Telegraphy and Telephony. By RUDOLPH L. DUNCAN and CHARLES E. DREW. (London: Chapman and Hall.) Pp. x + 950. 37s. 6d. net.

In attempting to cover the field indicated in the title and to make it a complete text-book for students, technical and non-technical, the authors have set themselves a task which would appear to be difficult even in a work of 950 pages. They appear, however, to have done their work both thoroughly and well, and they take the reader, with frequent useful analogies, from first principles up to the present complex application of those principles.

Mr. Duncan is director of the Radio Institute of America, where Mr. Drew is instructor in radio and in charge of the Electrical Division. Differences in terminology may therefore be expected. In most cases the terms used, such as "vacuum tubes," are familiar to, though not used by, English engineers. Some data regarding American receiving and transmitting valves which is included in an appendix is of little interest in this country.

BOOKS RECEIVED.

"Engineering Electricity." By R. G. Hudson. 2nd ed. (London: Chapman and Hall. Pp. viii+214. 12s. 6d. net.

"The Universe Around Us." By Sir James Jeans. (London: Cambridge University Press.) Pp. x+352. 12s. 6d. net.

Journal of the Institution of Electrical Engineers. Vol. 67, No. 392. (August.) (London: E. and F. N. Spon.) 10s. 6d. net.

Proceedings of the Cambridge Philosophical Society. Vol. XXV, Part III. (London: Cambridge University Press.) 7s. 6d. net.

"Radiotechnik." Part VI. "Die Elektrischen Wellen." By Prof. F. Kiebitz. (Berlin: Walter de Gruyter and Co.) Pp. 125. 1.50 marks.

Technical Dictionary in Seven Languages. Vols. I—IV. Compiled by E. Slater. (London: Sir Isaac Pitman and Sons.) Pp. ix +2211. £8 8s. net.

"Electromagnetic Problems in Electrical Engineering." By B. Hague. Oxford University Press. (London: Humphrey Milford.) Pp. xiv.+359. 30s. net.

"Relais und Schutzschaltungen in elektrischen Kraftwerken und Netzen." By R. Rudenberg. (Berlin: Julius Springer.) Pp. vii+281. 25.50 marks.

"Code for Protection Against Lightning." Miscellaneous publication, Bureau of Standards, No. 92. (Washington: U.S. Government Printing Office.) 25 cents.

Researches of the Electrotechnical Laboratory. No. 254. "General Theory and Earthing Device of Alternating Current Bridges." By K. Ogawa. Pp. 45.

Science Abstracts. Secs. A. and B. Vol. 32, No. 380. (August 25). Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s. Annual subscription, 30s., or 50s. for both sections.

"Public Cleansing: Collection, Treatment and Utilisation of Town Refuse." By the "Jas. Jackson" Study Circle of the Birmingham Corporation Salvage Department. (London: Ernest Benn, Ltd.) Pp. xix+251. 18s. net.

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DEVELOPMENT OF INSULATING OILS.*

Historical Features Reviewed—Some Unsolved Problems—The Evaluation of Sludging Characteristics—Co-operation with Oil Refiners—Drums and Tank Wagons.

By C. B. SKINNER, Fel. A.I.E.E.

THE integrity of modern transformers and circuit breakers, which are essential features of all transmission systems, is due in no little measure to the insulating oil now universally used in such apparatus. While the oil is a relatively minor part of these devices as a whole, its failure will mean the failure of the apparatus. This is increasingly true as the voltage of the transmission systems is increased. The service rendered by the oil used as an insulating medium in electrical apparatus is radically different from service rendered by oil in any other class of service, and there are rigid requirements for oil for this service which do not exist where oil is used for other purposes. In fact, insulating oil may be considered a material of construction rather than a material of maintenance.

The history of the development of transformer oil begins with the first high-voltage transmission lines in the early '90s, and a continuing and increasing amount of research has been required from that day to this to meet the ever increasing demands for quality and service. The electrical manufacturers' representatives who have been responsible for the quality of the oil used in transformers, have faced many difficulties and have experienced much grief from time to time, due to troubles for which the oil was either directly or indirectly responsible. The fact that such difficulties are rare at the present time does not indicate that further attention to this important material is unnecessary, but, on the other hand, it does indicate that a full knowledge of the difficulties which have been so disturbing in the past and a constant watchfulness have mitigated these difficulties to a point where the modern transformer gives perhaps less trouble than any other piece of apparatus in the transmission system.

It may be useful to review some of the history of the development of modern insulating oil and to indicate some of the problems still unsolved, so that a full appreciation by those responsible for the purchase and use of transformer oil may be had. This history may be divided into various chapters, each concerned with the items which seemed to be the cause of the major difficulty prevailing at each particular stage of the development.

When the study was made of oil which might possibly be suitable for the insulating and cooling of the transformers to be used on the Pomona transmission line, this being the first constant high-potential transmission line undertaken in the United States, the study included oils of a very wide variety. Mineral oils, from the heaviest cylinder oil to the equivalent of gasoline and benzine, were carefully studied. Similar tests were made of quite a number of vegetable oils, such as linseed, rosin oil, etc. These early tests were almost entirely on the basis of the determination of dielectric strength. In making these studies, glass containers were used, with the testing electrodes immersed in the oil in a horizontal position. It was observed that any foreign matter visible to the naked eye would line up between the testing electrode and materially reduce the dielectric strength upon the application of the testing voltage, and this at once showed the necessity for extreme care in keeping oil free from foreign matter, such as dirt, fibres, carbonised oil, etc. The necessity for cleanliness has been emphasised again and again with each major increased step in transmission voltages.

The Age-old Tradition.

In these same tests it was discovered that oil which had been heated in an oven for a considerable period had a much higher dielectric strength than the average oil delivered from the oil manufacturer. There is, of course, the age old tradition that oil and water will not mix, but there seemed no possible explanation for this increased dielectric value of the oil other than that it was due to the elimination of moisture, and that oil was subject to the same difficulties in this regard as most of the other materials of insulation, which, at that time, had already begun to be studied in considerable detail.

To test the theory (which from the ancient tradition seemed more or less absurd) that moisture was responsible for the low dielectric value of many oils as delivered, and their changed value on continued heating, the following test was made :—

An extremely small amount of water in increasing quantities was added, each addition being a fraction of a drop per gallon of oil, the oil being very thoroughly agitated after each addition. This gave undoubted evidence that very minute amounts of water in the oil would cause radically decreased dielectric strength. This has been checked again and again during the intervening 35 years, and more drastic precautions have been found necessary from time to time as the voltage of transformers has been increased. In fact, it has been found necessary to go to the precaution of treating, not only insulation of the transformer to eliminate moisture, but the whole structure, iron-core frame, etc., and to see that the oil which is introduced, especially in transformers for the higher tension, is, as we now say, absolutely dry.

Drying Methods.

The method of drying oil in the early stages of the transformer oil development was accomplished by giving it an extended heating at moderate temperature ; but, it was later found that although the temperatures used were relatively low, sufficient oxidation might be started to affect the endurance of the oil against sludging in service. This led to an investigation of other methods of drying and cleaning the oil, and this is now accomplished by various filtering and centrifuge processes. The requirement is that all suspended matter and all traces of moisture be removed. This is a difficult matter, due to the fact that while the ordinary refining process results in practical elimination of all free water the final moisture to be removed is apparently in solution in the oil.

In the early construction of transformers, the enclosing cases were frequently made of thin material with deep corrugations and with wooden tops, these wooden tops being used for giving added insulation to the outgoing leads. After experience with a number of disastrous fires with constructions of this kind, the underwriters demanded oil having the highest possible flash and fire test, consistent with satisfactory transformer operation. As a result of this requirement, new studies were made and heavier bodied oils adopted. At the same time, attention was given to a better mechanical structure for the transformer cases. The use of this heavier oil resulted in more sluggish circulation and consequently poorer cooling, and apparently little or no decrease in the fire hazard so far as the oil itself was concerned. Soon after this change was made a new and unexpected phenomenon appeared, and this phenomenon is now generally denominated as sludging. This has been, perhaps, the most difficult matter to deal with that has arisen in connection with transformer oil.

It was soon discovered that a lighter and more fluid oil was in general less subject to sludging than the heavier oils adopted to minimise the fire hazard ; but the adoption of these lighter oils merely minimised and did not cure the sludging trouble. As the units became larger and service more difficult, the sludging trouble increased to a point where transformer manufacturers and users found themselves in more or less continual trouble, and very extended studies were made to determine the cause and cure of sludging.

To date, however, no oil has been found which will not deposit sludge if the conditions of its use are sufficiently severe. By very careful selection and by eternal vigilance on the part of the oil refiners and the transformer manufacturers, oil has been produced which, under all modern operating conditions, is sufficiently free from sludge to give satisfactory service.

Unfortunately, no test has yet been devised which will quickly determine whether or not oil will be free from sludging in service, although an enormous amount of experimental work has been done and many tests have been proposed and used. This question has been considered of sufficient importance to warrant the co-operation of all the nations interested in the production and use of transformer oil to determine, if possible, a satisfactory sludging test. For this purpose, and working through the International Electroctechnical Commission, duplicate samples of oil have been submitted to laboratories of half a dozen or more countries and extensive tests have been entered into for this purpose. At the meeting of the International Electrotechnical Commission in Bellagio, Italy, in October, 1927, the report of the various committees and laboratories which have been working on this question for two or three years, was to the effect that the various tests

* From a Paper presented at the Pacific Coast Convention of the A.I.E.E., Santa Monica, California, September 3rd–6th, 1929.

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were conflicting in that one test might indicate that a given oil was satisfactory, while another test just as strongly defended might indicate this oil to be unsatisfactory.

The result of this meeting showed that additional work must be done in order to determine which of the half-dozen methods now more or less used would be the satisfactory one to evaluate oil with regard to its sludging characteristics, or whether an entirely new test must be devised. To date, the only safe procedure which has been found has been that of very careful laboratory tests combined with extended service tests, in many cases of several years, to bring the assurance that oil used would show a minimum of sludging troubles.

In the meantime, the oil refiners and transformer manufacturers, and some of the users of transformers, have been making continual studies, both as to the cause and elimination of sludging troubles, and for the securing of oil that would be free from this trouble and would meet all of the other rigid requirements for transformer oil to be used with the highest voltages.

An Accidental Discovery.

Through a pure accident, discovery was made fairly early in the study of insulating oil to the effect that free sulphur would very greatly impair its insulating value, and much study was given at one time to the effect of both free and combined sulphur in minute quantities in insulating oil. In like manner, the residual acids from the refinery treating, and other effects of processing the oil, had to be studied with each change in the refining process, to bring about the various characteristics necessary to meet the increasingly exacting requirements on this material.

The manufacturers of apparatus using insulating oils early found it necessary to establish intimate working relations with the oil refiners, and as they were required to meet one requirement after another, the refiners developed a special procedure from the selection of crudes in the fields through the final manufacturing process. The characteristics governing selection at the wells include such items as pour point, freedom from wax, amount of sulphur, etc. In some cases, special pipe lines are used to transport the crudes selected for the manufacture of insulating oils to the refineries, in order that contamination with other crudes shall not occur. During the preparation of the distillage by the vacuum process, rigid inspection for viscosity, flash, and pour point control is maintained, and where these oils require treatment with strong sulphuric acid or equivalent, special care is required to see that there is complete neutralisation and thorough washing of the oil, and this treatment is sometimes followed by redistillation in order to remove all traces of reaction products remaining after washing.

The advent of outdoor transformer and switching stations imposed an entirely new requirement of transformer and switch oil, namely, the necessity of a very low congealing temperature, or as commonly known, a low-cold test. Transformer oils which were found relatively satisfactory for the old indoor stations had a relatively high-cold test and consequently were not satisfactory for outdoor stations, particularly in cold climates. This requirement for a low congealing temperature is even more rigid in connection with oil switches, which must be free to operate at any temperature which may be reached in the climate where an outdoor switch may be installed.

This requirement for low-cold test oil demanded a whole new series of studies, as the general requirements for indoor apparatus, such as freedom from dirt, moisture, and relative freedom from sludging, etc., had to be maintained. In all such studies it had to be kept in mind that there was a constantly increasing demand for oil, and that any oil selected must be available in sufficient quantity to supply this demand. Fortunately, oil has been developed through the co-operation of the oil refiners and transformer manufacturers, which meets the previous requirements, as well or better than any which had been previously used, and which has a sufficiently low-cold test to be satisfactory for all ordinary outdoor service.

From almost the beginning of the development of oil for cooling and insulating apparatus, mainly transformer and circuit breakers, the transformer and circuit breaker requirements seemed to be sufficiently divergent, so that no single oil would be satisfactory for both services. Certain characteristics of these two services are in opposition to each other, while certain other desirable characteristics coincide. For example, all the early tests and service experience seemed to indicate that the circuit breaker required a relatively heavy and sluggish oil, while the transformer required as light an oil as possible, in order that it might have sufficient fluidity under all conditions to circulate rapidly and transfer the heat from the transformer windings and core to the outer cooling surface. Again, an enormous amount of experimental work was necessary to find an oil which would meet both these services sufficiently well so that utilities would not be required to carry two or three grades of transformer oil and one or more grades of circuit breaker oil. Several years of laboratory and field tests were carried on before there was sufficient confidence on the part of the electrical manufacturers to justify their making a positive assertion that an oil was available in quantity which had all the necessary requirements sufficiently well fulfilled to justify the stand, that this oil could be used as a universal oil for all insulating and cooling work in transformers and circuit breakers.

It has been found that the balance between the two services is very close, and that continued experimental work and the closest possible inspection and testing of oil of this class must be followed in order that the necessary characteristics may be maintained, suitable for all services and for all climates. The advantages of universal oil are so obvious that no arguments are necessary to justify its use.

Throughout the whole history of the development of oil for insulating purposes the question of shipping containers and storage arrangements has been found to be of the utmost importance. In the early days oil was shipped in wooden barrels which were made tight by the use of ordinary glue. This led to interminable trouble from the glue getting into the transformers and other devices, helping to reduce the dielectric strength and to increase the sludging characteristics. Seepage of the oil and the entrance of moisture were common difficulties with such containers.

With the introduction of steel drums a new kind of trouble developed. Additional dirt and scale was introduced into the oil, and it was soon found that the more rigid cleaning and inspection methods did not always eliminate such difficulties. When the use of oil arrived at a point where tank car shipments were necessary, still further difficulties (dirt and water) appeared. It was not at all uncommon in the early days to find a considerable quantity of water in the bottoms of the tank cars containing transformer oil. Condensation of moisture, both on the exposed surfaces of the tank cars and on the surface of the oil itself, were almost inevitable and imperfectly protected openings frequently resulted in additional trouble.

It had been assumed that steel drums with continuous lead washers under the bungs, would be both proof against seepage and proof against entrance of moisture, but this was found not to be the case, and the writer of these notes is familiar with a considerable number of cases where drums of oil, with bung-up exposed to the weather, were found to contain a considerable quantity of water, when it was absolutely certain that these drums were moisture free on shipment. This was apparently brought about by the heating and cooling of the oil due to the changes in temperatures, between day and night, the resulting pressure and vacuum helping the entrance of water at the bung when this would be covered by rain water.

The Oil Refiner's Task.

The oil refiner has accomplished, therefore, only a part of his necessary functions when he has prepared the proper grades of oil. These must be so handled after preparation as to deliver them in the cleanest possible condition to the ultimate consumer. Amounts of contamination which would be inconsequential in lubricating oils will cause no end of trouble in transformer oils, so that an entirely new scheme of preparation of packages and lines of special containers have been found necessary. Every container returned to the refiner must be most carefully inspected and put in such condition that it will not cause any of this contamination. The removal of rust and traces of foreign materials which have been stored in the containers, and every other kind of contamination must be absolutely removed, or the container is rejected and many rejections occur in the inspection of such returned containers. The time between the final cleaning and inspection of containers, and the time of filling with the transformer oil and sealing must be an absolute minimum.

Even with all the possible precautions taken, the practice of making individual inspection of oil in drums after allowing a suitable time for foreign matters to collect at the bottom, has been found essential.

There is, of course, involved the shipment of small packages ranging in volume from one to five gallons. Disastrous experiences were run into through the use of ordinary "run

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of mill" tin cans in the early stages of the business. It later developed that the cause of this was the use of packages, the seams of which had been soldered with acid flux, and the latter material had worked into the cans with harmful results to the dielectric strength of the oil which the packages contained. This has resulted in oil refiners installing a special line of machinery for the manufacture of these containers under such control as to insure against the possibility of their becoming contaminated with materials which cause harm to the oil. Not only must these containers be manufactured properly, but they likewise must be tested for leakage and suitably dried before filling, after which they must be immediately capped with the specially designed fittings which have been brought out for this purpose only. Furthermore, it is necessary that inspection be made of a certain portion of the tin containers in order to insure that the quantity of the oil ready for shipment in these packages is running uniformly satisfactorily.

During a few months of the year, under carefully controlled conditions, insulating oils of good dielectric strength could be delivered in ordinary tank cars, but, because of the extreme difficulty of properly drying them before filling, it is unsafe to guarantee deliveries in these tanks at all seasons. As a result of this condition, special cars have been developed with steam coils surrounding the shell, these coils in turn being protected by wooden jackets covered and protected with heat insulating material and thin sheet iron. Only with such equipment as this has it been found possible properly to dry out the cars before filling to such an extent that delivery of dry oil at destination can be assured. With these cars it is possible not only to dry them out before filling is started but during this operation to maintain the temperature of the cars at such a figure as to assure freedom from contamination of moisture in the oil in the cars before the filling is completed and the cars sealed.

A specific example, involving serious difficulty, will be of interest. Serious operating trouble was experienced with some high-voltage circuit breakers, each containing over 3 000 gallons of oil. The oil in this particular case was not the standard usually supplied by the manufacturer. As a result of the difficulty the oil had to be completely replaced in an outdoor installation in severe weather, and in the final investigation the trouble was traced to faulty manufacture of the oil and to sloppy methods in its handling.

It was early seen that some sort of cleaning and drying apparatus was essential in connection with the use of oil in some quantity, as is required in the average power transmission station. Various schemes of filtering, drying, and cleaning oil have been devised. These included filtering through paper, unslaked lime and the application of heat and various other schemes. The plan which seems to give the best all-round results and is now quite generally used, is that of the use of a centrifuge type of cleaning device, often combined with a pressure filter. Extensive research work in connection with the universal oil referred to above, has shown that both the transformer and switch oil may often be reconditioned after it has become contaminated, to a point where it is unsatisfactory for use. Apparatus for this purpose is now manufactured and very specific instructions have been worked out for reconditioning and for testing reconditioned oil.

Parallel Work.

Parallel to the research work on the oil itself, many improvements have been made in transformer and circuit breaker designs to aid in eliminating the difficulties encountered in connection with the oil problem. It was early proved through research work that exposure of oil to the air very greatly increased its tendency to sludge, and that this increase with a given exposure was more or less a function of the temperature of the oil. This led to transformer case designs, which included the conservator type of case, and, more recently, the inert air scheme, which automatically provides in service for the elimination of both moisture and oxygen from contact with the oil in the transformer. While these devices have not changed the tendency of the oil to sludge under a given set of conditions, they have aided very greatly in changing service conditions, thereby inhibiting sludging and maintaining oil in a clean and dry condition.

The final result of all this work, which has extended over a period of more than 35 years, has been to make the modern transformer and circuit breaker with the universal oil, among the most satisfactory devices which goes into the modern equipment for the production, transmission, and utilisation of electrical energy.

A NEW METAL.

Substitute for Platinum in Radio Valve Manufacture.

THE development of a new metal known as "Konel," which is credited with being much stronger than other metals at high temperatures, and which can be used extensively in the moving parts of internal combustion engines and other hot locations, has been announced by the Westinghouse Electric and Manufacturing Co. following the granting of foreign patent rights.

Originally developed by the Westinghouse Research Laboratories as a substitute for platinum in the manufacture of filaments for radio valves, the new metal was discovered to be harder to forge than steel, and to be very tough at high temperatures, when most metals lose their strength.

The new metal was created by Dr. E. F. Lowry, a graduate of Ohio State University, and American engineers predict many uses for it. As a substitute for platinum, Westinghouse officials are authority for the statement that Konel already is saving approximately £50 000 monthly in the manufacture of radio valves.

Platinum costs approximately £36 per ounce, while the new substance costs only a few shillings a pound. The life of Konel filaments is said to be approximately ten times longer than that of other filaments. Valves with filaments made of the new metal are operated 175 degrees colder than tubes with platinum filaments but with the same emission.

WRINKLE FINISHES.

New Appliance Coating Composed of Resins and Processed Drying Oils.

A NEW decorative finish applicable to domestic accessories, and known as the wrinkle finish, is described by "Electrical Manufacturing" as a coating composed of resins and processed drying oils in balanced ratio which, on baking, forms a resistant surface of delicate traceries exhibiting an artistic textured effect to flush switch plates and other accessories.

Wrinkle finish may be used either in a single coat or with added coats of lacquer or enamel, and it may be produced in natural colour or with bronze or aluminium powders or pigments that give a wide range of shades. It is applied by spraying, and is hardened by baking. The baking temperatures for metal, glass, earthenware and similar objects vary between 180 and 400 deg. F., and the time of baking between ½ and 5 hours.

APPLICATIONS OF TIN.

Comprehensive Plan of Research on Industrial Problems.

A COMPREHENSIVE plan of research into the industrial applications of tin, including its properties as a preventive of corrosion and its economic use in the production of more efficient high-speed machine-bearings, has been announced by the Tin Industrial Applications Committee. The Committee was recently formed, in direct co-operation with the British Non-Ferrous Metals Research Association, to investigate the properties of tin, with a view to standardising its most efficient applications for industrial purposes, and to finding new uses for the metal.

"We feel," the hon. secretary stated in an interview, "that the line of investigation now being undertaken will develop a new and successful preventive of corrosion. The research into bearing metals is of equal, if not greater, importance, since the efficiency of all engines is dependent upon them. Researches are being undertaken in several other directions.

"The commercial value of such research is well illustrated by a recent discovery. It has been found that by mixing a small amount of tin with lead, and adding a smaller quantity of another non-ferrous metal, the strength of the lead was increased enormously, as was its resistance to corrosion and cracking. This new alloy will mean the saving of many hundreds of thousands of pounds a year to the electrical industry and the building trades."

Since the formation of the Tin Industrial Applications Committee was announced a few weeks ago inquiries and applications for membership have been received from almost every part of the world. American and British industries using tin are taking an active interest. The committee is in close touch with many of the principal United States tin-consuming industries.

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ELECTROMAGNETIC TESTING FOR MECHANICAL FLAWS IN STEEL WIRE ROPES.*

Production of Electromagnetic Rope-tester Solves an Old Problem—The Main Principles of the System and its Application.

By T. F. WALL, D.Sc., D.Eng., M.I.E.E.

TESTING for mechanical flaws in wire ropes by means other than those which require them to be subjected to actual mechanical tension has been a problem of very long standing. Undoubtedly the ideal method for making such a test is a magnetic method.

No harm is caused to the rope by making the test, which can be made a routine performance without any interference with the rope itself or its fittings. The need for such a test is specially evident in the case of winding ropes of the locked-coil type as used in collieries, since an internal flaw may develop without any external sign being visible.

In the present paper the author gives an account of the researches carried out during the last two years, which have resulted in the development of a design of an electromagnetic rope tester.

Test-results are given which were taken on an actual rope specially constructed for the purpose, and in which hidden flaws were arranged. The method described makes it possible to detect in a rope broken wires which represent a flaw of less than 5% in the total cross-section.

Application of Method.

The application of this method for testing wire ropes is not confined to the winding and haulage ropes used in collieries. Other important uses are for testing the ropes used for cable trams, mooring-ropes for airships, and ropes used in suspension bridges, etc.

Briefly stated, the principle employed is to make use of a "search band of flux" which is linked with a search-coil system, and the disturbing effect on this search band of flux due to a flaw in the rope is shown by a corresponding change in the e.m.f. induced in the search-coil system.

For several reasons a.c. excitation is preferable to d.c. excitation. In the latter case the induced e.m.f. would be transient, whereas, with a.c. it will persist as long as the faulty portion of the rope is included in the magnetic circuit. Thus, with a.c. excitation, the rope may be passed through the magnetic system at as low a speed as may be desired. A further advantage of a.c. excitation is that a thermionic valve type of voltmeter may be used, and the effects of the induced e.m.f. amplified to any extent.

An ink recording instrument is arranged to be operated by the induced e.m.f. in the search-coil system, and in this way permanent records of tests on a rope are obtained so that the development of any incipient flaw may be carefully watched.

In the next section of the paper the flux-penetration in a wire rope for excitations of different frequencies is discussed. In the case of a locked-coil rope, it is important to realise that when the flux has penetrated through the locked-coil sheaths it will be practically uniformly distributed throughout the remainder of the cross-section, since the wires are so effectively stranded. In this respect the effect of screening on the flux distribution is quite different from the case of a solid material.

Tests on samples of locked-coil rope supplied by different manufacturers were made. In the original paper the results are shown in diagrammatic form.

The general conclusion to be drawn from the test results is that, for a.c. excitation at frequencies not greater than 20 cycles per sec., the flux is practically uniformly distributed throughout the whole cross-section of the rope, if the peak value of the flux density is not less than about 16 000 lines per cm^2. A serious objection to the use of a.c. excitation at frequencies as high as 50 cycles per sec., is the large iron losses that are produced in the rope at the high densities.

It has long been known that the magnetic permeability of an iron wire depends on the mechanical stress to which it is subjected, but apparently no results of experiments of wire magnetised by a.c. excitation have yet been published. It was therefore considered desirable to study this effect, which is illustrated in the original paper by curves showing the relationship between flux density and the peak value of the excitation ampere-turns with the rope stressed to a varying extent.

One important result is that, for high values of the excitation, the effect of mechanical stress on the permeability is only small. When testing wire ropes it is therefore important to use high values of the saturation, so that the disturbing effects of internal stresses become relatively unimportant. Such disturbances may be still further limited by adopting a method based on the comparison of two sections of the ropes which are not far apart.

In the next section of the paper the author discusses the effects of eccentricity of the rope in the tunnelled holes through which it passes, and he then proceeds with a general description of the principle of the electromagnetic rope tester.

This consists of a laminated iron yoke having machined tunnelled holes in the projecting limbs, and the wire rope is arranged coaxially with the tunnelled holes. An exciting coil is so wound on the yoke that it is symmetrically placed with respect to the two limbs.

One method of working which gives good results is to use two search-coils, balanced against each other. Then there will be no resultant induced e.m.f. in the search-coil system when a sound piece of the rope is passed through the gap, but immediately a faulty portion of the rope enters the magnet yoke a resultant e.m.f. will be developed. This null method enables a very small change in the flux to be detected.

In order to detect the induced e.m.f. in the search-coil system due to a mechanical flaw in the section of the rope it is desirable to use a type of voltmeter which requires a very small current to operate it, because in this way reactance and reaction effects which would be caused by the voltmeter current in the search-coil system will be eliminated. A resistance for the search-coil system of about 1 000 Ω has been found to give good results. Details of actual tests on a wire rope are given in the final section of the paper.

From the data presented in the original paper it is evident that, whilst a flaw of about 3% of the total section is detectable, a flaw of about 5% produces a pronounced effect, whilst a flaw of about 18% gives a very striking disturbance of the record.

The Users' View Point.

It may be stated that, from the practical point of view of the actual user of a winding rope, any mechanical flaw of less than about 10% is preferably not shown on the record of a rope test, since small flaws do not produce any serious mechanical weakness of the rope likely to endanger its safety, and it is only when about 10% of the section fails that a watch need be kept on the faulty section to see whether it develops further.

A complete rope-testing equipment, built in accordance with the principles explained in this paper, has been installed in the Hatfield Main Colliery near Doncaster. The diameter of the locked-coil winding rope which it is used to test is $2\frac{1}{8}$ in., and the pit shaft is 860 yd. deep.

* Abstract of a paper presented to the Institution of Electrical Engineers.

NEW ALLOYS.

Composition of Loading Material for a Projected Transatlantic Telephone Cable.

THE new continuously-loaded submarine telephone cable projected by the American Telephone and Telegraph Co. for the transatlantic service will employ as loading material one of a new series of alloys which are designated as "perminvars." These are composed of nickel, cobalt, and iron, to which may be added small amounts of non-magnetic metals such as molybdenum. They are characterised by high resistivity and by having a constant permeability over a wide range of magnetising force.

The conductor will be insulated with a new material, "paragutta." Submarine cables in the past have been insulated with gutta-percha or closely related materials, and in a few cases with rubber compounds. Paragutta makes use of similar raw materials, but so combined and treated as to give superior electrical properties with mechanical properties similar to gutta-percha.

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THE ELECTRIC HOMES CAMPAIGN.

Preliminary Details of Arrangements for Big Domestic Electrification Drive—A Proposed Home Wiring Specification.

READERS will have gathered from a letter in our correspondence columns last week some idea of the scope of the E.D.A. Electric Homes Campaign, the first section of which will operate from October, 1929, to June, 1930.

The objects of the campaign are :—

(1) To encourage the demand for, and the provision of, adequate wiring in the homes of Britain.

(2) To combat the idea that the installation of electric wiring is expensive.

(3) To show that the cost of using electricity for purposes other than lighting is small compared with many other household expenses.

(4) To encourage complete domestic electrification.

Investigations that have been made show that the majority of houses in this country, and even those being built to-day, are without means for using electricity for purposes other than lighting; and it is within the knowledge of many in the electrical industry that the selling and use of electrical domestic appliances is much retarded because suitable plugs are not always available.

An example of what is happening in many parts of the country is to be seen in a good class residential district not far from London, where a large number of three and four bedroom detached houses are being built, sold and occupied as fast as they are finished. These excellent houses are complete with modern conveniences in the way of sanitation, heating and electric lighting, but without a single plug provided anywhere in the house for the convenient use of electricity for other purposes.

Efforts have already been made by the E.D.A. to combat this state of affairs. In the Wiring the Homes of Britain Campaign, and later in the E.D.A. Circle Campaign, it was found possible to secure the interest of the public by means of demonstration houses in which adequate wiring, amongst other things, was shown.

Following these campaigns, the Electrical Association for Women, at the suggestion of the E.D.A., undertook an "Outlet" Campaign which has been carried on with such force as their resources in personnel and finance have permitted.

The interest of many architects, builders, supply engineers, contractors, etc., who have attended the E.A.W. meetings has been aroused; much, however, remains to be done in this direction. The ultimate idea of the E.A.W. was to establish the Women's National Specification (which they have published) as a guide for those who desire to provide adequate wiring in their houses for the convenient use of electricity.

An essential part of the Campaign will take the form of an E.D.A. Electric Home Wiring Specification which will be recommended to the public. The specification will be designed for the instruction of the public, including architects and builders, and to bring about a larger use of standard material, improve the standard of wiring, and to increase the number of points wired in each house.

Advice on Wiring.

A further advantage of the E.D.A. Electric Homes Campaign will be to give the man in the street reliable information as to how his house should be wired—of which at present he is generally ignorant—and to tell him where to apply for advice.

With increased facilities for using electricity in the home, the consumption of electricity will undoubtedly increase, so that the campaign will be of advantage to supply undertakings, as well as to manufacturers, wholesalers and contractors.

A somewhat similar campaign in Canada and the U.S.A., known as the Red Seal Campaign, has created a definite increase in the number of points on consumers' premises. In the "League News," issued by the Society for Electrical Development, dated January, 1929, figures are given for several principal cities in the U.S.A. which show an average increase of 65% in the number of points per installation, an increase in current consumption of more than 100%, and 43% greater value of electrical merchandise in Red Seal homes, as compared with others.

These figures should serve to inspire all sections of the electrical industry in Great Britain, and particularly individual undertakings and firms, to support the campaign wholeheartedly.

The E.D.A. Council is of opinion that the objects of the campaign will be greatly assisted by the adoption of suitable tariffs, and extension of assisted wiring schemes and increased facilities for the easy purchase of installations and appliances.

The proposed E.D.A. Home Wiring Specification will cover the number and size of all plugs, switches, etc.; in the installation. It will not be a complete technical specification, but will deal chiefly with the installation lay-out.

Every campaign must appeal essentially to the ultimate user of the product advertised—in this case the householder. When he is convinced that the use of electricity for purposes other than lighting is desirable and is economically advantageous to him, he will create a demand which will eventually have to be satisfied by builders and others providing for his needs. The campaign will, however, endeavour to hasten matters by directing publicity towards the builder and others, who are concerned with supplying houses.

Lines of Appeal.

The appeal to the public will be designed principally to show :

(1) The necessity for making provision for electric lighting in every home.

(2) The advantages of using electricity for purposes other than lighting.

(3) The necessity for providing adequate wiring for complete electric service in the home.

(4) The increased value of a house after such adequate wiring has been installed.

To the builders and housing authorities the Campaign will endeavour to show :

(i) That the public require their houses to be adequately and safely wired.

(ii) That the propaganda which will be directed towards the public in this Campaign will have the effect of creating a demand for such houses, and

(iii) That the E.D.A. propose to use every effort to circulate information concerning houses which are adequately wired for complete electric service in the home.

It is submitted that if builders can be convinced that there is a real public demand for E.D.A. Electric Homes they will provide them. Further, in view of the increased competition, any additional selling argument will be welcomed by them.

To the landlord the Campaign will endeavour to show that it is to the landlord's advantage to wire his property, as there is a demand for adequately wired houses, and that, even on property which is subject to the Rent Restrictions Act increased rents sufficient to pay a return on the additional outlay can easily be obtained.

In order to encourage architects to design houses on the lines of the E.D.A. recommendations, efforts will be made to convince them of the value of the electrified home. Those architects who attended E.A.W. meetings on this subject expressed themselves generally anxious to design such houses. The architect is often willing to receive advice and guidance concerning electrical installations in small houses. At the present time his usual plan is simply to allow in his quantities a sum, often totally inadequate, for wiring; the E.D.A. Specification should improve matters in this direction. Efforts will also be made to interest house agents and building societies.

A booklet, with illustrations and diagrams, is being prepared for issue to the public. The booklet will show in a forceful manner the reasons why the complete wiring of a house should be undertaken. This booklet, and the Association's advertisements, will invite the general public to apply for the E.D.A. Electric Home Wiring Specification.

The first draft of the E.D.A. Electric Home Wiring Specification has been prepared by the Campaign Committee and submitted to the following Associations and Committees for their consideration :—The Electrical Association for Women; the Electrical Contractors' Association, Inc.; the Cable Makers' Association; the Accessories Section of the British Electrical and Allied Manufacturers' Association; the Electric Lamp Manufacturers' Association of Great Britain, Ltd.; the Incorporated Municipal Electrical Association; the Conference of Chief Officials of London Electric Supply Companies; the Incorporated Association of Electric Power Companies; the Provincial Electrical Supply Association; the Electric Light Fittings Association; the Heating and Cooking Section of the B.E.A.M.A.; the Electrical Wholesalers' Federation; the Electrical Merchants and Manufacturers' Association; and

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E.D.A. Provincial Area Sub-Committees. It is hoped to secure the approval and adoption of the Specification at a meeting of the E.D.A. Council in November, and to circulate it immediately thereafter.

The principal item of general propaganda for "local" distribution during the first period of the Campaign will be the E.D.A. Electric Home Booklet. Specimen copies, with list of prices for varying quantities, will be circulated to everyone on the Association's mailing lists. In E.D.A. press advertisements the public will be invited to apply for copies of the book at electric showrooms or shops, or direct from the Association.

In those places where E.D.A. Circles have been established it may, in addition, be found practicable for Circles to co-operate in circulating the book direct to householders. Where this course is not possible, and in all other places, the Association appeals for the wholehearted support of individual supply undertakings and contractors, so as to ensure the widest possible circulation for the booklet.

Area Conferences, at which the organisation and operation of the Campaign will be explained in detail and discussed, will be held during September in the following centres:—Glasgow, Edinburgh, Newcastle, Manchester, Leeds, Birmingham, Cardiff, Bristol, London.

It is desired that the ordinary meetings of all E.D.A. Circles in October should take the form of open conferences to discuss the Campaign. At these conferences Circle representatives who have attended E.D.A. Area Conferences will present a report; wherever possible arrangements will be made for the Area Officer, or another member of the E.D.A. staff, to attend Circle Conferences.

During the months of October and November it is also desired that joint conferences should be organised between E.D.A. Area Committees or E.D.A. Circles and the local branches of the Electrical Association for Women, with a view to ensuring the closest possible co-operation in connection with the supplementary local activities.

The interest of the public in, and value to the industry of, exhibition houses has been amply demonstrated during the last two or three years. It is desirable, for the success of the Campaign, to secure a large number of demonstration houses, wired in accordance with the E.D.A. Electric Home Wiring Specification, or modified demonstrations in showrooms or small halls. Such demoostrations provide the very best means for educating householders, architects, builders, landlords and estate agents.

The Association will provide notes for two special lectures:—No. 1, for the general public; No. 2, for architects, builders, landlords and estate agents. Circles are desired to secure voluntary lecturers and to obtain immediately as many opportunities as possible for meeting organised groups of people, e.g., ratepayers' associations, tenant and property owner associations, rotary clubs, and any local political, social, religious, or commercial organisations in the respective districts.

Copies of the Electric Home booklet and the E.D.A. Electric Home Wiring Specification will be supplied free for distribution to members of sales staffs. The Association considers it of the greatest importance that every electrical salesman and saleswoman should be thoroughly conversant with the E.D.A. recommendations.

Illustrations of window displays, specially designed to emphasise the importance of adequate wiring, will from time to time be issued with instructions in the association's monthly publicity and selling programmes.

During the whole period of the Campaign the Association will support local activities with advertisements in the national Press directed generally towards the public, and, through special channels, to people purchasing or changing houses. A regular series of advertisements will also be inserted in architectural and building journals.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Where *is* that Battery?"

[To the Editor.]

Sir,—I am glad to be considered a friend of "Cynicus," but he begs the question of the battery by turning to the vehicle itself. The judgment of the motor car buying public has little or nothing to do with the fundamental fallacy of the "stink wagon." The public did not want an over-engined, over-speeded vehicle, but for the past 30 years they have had to have it because engineering genius has so far not given them a slower and quieter and lower-powered machine. The petrol vehicle of to-day is really an electric vehicle with a reciprocating engine, a fact which is greatly to be deplored by all electrical men who have abandoned reciprocating engines in their power houses.

I challenge "Cynicus" to prove his statement that maximum safe speed and twenty-four hours' running are essential and fundamental in all classes of vehicles. On the score of speed, who wants it? Lower the average speed of traffic in any town by 10 m.p.h., and all vehicles will "get there" just as quickly. Twenty-four hours' running! Who wants it, especially among commercial vehicle users? May I remind "Cynicus" that motoring to-day (except on long open runs) is merely "blinding and braking," a fact that will remain a reproach to engineers as long as there is a "stink wagon" left on the roads.

Meantime "Cynicus" contributes nothing to that great question of the battery. He by-passes my statement that the battery makers are too rich and too busy to trouble about improving a product which has stood still for twenty years. I intended to infer that, due to the war and the purely adventitious arrival of "radio," they are now reaping the fruits of many barren pre-war years. What will they do with those profits. Are their shareholders merely to benefit, or is there to be a pool formed from which research on the question of an improved battery can be financed?

While admitting that every commercial undertaking must pay its way, the engineering industry has always prided itself upon putting development before mere profit. For that reason every engineering product is always undergoing changes for the better, and those improvements are usually financed out of profits.

The battery industry is daily becoming stronger. Only last week you announced an important fusion between two long established and reputable battery manufacturers. Further, it is cheering in every way to read in the advertisements of another battery firm that they are the "largest battery manufacturers in the British Empire." Rumour is "swift footed and many tongued," and now she is busy in the battery world. Splendid! Battery makers, the whole electrical industry wants to hear from you. You are technically the most backward section of a mighty army of engineers. From the Cinderella of electrical engineering you are changing to the beautiful princess, and soon you will have money to burn, if you have not already got it.

It seems incredible that you are all sitting on the fence while the Irish Free State invests a paltry £5 000 in order to prove that your giant has feet of what?—lead!

Your weighted footsteps are holding back important developments in the industry, especially in the field of road and rail traction.—I am, etc.,

"Battery Electric."

September 9th.

POINTS OF VIEW.

The first essential of an export trade is a really healthy home trade.—*Mr. P. S. Cadbury.*

* * *

The average customer is exceedingly tolerant, and even where there is great justification, only a few complain.—*Mr. J. G. Williams.*

* * *

Our timidity in making full use of mechanical analogy in electricity is keeping us back to an absurd extent.—*Mr. C. Turnbull.*

* * *

The place to sell more service is in the home. Domestic sales are and always will remain the backbone of our business.—*Mr. M. S. Sloan.*

* * *

I know it will be a big problem to stimulate a sufficient demand to absorb the 153 000 000 units which will be generated yearly by the Shannon.—*Mr. William T. Cosgrave.*

* * *

Bachelors of Science invariably write better letters than Bachelors of Art, because they have been taught to write what they have to say, and then leave off.—*Mr. P. B. Showan,*

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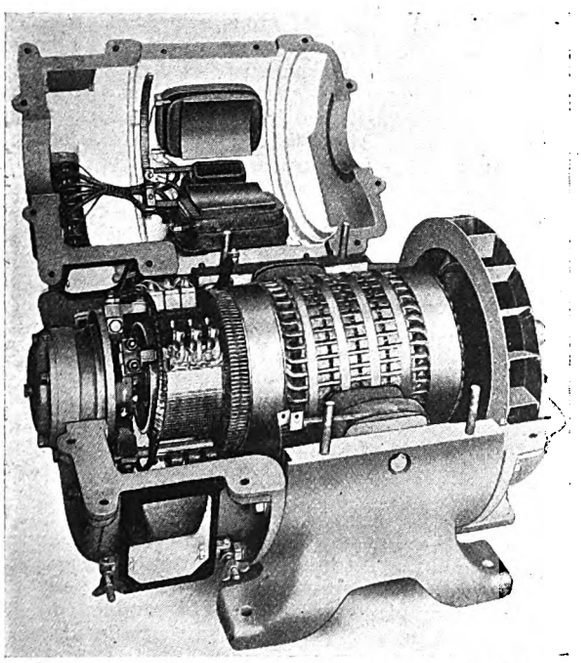
SHIPPING, ENGINEERING AND MACHINERY EXHIBITION.

A Brief Review of Some of the Outstanding Items of Electrical Interest—Many New Equipments for Marine Use.

AMONG the varied exhibits at the Shipping, Engineering and Machinery Exhibition, which opened at Olympia, London, yesterday, are many shown by electrical firms. These items include wireless equipment, lighting plants, motors for a number of purposes, electric winches, etc.

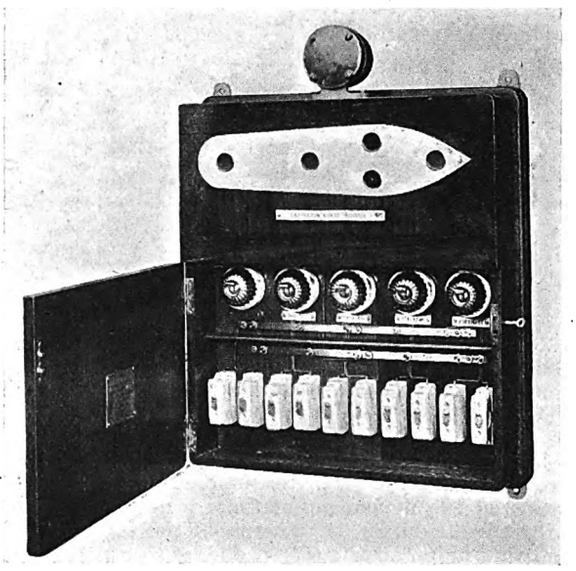
It will be appreciated that to describe the whole of the electrical side of the exhibition would occupy too great a space, and as a compromise, therefore, and in order that readers may form some opinion of the show, we have selected a number of representative items for treatment.

The exhibits of the METROPOLITAN VICKERS ELECTRICAL CO., LTD., of Trafford Park, Manchester, are, for instance, chiefly devoted to marine interests, and include a 7½ kW ship's lighting set. This set comprises a single-cylinder engine, direct coupled to a single pedestal bearing generator. The engine, of the enclosed pattern, is designed for a normal working steam pressure of 120 lb. per sq. in., but is capable of operating on pressures up to 200 lb. per sq. in. The generator is designed to give 7½ kW at 110 V and 550 r.p.m., and is of drip-proof construction, having a sheet steel canopy at both ends of the yoke to protect the windings and commutator. The windings are specially insulated and impregnated to resist a moist saline atmosphere, metallic surfaces are suitably protected against corrosion, and all parts are specially treated to withstand vibration. Another exhibit is a 5 H.P. T.E. vertical pump motor, rated at 1 200 r.p.m. with speed regulation by shunt control to 1 800 r.p.m., with a temperature rise not exceeding 40 deg. C. This motor is capable of working on a varying voltage such as would occur when supplied from a battery, at the same time giving the full speed range within specified voltage limits. A special location bearing is housed in the top bracket to take the weight of the armature and to absorb a pump thrust up to 800 lb. The motor is fitted with a combined bracket and foot for attachment to the pump seating. A standard 10 H.P. vertical marine type pump motor, designed for high speed centrifugal pump drives is also shown. The motor is suitable for a 220 V circuit and is rated



A 50 H.P. ventilated type marine motor by the Metropolitan-Vickers Electrical Co., Ltd.

for 10 H.P. at 1 200 r.p.m. with speed variation up to 1 600 r.p.m by shunt field control. The motors are provided with a few series turns which enables them to start up against considerable overloads. The generator control panel exhibited is a standard panel and is designed for use in conjunction with a 7½ kW generator. It is built of bevelled ebony syndanyo, mounted on a strong angle iron frame, which can be made suitable for either deck or bulkhead mounting. The instruments are of robust design and are sufficiently dead beat to have their readings unaffected by the rolling and pitching of the ship. A 2-stage steam-operated air ejector, with tubular inter-cooler and heater embodied in one casing, is another item, and this is suitable for maintaining a vacuum of 28½ in. Hg in a condenser for a 4 000 B.H.P. turbine. The steam consumption would be approximately 275 lb. per hour. Another



The navigation lights indicator shown by Siemens Brothers & Co., Ltd.

exhibit is a vertical 3 in. centrifugal condensate extraction pump arranged for direct drive from the slow speed shaft of the speed reduction gear of a turbine up to 7 000 B.H.P. The pump speed is 1 500 r.p.m. A 1½ H.P. motor, suitable for oil separator drives, is exhibited, and gives an example of a small "Metro-Vick" marine type motor.

The 11 H.P. totally enclosed ventilated motor shown on the stand has an output of 11 H.P. at 780 r.p.m. 220 V. and is rated at 6 hours—40 deg. C. The field coils and the armature iron are cooled by two separate air streams. Cooling is effected by air passing through the armature iron, and, it is pointed out, as the losses generated in this portion of the machine form a considerable portion of the total losses of a totally enclosed machine, this method of cooling results in a very great reduction in the size and weight over a standard totally enclosed machine. No external air comes into contact with the windings or commutator, and it is claimed that the machine will operate satisfactorily either in an explosive or highly corrosive atmosphere.

SIEMENS BROTHERS AND CO., LTD., of Woolwich, London, S.E., also show equipment of marine interest, including ships' electric telegraphs. This apparatus takes the place of the usual mechanically-operated gear for communicating from the bridge to the engine room, and also for docking and steering. It is independent of the ship's power mains, being operated by means of primary batteries and directly connected without the use of switches, so that the circuits cannot be accidentally left open. Telephones for navigational purposes are also shown, and it is pointed out that the problem of an efficient system for the purpose of communicating from the bridge to the engine room, poop, etc., resolves itself into the provision of an instrument which enables a conversation to be carried on notwithstanding the noise of the engine or the force of the wind. Siemens telephones, it is claimed, enable a conversation to be carried on under these conditions. The electric helm indicator shown is operated directly by the movements of the rudder, and, therefore, indicates the actual angle of the rudder or helm, and not the movements of the telemotor of other control gear. The movements of the rudder are indicated positively in steps of 2½ deg. up to 10 deg. on each side of amidships and for the remainder o

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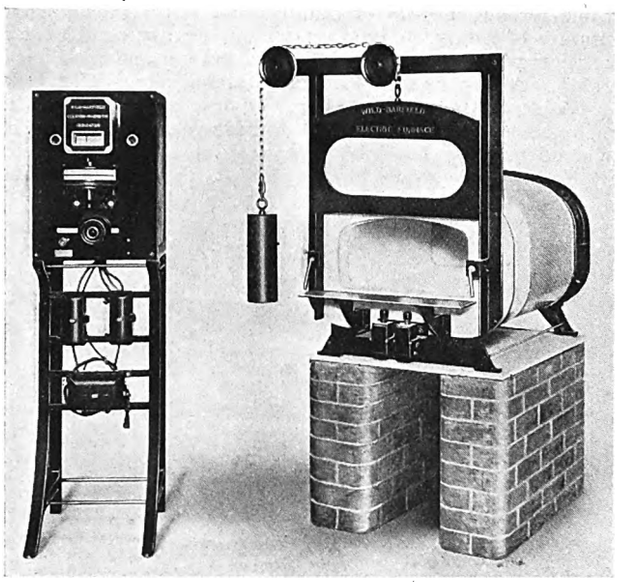
the motion in 5 deg. steps. The instrument is actuated by its own battery (one cell) and is, therefore, independent of the ship's mains. The " Rotary " type ahead and astern revolution indicator exhibited has been designed primarily to indicate when the engines start and stop, but it also enables the revolutions per minute of the shaft to be ascertained. The



A horizontal furnace, type 16 F, with an output of nearly 3½ tons of steel per working week of 47 hours. The exhibit is that of Wild Barfield Electric Furnaces Ltd.

wide short pointer moves one-tenth revolution of the dial for each revolution of the propeller shaft, giving a very distinct indication of the movement of the engines.

The wireless exhibits include two of the company's i.c.w. transmitting units, sizes 200/300 and 400/500. These have been designed to take the place of the ½ and 1½ kW spark transmitters respectively. Both transmitters employ the balanced valve circuit. The auxiliary short wave transmitter included on the stand employs a 500-W oscillating valve and is suitable for use on vessels which wish to maintain communication during a period each day from any part of the world with the mother country. A most interesting feature is the extremely accurate transmitting condenser by means of which the transmitter can be returned at once to any desired wavelength within the short wave band. Other wireless items include a short range telephone transmitter suitable for use on board coastal vessels, survey vessels, etc., and a 1½ kW quenched spark installation.

Among the auxiliary apparatus on view is the Siemens auto alarm device, and a single rotating frame direction finder.

The temperature measuring apparatus shown comprises electrical distance thermometers, which are suitable for temperatures from 200 deg. C. to 500 deg. C., thermo-electrical pyrometers suitable for temperatures from about 300 deg. C. up to 1 400 deg. C., and optical pyrometers for temperatures from 700 deg. C. to 2 500 deg. C.

Visitors to the exhibition should make a special point of calling at THE ELECTRICIAN stand in Section L Gallery, No. 1, where every assistance will be given in dealing with inquiries, etc. Apart from its obvious use as a rendezvous for electrical men, anyone seeking a brief rest from the general exhibition will be welcome.

ALLOY WELDING PROCESSES, LTD., Ferry Lane Works, Forest Road, London, E.17, have on view ten different types of welding equipment, including the latest " A.W.P." design of motor generator set, which will appeal to all those who desire a machine of pleasing appearance, light weight, small dimensions and competitive in price. In addition to the machines there are the usual wide range of electrodes now known as the " A.W.P." brand, which embraces varieties to suit all classes of work including stainless steel, staybrite steel, high speed steel, manganese steel, copper, bronze, and brass. Demonstrations are given daily in the use of these electrodes and include the welding of the various acid and heat resisting proprietary steels now on the market.

BULL MOTORS, LTD., Ipswich, show a portable arc welding set of a new type. It is called the " Bull Midget " portable arc welding plant, and is notable for compactness of design and for the fact that the control gear is completely enclosed in a steel cubicle, the instruments being of the ironclad flush type. The welding generator is controlled by shunt and series field regulators, and welding can be satisfactorily carried out over a range of 25/100 A. A standard 200 A portable arc welding set provided with d.c. motor, and complete with all control gear, is also shown. Both these sets are in operation under welding conditions, and the flexibility of operation and stability at the lower welding currents demonstrated. Another exhibit is a " Bull " weatherproof motor in operation under conditions which demonstrate the suitability of this motor for use in exposed outdoor positions. A small pump is coupled to the motor, and directs upon the latter a continuous shower of water. Explosion proof motors especially designed for use in fiery mines, oil pumping installations, and other inflammable atmospheres, are shown. These are of both a.c. and d.c. types, and the explosion proof construction is covered by the certificate of the Mining Department, Sheffield University. A high tension d.c. motor-generator set, examples of other special machines, and exhibits showing the construction of standard d.c. and a.c. motors are also featured.

BLACKSTONE AND CO., LTD., Stamford, show examples of cold starting heavy-fuel-oil engines, " unchokeable " pumps, and petrol-electric sets. Two horizontal heavy-fuel-oil engines are featured, one a 55 B.H.P. single cylinder unit, and the other a 64 B.H.P. twin direct-coupled to a 230 V " Bull " generator. Both engines are fitted with " spring injection." The 1½ kW petrol-electric set shown is driven by a " Blackstone " petrol engine with overhead valves and automatically governed throttle which controls both quantity and quality of the mixture passing to the combustion chamber. The set is accurately balanced, easily started, effectively silenced, and a partial vacuum, permanently maintained in the crankcase, prevents the escape of oil at the bearings and makes the set clean running. There are also two Blackstone " unchokeable " pumps on this stand, representing the range of sizes up to 16 in. inlet, made by this firm. A 3 in. belt-driven set is shown at work, which is capable of dealing with liquids carrying in suspension solids up to 2⅝ in. in diameter, and is seen pumping solid spheres of this size. Another 3 in. " unchokeable " pump is shown direct-coupled to a 5 B.H.P. Blackstone " no-trouble " petrol engine, the complete unit being mounted on a trolley, making a portable set suitable for emptying dykes, trenches, cesspools, gullies, tanks, foundations, etc.

WINGROVE AND ROGERS, LTD., Arundel Chambers, Strand, London, W.C.2, show one of the latest designs in electric vehicles. This has a capacity of 2 tons, a speed of 5 m.p.h., and a radius of action of 15/20 miles per charge. The battery is carried in a steel compartment, suspended centrally beneath the chassis. This compartment is mounted on a series of coil springs in order to protect the battery from shock when the truck is being loaded. It consists of 20 cells, 168 A h capacity, of D.P. Kathanode manufacture, or, 20 cells, 161 A h capacity, Exide-Ironclad manufacture, arranged in hard wood boxes, and provided with iron lifting straps. The motor is of the totally-enclosed series wound traction type with steel yoke. The poles are built of annealed sheet steel punchings, assembled under pressure and secured to the yoke by tap bolts. Four poles are used. The fields are former wound of d.c.c. wire vacuum impregnated to resist oil and moisture, and the coils are protected from the yoke and from their respective poles by fullerboard sheaths. The armature core is built of sheet steel stampings, assembled under pressure between end plates, the punchings being keyed directly to the shafts. The armature winding consists of former wound coils of d.c.c. wire or ribbon. The formed coils are taped all over and impregnated.

Armature and Commutator Details.

Armature slots are lined with treated fullerboard, and when completely wound a second impregnation is given to the entire armature. The commutator is built of hard drawn copper bars of ample wearing depth, assembled on a cast iron hub pressed on and keyed to the shaft, insulated with selected mica and undercut. The brushes are of carbon with flexible copper tails moulded in. The brush holders are of the box type. The controller is of the reversible drum type to suit the series wound motor with double wound field coils. Three speeds forward and three reverse are provided. In first speed the fields are in series with the resistance in. In second the fields are in series with the resistance out. In third the fields are in parallel, resistance out. The greatest pulling power is obtained in third speed. The drum consists of a square steel shaft on which is moulded a micanite covering 1/16 in. thick. The segments are cast iron fitted to the drum-

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shaft, and carry renewable strip copper contacts secured by means of screws, the heads of which are on the inner side of the segments. The provision of suitable gearing keeps the angle of movement of the control lever within convenient limits, and definite positions are provided for each speed. All cables are brought to a common terminal board, located beneath the front section of the platform, which facilitates the removal of the motor when required. Cables from the terminal board to the controller are carried inside the hollow dashboard out of danger from accidental damage and yet easily accessible.

The exhibits of the ELECTRO-MECHANICAL BRAKE CO., LTD., 86, Strand, London, W.C.2, include (1) electric winches and ship's winches, embodying double opposed worms, thus eliminating the necessity of using ball thrusts; (2) a.c. and d.c. pillar type starters for both industrial and ship uses; (3) steel case controllers, for industrial purposes; (4) explosion proof air break drum type controller, for use in fiery mines, gas works, and on board all ships; (5) unbreakable jointless and rustless grid type resistance, for use on board ship and general industrial purposes; and (6) steel case cam type star delta and rotor starters.

PETTERS, LTD., Westland Works, Yeovil, are showing among other plants a 1½ kW electric generating set, which consists of a Petter 3 B.H.P. paraffin or petrol engine (magneto-ignition type) direct-coupled to an electric generator carried on a cast iron baseplate. The engine is specially built for the purpose, being fitted with highly sensitive governor and heavy single disc flywheel. The engine is of the two-stroke cycle type and when supplied for running on paraffin is started by means of a small quantity of petrol. After running for a few moments the engine changes over automatically and runs on paraffin. High tension magneto is fitted. The dynamo is of the two bearing type. Another set is a 3 kW generating plant, consisting of a 5 B.H.P. surface ignition, cold starting oil engine, direct-coupled to an electric generator, the speed being 725 r.p.m. The engine is governed by means of a centrifugal governor which operates by controlling the amount of fuel injected. The engine starts from cold, and the set is recommended for use as a standby or emergency plant. An 8 kW generating set of a similar type to the 3 kW set, but with a 12 B.H.P. engine running at 525 r.p.m., is also shown.

Stoking Equipment.

EDWARD BENNIS AND CO., LTD., 28, Victoria Street, London, S.W.1, are exhibiting working models of:—(1) A new natural draught coking stoker on a single flue Davey Paxman economic boiler; (2) a new type of air draught stoker as applied to a marine boiler; (3) a forced draught chain grate of the new carrier bar type with multiple air control; and (4) a coal pulverising plant on the "Simplex" unit system.

WILD BARFIELD ELECTRIC FURNACES, LTD., Elecfurn Works, Harrow Road, London, N.7, have made arrangements with the Matchless Motor Cycles (Colliers), Ltd., of Plumstead, and with the De Lavaud Free-Wheel Differential, Ltd., of Letchworth, to send men from their works, and to divert the production from their factories to Olympia each day to be heat treated in "Wild-Barfield" electro-magnetic furnaces, similar to those in their own works. The furnaces used in these operations are standard works types, but it will be noticed from the photograph that the control panels are now self-container floor units, the controls, with the exception of the magnetic indicator, being behind the panels. Those interested in carburising, annealing, etc., in large furnaces can also see a furnace fitted with automatic temperature control in operation. The consumption of this furnace is 20 kW, and the heaters are specially prepared nickel chromium elements totally enclosed in the bricks constituting the chamber. A new electrically heated die casting machine is also on view.

This machine is mounted on a cast stand, which brings it to a convenient height for the operator. The actual heating chamber is 8 in. diameter and 11½ in. deep, in which the pump mechanism, consisting of a container and cylinder machined out of cast iron, is accommodated. The maximum current consumption is 2 kW, and the equipment may include either a rheostat for hand control or a regulator for automatic control. Electrically heated high speed steel hardening furnaces are also shown in operation, together with oil and air tempering ovens with automatic control, electric solder bolt heaters, and laboratory muffles. A "Vickers Pyramid" hardness testing machine, manufactured by Vickers-Armstrongs, Ltd., of Erith, for whom the company are distributors, is shown in operation, and samples brought by interested visitors can be tested on the stand.

The exhibits of the PREMIER ELECTRIC WELDING CO., LTD., Abbey Wood, London, S.E.2, include a large number of mechanical and semi-mechanical devices for producing rapid welding by means of coated electrodes. Included in this range is the "Flexin" hand welding tool, and the "Flexin" flexible electrode. In this system the flexible electrode, fully fluxed and wound on a special drum, is fed to the arc by means of a pneumatic or electrically driven hand tool. Another exhibit is the "Belfinish" electrode, which claims results much in advance of those obtained by other processes. The value of this electrode will be illustrated by welded samples of various types. Included on the stand is a full range of "Premier" electrodes. Examples of "Prescot" resistance welding machines manufactured by BRITISH INSULATED CABLES, LTD., are shown at work welding all classes of steel and iron and some non-ferrous metals.

Signalling and Measuring Instruments.

EVERSHED AND VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.4, are exhibiting a number of the marine signalling instruments which have been supplied to the Admiralty and to the Merchant Marine, including the electrically operated helm indicator, link, and valve indicator, the "Pulsator" speed indicator, and the latest form of electrical tachometer. One of the most interesting exhibits is a working model of the Brewerton Course Recorder, an apparatus which repeats to scale on a chart the movements of a ship. A full display is given of the electrical testing instruments made under the name of "Megger," including the "Megger" and "Bridge-Megger" testing sets, "Meg" insulation tester, workshop ohmmeters, and ducter low resistance testing sets. In addition, there is shown for the first time the new "Bridge-Meg" resistance tester, described in THE ELECTRICIAN last week. The "Megger" earth tester is also shown in operation on a model of a sub-station with transmission line. A number of the "Evershed" chart recording instruments having straight time lines are exhibited in operation, including watt-meters, power-factor meters, and frequency meters. In addition, an operation recorder is shown working. A traction recorder, similar to that supplied to many of the leading railways and tramway services, both at home and abroad, is also demonstrated. Another item is the "Midworth" distant repeater. The purpose of this system is to repeat at a distance the movement of instruments or apparatus, and it is also used for the actual distant control of distant machinery.

DAVEY, PAXMAN AND CO., LTD., of Colchester, are exhibiting one of their four-cylinder vertical cold starting oil engines designed for marine auxiliary work, capable of developing 250 H.P. continuously, with overloads of an hour's duration up to 290 H.P. The design embodies the Blackstone patent "spring injection" system of fuel injection. The Paxman patent eccentric operated exhaust valve gear is also incorporated. The engine shown is totally enclosed and provided with forced lubrication throughout; the camshaft is sheathed, and the governor, which is instantaneous, is driven direct from the crankshaft and is continuously lubricated from the main oil system.

200kW Auxiliary Plant.

RUSTON AND HORNSBY, LTD., of Lincoln, are exhibiting a 200 kW marine auxiliary generating plant. The engine is a five-cylinder unit running on the Ruston airless injection principle, capable of power production continuously over long periods with heavy loads on low-grade fuel oils.

NORRIS, HENTY AND GARDNERS, LTD., of Barton Hall Engine Works, Patricroft, Manchester, are exhibiting a number of heavy oil engines, both of vertical and horizontal type, together with an electric lighting set, a small air compressor set, and a double acting water pumping set for deck and general use.

The YORKSHIRE COPPER TUBE WORKS, LTD., of Leeds, are showing copper tubes in all sizes from 0·005 in. to 24 in. diameter as supplied to the British Admiralty and foreign navies, home, foreign and colonial railways, marine engineers, consulting engineers, coppersmiths, etc., and condenser tubes in all standard and special alloys.

The exhibits of R. A. LISTER AND CO., LTD., Dursley, Gloucestershire, include small lighting plants for yachts, country houses and so on, while the SUNDERLAND FORGE AND ENGINEERING CO., LTD., of Pallion, Sunderland, are exhibiting a marine electric equipment, including a worm-geared silent deck winch, a contactor type control gear panel, open type single pedestal bearing generators, 110 V ships' lighting sets, a six-way marine type switchboard, a patent unistart switchboard, and a vibratory screen for grading coal, coke, or cement.

(To be continued).

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NEWS IN BRIEF.

Forthcoming Exhibitions—Electric Bridge over the Tees—E.P.E.A. Southern Section Dinner—Blackpool Illuminations—Prospectuses of Technical Schools.

GRIMSBY Corporation recently invited tenders for the construction of a sub-station building at Holton-le-Clay.

The first electrically illuminated tennis court in Australia was opened seven years ago, and the number of such courts is now estimated to be between 2 000 and 3 000.

Applications are invited for stands at an exhibition of electrical appliances to be held at Milford Haven from October 2nd to 4th, inclusive. Further particulars from the Resident Engineer, Council Offices, Milford Haven.

An improvement scheme, to be carried out at Boston (Lincs) Docks, includes the erection of a coal hoist, electrically-driven pumps, etc., estimated to cost £16 000.

Wireless exhibitions are to take place at Fribourg from September 7th to 15th, at Lyons from September 21st to 29th, and at Paris from September 27th to October 13th.

The Exhibition of Inventions will be held at the Central Hall, Westminster, from October 2nd to 12th, inclusive. The Institute of Patentees, 39, Victoria Street, London, S.W.1, will supply further details.

The Business Efficiency Exhibition will take place in the Free Trade Hall, Manchester, from September 18th to 28th, inclusive. Further particulars can be obtained from Mr. A. C. McLellan, 37 and 38, Strand, London, W.C.2.

It is announced that the Ministry of Transport is to bear 75% of the cost of the proposed bridge over the river Tees at Newport. The type of bridge contemplated is one of the vertical lift type, the centre span being raised by electric power to facilitate the passing of traffic on the river. The total cost of the scheme is estimated at £60 000, and a Bill in Parliament to authorise it will be promoted by Middlesbrough Corporation and the county councils concerned.

LOOKING BACKWARD

FIFTY years ago, according to THE ELECTRICIAN *dated September 13th, 1879,*

Although there were no commercial telephone exchanges, the use of telephonic communication was extending gradually. A proposal to establish a Manchester Telephonic Exchange was receiving wide support.

An electric railway 300 metres long was in operation at the Berlin Industrial Exhibition.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *dated September 16th, 1904, stated that :*

Station engineers were warned that after the long spell of hot and dry weather, thorough tests of the insulation of mains networks was desirable.

When Southwark Council discussed the desirability of advertising for a chief electrical engineer, an Alderman said that "any person of ordinary intelligence could read up in a month all that an electrical engineer knew. It was all a lot of theory. What they wanted was a good mechanic to supervise the station."

* * *

FIFTEEN years ago, it was stated in THE ELECTRICIAN *dated September 11th, 1914, that :*

The Institutions of Civil, Electrical and Mechanical Engineers were considering the formation of an infantry battalion for Kitchener's Army.

* * *

TEN years ago, THE ELECTRICIAN *for September 12th, 1919, reported that :*

The price of copper (best selected) had fallen to £109 per ton.

The Joint Industrial Council for the Electric Cable Making Industry held its first meeting.

A telegraph picture service between Sydney and Melbourne was inaugurated on Monday. The ordinary telegraph lines are used, and the pictures may be handed in at any post office for delivery in the same way as telegrams.

Automatic telephones have now been installed at the White House, Washington. The President's number has, therefore, been changed for the first time in 29 years, and for the third time since 1878, when the telephone was first installed.

Imports into the Irish Free State during July, 1929, included electrical goods valued at £35 539, compared with £33 038 in July, 1928. The aggregate value of the same classes of goods imported during the seven months ended July, 1929, was £347 256, against £246 711 in the corresponding period of 1928.

A booklet has been issued giving particulars of the evening classes in electrical engineering at the Northampton Polytechnic Institute, St. John Street, London, E.C.1. It contains a list of the teaching staff, and details of the subjects covered by the courses, requirements for admission, examinations, certificates awarded, degrees and scholarships obtainable, syllabuses of the classes, the equipment of the electrical laboratories, etc. Enrolment will take place on each evening (except Saturday) of the week commencing September 16th, and classes will commence on September 23rd. Prospectuses can be obtained from the Principal.

At the E.D.A. display at the North-East Coast Exhibition film displays were given on 965 occasions, attendance nearly 38 000, while 31 displays were given to schools, with an attendance of 1 100.

The eleventh annual dinner of the Electrical Power Engineers' Association, Southern Division, will take place at the Hotel Cecil, London, on October 19th. Tickets (7s. 6d.) from the hon. secretary of the Division, Mr. P. Gordon Hieatt, 25, Parkhurst Road, Bowes Park, London, N.22.

The National (London) automatic telephone exchange, serving the Aldersgate and Wood Street areas, the north of Newgate Street and Cheapside, was put into service on September 7th.

Amongst the most interesting exhibits at the Exhibition of Model Engineering, which was opened at the Royal Horticultural Hall, London, on September 7th, is an electrically operated working model of the Lord Mayor's Show of 1616, by Mr. John B. Thorpe. The Show is said to be historically correct, and it takes five minutes to pass along a stage which has Old Cheapside as a background.

The first section of the Blackpool autumn illuminations was inaugurated on August 6th, when 12 000 electric lamps were switched on at the open air baths. The scheme has been executed under the superintendence of Mr. C. Furness, borough electrical engineer, and Mr. F. W. Field, resident engineer. The illuminations will be continued every night, and on September 21st, when effect will be given to the full scheme, about 100 000 lamps will be in use. At the open air baths there are eight flashing kaleidoscopes, the dome above the entrance hall and all the main buildings are outlined in light, and an illuminated yacht rides at anchor in the centre of the lake.

At last week's meeting of Salford City Council, at which the recommendation to accept the tender of Nederlandsche Kabelfabriek, Delft, Holland, for the supply of cables, amounting to £8 428, was adopted, it was stated that the saving as compared with the lowest satisfactory English offer was approximately 14%.

The eighth National Exposition of Power and Mechanical Engineering will be held at New York from December 2nd to 7th next. The exhibits will include the latest mechanical equipment for fuel combustion, power generation, distribution, transmission and utilisation, heating and ventilating equipment, refrigeration and material handling plant. There will be over 500 exhibitors. British participation is welcomed by the organisers, the International Exposition Co., Grand Central Palace, New York.

The Polytechnic School of Engineering (Regent Street, London) has just issued a prospectus of its wireless and high frequency engineering courses for the session 1929–30. These courses extend over five years, and provide a thorough training in the principles and technique of the subject. The prospectus gives particulars as to fees, the times and days of the various classes, and the principles dealt with therein. Enrolments will take place from September 16th to 20th, and Mr. W. H. Date, head of the wireless and high frequency section, will supply any further details.

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BUSINESS ITEMS.

MESSRS. CITY WIRELESS SUPPLIES, 49, New Briggate, Leeds, is now under the sole control of Mr. F. Fricker.

MESSRS. SIEMENS AND HALSKE have secured a contract for the erection of new telephone exchanges at Hankow, commencing with 8 500 telephones.

We understand that J. HENDERSON AND CO., LTD., are supplying eight electrically operated aerial cableways to Sir John Jackson (Singapore), Ltd.

MESSRS. S. R. WHYTE, electrical contractors, of 458, London Road, West Croydon, are renovating and extending their premises and opening up a large new showroom.

At the Annual Exhibition held at Bristol last week, the ELECTRIC HOMES CO., of 71, Park Street, gave special study to exhibits of lighting fittings and shades. A wide range of electrical domestic appliances was also shown,

The TELEGRAPH CONDENSER CO., LTD., announces that, as Messrs. Green and Jackson, of Birmingham, have dissolved partnership, Mr. P. H. Jackson, trading as P. H. Jackson and Co., has now taken over the sole agency for T.C.C. condensers in the Midland territory.

Col. R. E. CROMPTON announces that he has entered into partnership with Dr. ALFRED EKSTROM, who has specialised in the problems of applying electrical energy to agriculture in Sweden. The partnership will act as consultants on similar matters in the United Kingdom and in our Colonies.

B.T.H. magnetos were fitted to the machines in which Flying Officer H. R. D. Waghorn and Flying Officer R. L. D. Atcherley made their record-breaking flights in the Schneider Trophy race.

BELL'S ASBESTOS AND ENGINEERING SUPPLIES, LTD., Asbestos House, Southwark Street, London, S.E.1, have issued special literature regarding the removal of their chief offices to the new works at Slough. It is expected that the new London offices and warehouse at 157, Queen Victoria Street, and 239, Upper Thames Street, will be ready for occupation this month, meanwhile arrangements have been made for the counter trade to be carried on at the old Southwark address as above.

We are informed that Messrs. PETO AND RADFORD and the HART ACCUMULATOR CO., LTD., have as from September 9th, joined forces under the name of the NATIONAL ACCUMULATOR CO., LTD. The National Company offers the two makes of battery—Hart, and Peto and Radford, forming, together, a very extensive range. Sales will shortly be conducted by the company from 93, Great Portland Street, at which address offices and showrooms have been taken and specimens of the products of both companies will be on view. An arresting window display will be maintained, and a full battery service given.

We are advised by WINGROVE AND ROGERS, LTD., Arundel Chambers, Strand, London, W.C.2, that seven standard "Victor" electric vehicle chassis, fitted with van bodies to the Postmaster-General's specification, were recently delivered to the Mount Pleasant Post Office, London, where we understand they are in regular use for parcels delivery work. This purchase is in the nature of an experiment, which Messrs. Wingrove and Rogers feel confident will prove successful, as the work involves a limited daily mileage, for which duty this vehicle is expressly designed. The vans themselves, however, are long past the experimental stage, and a large number have been sold in various parts of the country for similar delivery work. It is understood that a demonstration van will shortly be available at the above address.

H.M. Consul-General at Bushire has forwarded to the Department of Overseas Trade information which he has received from Captain C. G. Prior, political agent, Bahrein, relating to a launch built in Kuwait and provided with a 60–65 H.P. Kelvin engine, which he has seen at Bahrein. He says the launch was lit by electricity, but the generating set, without battery, was of American origin. He would be glad to be put into touch with makers of such generating sets in England, so that he may recommend their use in launches. The installation of electric light in Bahrein is going to give rise to a large market for electrical accessories, lamp fittings, small apparatus driven by electricity, etc., and he would like to have particulars of firms dealing in such articles, with catalogues, so that he may introduce them to appropriate firms, etc. Copies of catalogues may be sent to H.M. Consul-General, British Consulate-General, Bushire, for transmission to Captain Prior, but the Comptroller-General of the Department of Overseas Trade would like to be informed of any such action. (Reference B. 5622.)

PERSONAL.

MR. T. Johnston has been appointed manager of Drake and Gorham (Wholesale) Ltd. (Dublin branch). He was formerly assistant manager.

Mr. C. G. Seeley, manager of the Australian General Electric Co., Ltd., has been elected a member of the American Electro-Chemical Society.

Sir Edward Manville (a partner in the firm of Kincaid, Waller, Manville and Dawson) has been elected Master of the Coachmakers' Company.

Mr. R. W. Whitley has been appointed as London manager of J. H. Tucker and Co., Ltd., and took up his duties on Monday at 101, Dean Street, W.1.

We understand that Mr. H. J. Farrell is now directing the Irish business of Ferranti, Ltd., from new headquarters at Corn Exchange Buildings, Burgh Quay, Dublin.

Councillor John Walsh, a well-known electrical engineer, will be re-nominated as Conservative candidate for St. Mark's Ward, Blackburn, in the forthcoming municipal elections.

Mr. H. McDonald has resigned the management of the Dublin branch of Drake and Gorham (Wholesale) Ltd., in order to take charge of the Irish organisation of Philips Lamps, Ltd.

Mr. E. G. Hitch, son of Mr. W. E. Hitch, retired sectional engineer of the Post Office, has been appointed electrical mechanician, Posts and Telegraphs Department, Kenya Colony, East Africa.

Mr. F. Buckley has been appointed, in succession to the late Mr. C. J. Jewell, as a representative of the Norwich Electric Tramways Co. on the National Joint Industrial Council for the Tramway Industry.

Mr. William Birtwistle, a millionaire and septuagenarian, and Miss Edith Stevenson, are to be married in London. Miss Stevenson is 21 years of age, and recently resigned a position at Siemens' Lamp Works.

The Earl of Birkenhead, chairman of the Greater London and Counties Trust, Ltd., sailed on the "Olympic" this week on a business trip to America in connection with his various business interests there. He will be away four or five weeks.

Mr. P. H. Warren, a member of the staff of the erection department of the Metropolitan-Vickers Electrical Co., is, according to the "Metropolitan-Vickers Club News," the first man to have used the England to India air service for a business journey.

Sir Sassoon Jacob David, lately chairman of the Bombay Electric Supply and Tramways Co., Ltd., who died on September 27th, 1926, left personal estate in England of the net value of £4 242 18s., in addition to property in India of the net value of 1 607 500 rupees, exclusive of trust property valued at over 20 000 000 rupees.

The marriage was solemnised at St. Peter's Church, Rugby, on September 3rd, of Mr. Alfred Ferdinand Fowler, formerly of the staff of the British Thomson-Houston Co., Ltd., and now with the West Midlands Joint Electricity Authority, at Wolverhampton, and Miss L. E. Hill, of Rugby. Mr. Fowler received a clock from his colleagues at Wolverhampton.

Mr. F. F. Elliott, station engineer of Woolwich (London), Borough Council's electricity department, who had been selected by Torquay Electricity Committee for appointment as borough electrical engineer and manager at Torquay at a commencing salary of £1 000 per annum, has withdrawn his application, and, at a meeting on September 3rd, the Corporation authorised the Committee to appoint one of the other applicants.

The Lord President of the Department of Scientific and Industrial Research has appointed Lord Rayleigh, F.R.S., Sir Arthur Balfour, Sir William H. Bragg, F.R.S., and Sir James Walker, F.R.S., to be members of the Advisory Council to the Committee of the Privy Council, the following members having retired on completion of their terms of office: Sir H. C. Harold Carpenter, F.R.S., Dr. G. C. Clayton, Sir Richard T. Glazebrook, F.R.S., and Sir James H. Jeans.

Obituary.

MR. JOHN HALLAM, partner in the firm of J. E. Hallam and Sons, general electrical engineers, of 30, Great Portland Street, Stockport.

ALDERMAN GEORGE NEW, on September 4th, aged 66 years. He had been a member of Sunderland Town Council for 32 years and served as chairman of the Tramways Committee.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

KINGSWOOD (SURREY) PAROCHIAL COUNCIL.—Electric light installation in Parish Church. Particulars from the churchwarden, Mr. W. S. Lloyd, Spencer House, Tadworth.

DUNDEE EDUCATION AUTHORITY, September 13th.—Electric lighting work in connection with erection of new Primary School at Rockwell, Lawton Road, Dundee. Specifications, etc., from Messrs. Allan and Friskin, 26, Castle Street, Dundee.

LEYTON CORPORATION, September 13th.—Electric light installation at Canterbury Road Schools. Particulars from the architect, Mr. John H. Jacques, 61, West Ham Lane, Stratford, London, E.; deposit £1.

WORKSOP GUARDIANS, September 13th.—Re-wiring Kilton Hill Infirmary. Specifications from Mr. J. Haslam, Ryton Chambers, Bridge Street, Worksop.

Travelling Cranes.

BELFAST CORPORATION, September 16th.—Overhead travelling cranes, for the electricity department. Specification (W. 95), etc., from Mr. F. H. Whysall, city electrical engineer and manager, East Bridge Street, Belfast; deposit £2 2s.

BOLTON GUARDIANS, September 16th.—Six months' supply of electric lamps, etc. Form of tender from the clerk, Mr. H. I. Cooper, 28, Mawdsley Street, Bolton.

EDMONTON GUARDIANS, September 16th.—Six months' supply of electric lamps. Forms of tender from the clerk, Mr. E. Ridley, 77, Bridport Road, Edmonton, London, N.18; stamped addressed envelope to be sent.

MERSEY RAILWAY CO., September 16th–24th.—Supply of electrical sundries (item No. 10); metallic and carbon filament lamps and fittings (No. 13), etc. Forms of tender from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead. Patterns and samples can be seen on September 16th and 17th at the place shown on the tender forms. Tenders by September 24th.

WIGAN GUARDIANS, September 16th.—Supply of electrical engineering sundries for six months. Tender forms from the Matron of the Institution, Frog Lane, and the Steward, Billinge Infirmary, Orrell.

LINLITHGOW DISTRICT COMMITTEE, September 17th.—Supply and fixing of electric lamps, brackets and fittings in Winchurch Special Lighting District, and/or in Kirkliston Special Lighting District. Specifications from Mr. J. G. B. Henderson, District Clerk, Linlithgow, or Mr. G. A. Maclennan, Middleton Hall, Uphall.

HOLBORN (LONDON) GUARDIANS, September 18th.—Six months' supply of electrical fittings. Forms of tender from the Clerk, 53, Clerkenwell Road, E.C.1; stamped, addressed envelope to be sent.

ROCHDALE CORPORATION, September 18th.—Supply of a.c., single phase, ordinary house service and prepayment type meters for 12 months. Specifications from Mr. F. H. Rudd, engineer and manager, Electricity Works, Dane Street, Rochdale.

DEVON MENTAL HOSPITAL, EXMINSTER, September 20th.—Six months' supply of electric lamps, etc. Tender forms from the clerk, Mr. Cecil Masters.

NORTHERN IRELAND MINISTRY OF FINANCE, September 20th.—Electric light installation at the Custom House, Londonderry. Specifications can be seen and forms of tender obtained at the Custom House, Londonderry, and at the offices of the Ministry, 15, Donegall Square West, Belfast.

WARRINGTON GUARDIANS, September 21st.—Twelve months' electrical supplies to Whitecross Institution, Warrington, or Cottage Homes, Padgate. Tenders (separate for the two places), to Mr. Arthur Bottomley, clerk, Union Offices, Museum Street, Warrington.

SALFORD CORPORATION, September 23rd.—Supply of 10 000 kVA, 33 kV/6·6 kV transformers for outdoor service. Specification from the City Electrical Engineer.

COMMISSIONERS OF H.M. WORKS, ETC., September 24th.—Steam generating set, control panel and modification of existing electric generator, at the State Institution, Rampton, Retford. Specification, etc., from the Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1; deposit £1 1s.

DEVIZES RURAL DISTRICT COUNCIL, September 25th.—Electric light installation in houses at Easterton, Great Cheverell, Market Lavington, West Lavington, and Worton. Particulars from the clerk, Mr. P. R. Trapp, Maryport Chambers, Devizes.

STAFFORD COUNTY EDUCATION AUTHORITY, September 26th.—Electric light and power installation in new wing of Wolverhampton Grammar School. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £3 3s.

EAST LOTHIAN EDUCATION AUTHORITY, September 27th.—Electrical work in connection with erection of public schools at Longniddry and Aberlady. Forms of tender, etc., from Messrs. Morham and Brotchie, 29, Hanover Street, Edinburgh.

HORSHAM URBAN DISTRICT COUNCIL, September 27th.—Supply and erection of (*a*) rotary convertor 125 kW step-up transformer, two draw-out truck type e.h.t. switch units; (*b*) sub-station equipment: two 100 kVA transformers, e.h.t. switchgear, l.t. switchboard and cable works; (*c*) one e.h.t. feeder cable, laid complete. Specification with form of tender, drawings, etc., from the electrical engineer, Mr. F. Ffrench, Electricity Works, Horsham, depositing £3 3s. (or £1 1s. for any one section).

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, September 27th.—Supply and erection of a double circuit, 33 000 V, three-phase, 50 cycle, overhead (steel towers) transmission line. Specification (No. 33/T/1), from Mr. E. F. Hetherington, chief engineer and manager, at the offices of the Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, September 28th.—Six months' supply of electrical fittings, etc. Forms of tender from the clerk and treasurer, Mr. C. L. Addison Smith, 19, Heriot Row, Edinburgh.

METROPOLITAN ASYLUMS BOARD, October 2nd.—Installation of electric bells at Paddington Casual Ward (Contract No. 6): new storage battery for t.s. "Exmouth" (No. 7); and alterations to electric lighting in "X" block at Eastern Fever Hospital (No. 8). Specifications from the Board's Office, Victoria Embankment, E.C.4; deposit £1 for each.

HALIFAX CORPORATION, October 7th.—Electricians' work in connection with erection of filter house, etc., for the waterworks department. Specifications, etc., on and after September 16th, from the Borough Engineer; deposit £2 2s.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc. Specifications from the Borough Electrical Engineer, 18–24, Lower Clapton Road, E.5; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled, duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links, one 30 000 kVA busbar coupler equipment, with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18–24, Lower Clapton Road, E.5; deposit £3.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52) 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, September 16th.—Supply of automatic sub-station at Remuera (two 500 kW machines and switchgear); automatic sub-station at Point Chevalier (two 1 000 kW machines and switchgear); 22 000 V switchgear; 6 600 V switchgear; and supervisory control apparatus. (Reference B.X. 5 506.)

INDIA STORE DEPARTMENT, September 17th.—Supply of 119 tons of g.i. wire. Schedule (No. 3) (5s.) from the Director-General, Belvedere Road, London, S.E.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 17th.—Supply and erection of petrol-electric sets. (Reference B.X. 5 537.)

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ANDERLECHT MUNICIPALITY, September 18th.—Supply of three-phase static transformers. Cahier des charges from La Régie de l'Electricité, 6, Rue Van Lint, Anderlecht; fr. 3.

BELGIAN POSTES AND TELEGRAPHS, September 18th.—Miscellaneous telephone apparatus and accessories. Cahier des charges special, No. 3 431, from the Posts and Telegraphs Dept., La Salle Madeleine, Brussels; fr. 6.

LAOIGHIS COUNTY COUNCIL, September 18th.—Electrical installation at the County Court, Portaoighise. Specifications from the County Surveyor, Court House, Portaoighise.

VICTORIAN RAILWAYS COMMISSION, September 18th.—Electric lamps, for Victorian Railways (contract No. 43 141). (Reference B.X. 5 619.)

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, September 20th.—Two electric lifts at the Stationery Office (Beggar's Bush Barracks), Dublin. Specification from the Office of Public Works, Dublin; deposit £1.

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Supply of electric goods, locomotives and battery tenders, in connection with electrification of Madras suburban services. Specifications, etc. (£1) from the Company's offices, 91, Petty France, Westminster, S.W.1.

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Electrical control and traction equipment for suburban services. Specifications, etc. (£1, not returnable), from the Company's Offices, 91, Petty France, Westminster, S.W.1.

AUCKLAND ELECTRIC POWER BOARD, September 23rd.—Supply of pilot cable and joint boxes. (Reference B.X. 5 643.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 23rd.—Electric light installation and distribution system for the town of Kafr-el-Cheikh (Gharbieh Province). Reference B.X. 5 502.)

INVERCARGILL (N.Z.) CORPORATION, September 23rd.—Supply and delivery of switchboard, to be directly operated and suitable for controlling 11 000 V, three-phase, 50-cycle current. It may be either of the draw-out truck type or totally armour clad, and will at first consist of seven units. (Reference B.X. 5 507.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 23rd.—Crude oil engine-driven 150 kW electric generating plant. (Tender No. 1 528.) (Reference B.X. 5 566.)

INDIA STORE DEPARTMENT, September 24th.—Supply of 31 000 yards of dry core electric cable. Schedule (No. 4) (5s.) from the Director-General, Belvedere Road, London, S.E.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, September 24th.—Supply of condensers (schedule C. 461.) (Reference B.X. 5 488.)

INDIA STORE DEPARTMENT, September 25th.—Supply of 200 000 porcelain and composition telegraph insulators. Schedule (No. 3) and form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

Electrical Plant for South Africa.

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 26th.—Two 100 kVA motor-alternators (tender No. 1 521). (Reference B.X. 5 564.)

DURBAN CORPORATION, September 27th.—Supply of three-phase ironclad, compound filled switch panels (specification S. 778). (Reference B.X. 5 505.)

SOUTH INDIAN RAILWAY CO., LTD., September 27th.—Convertor equipment for sub-stations, transformer switchgear and accessories, overhead transmission line, etc., in connection with electrification of suburban services. Specifications (£1) from the Company's Offices, 91, Petty France, Westminster, S.W.1.

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Supply and erection of electric power station for the town of Samannoud (Gharbieh Province). (Reference B.X. 5 596.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Machine tools, Diesel and semi-Diesel engines, boilers, electric batteries, etc., for the Prisons Administration. (Reference A.X. 8 245.)

MARLBOROUGH (N.Z.) ELECTRIC POWER BOARD, September 28th.—Supply and erection of 600 B.H.P. Diesel-driven generating plant and switchgear. (Reference B.X. 5 556.)

COMPANHIA DOS CAMINHOS DE FERRO PORTUGUESES, September 30th (extension of time).—Signalling apparatus. (Reference A. 8 427.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 30th.—Supply and erection of electric power station, with overhead and underground networks, for the town of Deirout. (Reference B.X. 5 598.)

STATE ELECTRICITY COMMISSION, VICTORIA, September 30th.—Supply and delivery of three 3 000 kVA 50 cycle, oil immersed, self-cooled, outdoor type single-phase transformers and spare coils and bushings. (Reference B.X. 5 523.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 30th.—Twelve months' supply of electric lamps (tender No. 1 526). (Reference B.X. 5 590.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Three 3 000 kVA transformers and spares. (Reference B.X. 5 523.)

SOME of the competitors, after the three-legged race at the Enfield Cable Works' sports on September 7th. The winners were Mr. R. Kiddle and Miss D. Turner (second and third from left). Mr. J. R. Baker, hon. secretary of the Sports Committee, is on the right with his partner, Miss R. Ainge. *See page* 313.

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; returnable deposit £2 2s.

WELLINGTON CORPORATION, September 30th.—Electric motors, starters and switchgear, for the Milk Department. (Reference B.X. 5 508.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 1st.—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B.X. 5 567.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—Supply of electric lamp standards. (Reference A.X. 8 251.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 1st.—Supply and delivery of switchboard cords. (Reference B.X. 5 515.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 1st.—Supply of bolts, brackets, screws, springs, etc., for British Post Office No. 121 wall telephones and No. 2 receiver switch. (Tender No. P. and T., 151/1 700.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 2nd.—Supply and erection of electric power station for Dessouk Town (Gharbieh Province). (Reference B.X. 5 597.)

SYDNEY CITY COUNCIL, October 2nd.—Supply of 6 600 V metal-clad switchgear for Argyle sub-station (specification No. 858; 2s. 6d.); 2 200 V ironclad switchgear for Town Hall sub-station (No. 856; 2s. 6d.); and 1 500 V switchgear for Argyle sub-station (No. 857; 2s. 6d.). Specifications can be obtained from the Chief Engineer, 61, Hunter Street, Sydney, N.S.W.

VICTORIAN RAILWAY COMMISSION, October 2nd.—Supply of a.c. line relays for power signalling. (Reference B.X. 5 563.)

SOUTH AFRICAN POLICE, October 3rd.—Supply of electric torches, etc. (local indent No. 50.) (Reference C.X. 3 118.)

BULAWAYO MUNICIPALITY, October 4th (extension of time).—High tension overhead lines, with appurtenant gear and step-down transformers; pumps and motors with starters, etc. (contract No. 6/29). (Reference A. 8 462.)

SOUTH INDIAN RAILWAY CO., LTD., October 4th.—Supply of converter equipment for sub-stations (specification No. 6); transformer switchgear and accessories (No. 7); and overhead transmission line (No. 8). Specifications, etc., from the company's offices, 91, Petty France, Westminster, S.W.1. A charge of £1 (not returnable) will be made for each specification

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MONTEVIDEO PORT ADMINISTRATION, October 7th.—Electric trucks, for load of 1 500 to 2 000 kilos, with generating sets for charging batteries, etc. (Reference A.X. 8 353.)

VICTORIAN ELECTRICITY COMMISSION, October 7th.—Supply and delivery of 11 000 V three-core cable. (Reference B.X. 5 539.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 8th.—Electric ranges, radiators and water heaters, for Waitaki power scheme (section 38). (Reference B.X. 5 642.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 8th.—Telephone relays (schedule C. 478). (Reference B.X. 5 655.)

ANTWERP MUNICIPALITY, October 10th.—Supply of 32 portal type electric travelling cranes (cahier des charge No. 800). (Reference A.X. 8 447.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 10th.—Supply and erection of electric generating station for Tala. (Reference B.X. 5 647.)

SOUTH INDIAN RAILWAY CO., LTD., October 11th.—Overhead contact and distribution lines, in connection with electrification of Madras suburban services. Specifications (10s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Condensers (P. and T. 151/1 733.) (Reference B.X. 5 602.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Supply of B.P.O. type resistances. (No. P. and T., 151/1 712.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single-phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 15th.—Switchboard instruments, test plugs and sleeves (schedule C. 472). (Reference B.X. 5 541.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type resistances. (Reference B.X. 5 551.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type retardation coils. (Reference B.X. 5 552.)

CAPE TOWN MUNICIPALITY, October 16th.—Supply of paper insulated cables (specification No. 474). (Reference B.X. 5 640.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 16th.—Electric motors, pumps, filters, and artesian well. (Reference A.X. 8 373.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic wall and table telephones. (Reference B.X. 5 509.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic telephone dials (P. and T. 151/1 734.) (Reference 5 605.)

JOHANNESBURG MUNICIPALITY, October 17th.—Tramcar motors (contract No. 253). (Reference B.X. 5 664.)

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Turbo-alternators, steam piping, crane and switchgear (contract 52.) (Reference B.X. 5 607.)

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Supply of h.t. cables, transformers and sundries, in connection with extensions of the electricity undertaking (contract 53). (Reference B.X. 5 604.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 17th.—One 10-ton electric overhead travelling crane (tender No. 1 533). (Reference A.X. 8 463.)

H.T. and L.T. Switchgear.

WELLINGTON CORPORATION, October 21st.—High and low tension switchgear (contract No. 449). (Reference B.X. 5 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Supply of insulated wire (schedule C. 475). (Reference B.X. 5 580.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Telephone transformers (schedule C. 474). (Reference B.X. 5 581.)

VICTORIAN RAILWAY COMMISSION, October 23rd.—Dry-core telephone cable (contract No. 43 384). (Reference B.X. 5 638.)

MELBOURNE CITY COUNCIL, October 30th.—Two 2 500 kW motor-converters and accessories, or two 2 500 kW rotary converters, with transformers and accessories. (Reference B.X. 5 570.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 30th.—Head receivers (P. and T. 151/1 725). (Reference B.X. 5 603.)

ARGENTINE STATE RAILWAYS, November 4th.—Turbo-generator sets, and headlights for locomotives. (Reference B.X. 5 657).

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Low tension porcelain insulators, etc. (Reference B.X. 5 648.)

VICTORIAN ELECTRICITY COMMISSION, November 4th.—Supply of 6 600 V automatic voltage regulators and spares (specification 29/83). (Reference B.X. 5 637.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Transmitters and associated parts (schedule C. 476). (Reference B.X. 5 653.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Receivers and associated parts (schedule C. 477). (Reference B.X. 5 656.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Supply of telephone generators and motor generators (schedule No. C.479). (Reference B.X. 5 662.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General, Savoy House, Strand, London, W.C.2.

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote, metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92.) (Reference B.X. 5 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 10th.—Three single-phase, oil insulated, water-cooled transformers, with accessories (section 295). (Reference B.X. 5 600.)

Tenders Accepted.

ADMIRALTY.—Alloy Welding Processes, Ltd., 12 months' supply of A.W.P. electrodes.

GENERAL POST OFFICE.—Edison Swan Electric Co., Ltd., supply of carbon filament lamps.

SHEFFIELD CORPORATION.—A. Reyrolle and Co., Ltd., supply of 24 e.h.t. switches, £3 950 8s.

GENERAL POST OFFICE.—Edison Swan Electric Co., Ltd., gasfilled and metal filament (vacuum) lamps.

SOUTHERN RAILWAY.—Edison Swan Electric Co., Ltd., drawn wire, gasfilled and carbon filament lamps.

MANCHESTER EDUCATION COMMITTEE.—John Adams, Ltd., electrical installation at Aspinal Municipal School.

KINGSTON AND DISTRICT GENERAL HOSPITAL.—Philips Lamps, Ltd., supply of portable X-ray apparatus, £142.

MANCHESTER CORPORATION.—Hall and Stinson, electrical installation in houses on Moston (Lightbourne Road) Estate.

GLASGOW CORPORATION.—Bruce Peebles and Co., Ltd., supply of six 400 kVA transformers, £169 each. (Recommended.)

WAR OFFICE.—General Electric Co., Ltd., pearl Osram gasfilled and vacuum lamps, clear Osram lamps and Robertson carbon filament lamps.

DUBLIN CITY COMMISSIONERS.—North British Lifting and Moving Appliance Co., Ltd., supply of motors, automatic starters and starting switches.

SALFORD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply of transformers and underground street pits, £1 342. (Recommended.)

GENERAL POST OFFICE.—General Electric Co., Ltd., telephone exchange equipment for Ashton-on-Ribble, Fulwood and Leyland (Preston multi area).

WATFORD CORPORATION.—General Electric Co., Ltd., truck type h.t. switchgear, for the premises of the Electric Hose and Rubber Co., Ltd., £514 0s. 6d.

HOLYWOOD URBAN DISTRICT COUNCIL.—Johnson and Phillips, Ltd., supply and erection of mains, switchboard, cable, transformers, etc., in connection with electricity supply scheme.

COMMISSIONERS OF H.M. WORKS, ETC.—Metropolitan-Vickers Electrical Co., Ltd., transformers for Natural History Museum, London; Electrical Installations, Ltd., rewiring at Imperial College of Science, London; Belshaw and Co., Ltd., wiring at Broadmoor Asylum.

GLASGOW CORPORATION.—Bennet Furnishing Co., Ltd., 50 sets, and G. D. Peters and Co., Ltd., 100 sets of car seats; British Insulated Cables, Ltd., ⅝ in. insulated bolts; Hart Accumulator Co., Ltd., storage battery for Bearsden substation; Dyer and Young, Ltd., armature coils; Callender's Cable and Construction Co., Ltd., d.c.c. wire.

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COIL WINDING.

Machines for Production of Self-supporting Coils of Spool-wind Type.

AT the exhibition to be held from October 16th to 26th, at Leicester, the UNIVERSAL WINDING COMPANY, of Manchester, are exhibiting three of their automatic coil winding machines.

The No. 96 machine to be exhibited features the production of self-supporting coils of the spool-wind type, that is, having the wire turns parallel and laid in a plane at right angles to the axis of the coil. The supporting element is obtained by the interweaving of cotton strands between the wire turns and layers. This not only furnishes the desired binder, but also acts as an insulating agent, especially between the end turns of each layer, at which point the cushion of cotton is increased to the maximum, to take care of the increased potential.

In addition to the standard wire compensating device, the machine is equipped with an electrical stop motion, which will cause the winding spindle to stop instantly should breaks or other interruptions occur in the cotton supply. An attachment for stopping the winding spindle when breaks occur in the wire supply and a counter for recording the number of wire turns are incorporated.

The No. 97 machine has been designed for the production of self-supporting spool-wind coils having paper insulation of high di-electric strength between the wire layers. Equipped with two spindles, the winder produces four coils of like specifications simultaneously, handling wires ranging from No. 29 to No. 44 (B. and S. gauge) in size, and winding coils either round or rectangular in form up to 2 in. in diameter. Each layer of wire is registered by means of an adjustable counter which can be set for any required number of layers up to 100, and when the predetermined point has been reached, the winding spindles are automatically stopped by means of a release.

The No. 102 winding machine has been evolved for the production of telephone receiver and other small spool-wound coils not requiring insulation. The No. 102 is offered in units of three or six spindles, as desired, the spindles being governed by a common traverse, but otherwise operating independently. The winding spindles are equipped with individual measuring devices capable of being set at any predetermined number of layers up to 90. The standard type of machine is equipped to wind 100 turns per layer of wire ranging from No. 38 to No. 44.

THE SOCIAL SIDE.

AT the recent inter-departmental rowing contest, promoted by the Portsmouth Tramways and Electricity Employees' Social and Athletic Society, the lamp boys defeated the mains department in the final. During the preceding three weeks, the lamp boys had won a galley race at Cowes Regatta, and the Visitors Cup and first prize for a galley race at Sandown Regatta.

The first annual sports and gala of the Enfield Cable Works Social and Athletic Club took place at the Enfield Cable Works' own ground at Brimsdown on September 7th. In addition to a long programme of athletic events, there were members' vegetable and flower shows, a Morris and folk dancing display, various side shows, and dancing in the evening to music supplied by the Enfield British Legion Military Band. A further attraction was a grand display of flowers by Messrs. Chaplin Bros., Ltd., of Waltham Cross. There was a large attendance of spectators, amongst those present being Mr. W. Fraser, deputy managing director of the company; his sister, Miss Fraser, who distributed the prizes; Mr. D. A. S. Porteous, works manager; Mr. F. W. Main, chief of the test and research department; Mr. E. C. Pentney, London buyer; and Mr. J. R. Baker, who, as hon. secretary of the Sports Committee, was largely responsible for the success of the meeting. Amongst the winners of the athletic events were: H. Baldock, men's 100 yds, 220 yds., and 440 yds. scratch races; C. Speller, men's mile handicap; R. Mills's team, relay race; L. Jessup, veterans' 100 yds. handicap; A. C. Harvey, men's mile walk (time, 8 min. 58⅘ sec.); F. Vesey, men's long jump (18 ft. 2 in.); W. Warren, men's high jump (5 ft. 2 in.); D. Turner, ladies' half mile walk; D. Cutting, ladies' 80 yds. scratch race; Fire Brigade team, inter-departmental tug-of-war; and Waltham Abbey team, fire brigade competition. During the men's mile walk A. Plumb gave an exhibition performance, covering the mile in 7 min. 20 sec. See page 311.

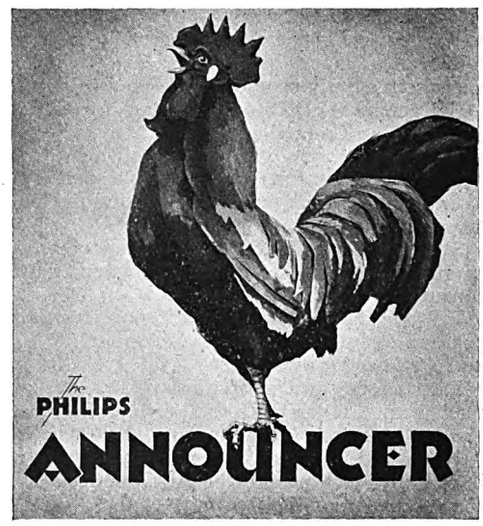
TRADE PUBLICATIONS.

SPECIAL booklets devoted to domestic appliances have been sent to us by the A.E.G. ELECTRIC CO., LTD., of 131, Victoria Street, London, S.W.1.

Vol. 2, No. 2, of the "Nickel Bulletin," published by the MOND NICKEL CO., LTD., Imperial Chemical House, London, S.W.1, has been received.

The September blotter of the JACKSON ELECTRIC STOVE CO., LTD., of 143, Sloane Street, London, S.W.1, illustrates one of the coming season's new fires.

A new publication by MR. ALAN WRIGHT, of 117, Victoria Street, London, S.W.1, is a leaflet dealing with the "Inventum" electrically heated incubator.



The cover of the current issue of the new publication "The Philips Announcer."

Enclosed lighting units manufactured by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., of 38/39, Upper Thames Street, London, E.C.4, are dealt with in catalogue No. 199, superseding No. 156.

The September blotter of POPE'S ELECTRIC LAMP CO., LTD., of Elasta House, 5, Arthur Street, London, W.C.2, has been received. Folder No. 5 145, entitled "the Wizard of Light," is also to hand.

HERBERT MORRIS, LTD., Loughborough, have published a new booklet entitled "A Jib-Crane Revelation"; the reference is No. 833. Folder F. 38, dealing with a new portable electric hoist, has also been issued.

The September issue of the electrical accessories list of BAXTER AND CAUNTER, LTD., 219, Tottenham Court Road, London, W.1, is now available to the trade. The next issue will be published in November.

We have received from S. G. LEACH AND CO., LTD., of 26/30, Artillery Lane, London, E.1, a copy of publication No. N.S. 107, describing a Home Office pattern propellor fan which has just been placed on the market.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C. has issued advanced information relative to the new products for the 1929/30 radio season, which will become effective on September 23rd.

New publications from SIEMENS BROTHERS AND CO., LTD., of Woolwich, London, S.E.18, include catalogue 820, section VIII, dealing with junction boxes for pyrometer installations, and catalogue 840, section III, concerning electrical distance thermometers for hotels, theatres, etc.

ASKANIA-WERKE A.-G. have published a special leaflet concerning the Askania sag meter for overhead line construction, a description of which was published in THE ELECTRICIAN of June 28th. Copies of the leaflet are obtainable from Mr. O. G. KARLOWA, Abford House, Victoria, London, S.W.1.

We have received from OERLIKON, LTD., of 28/31, Essex Street, Strand, London, W.C.2, copies of bulletins Nos. 94 to 97. These deal with equipment at the Tammerfors electricity works, e.h.t. circuit breakers, mercury rectifier equipments, and new locomotives supplied to the Swiss Federal Railways, respectively.

The September issue of the "Relay Recorder," the house journal of the Relay Automatic Telephone Co., Marconi House, London, W.C.2, contains its usual quota of good natural and well-expressed sales talk, as examples of which the articles on "Telephone Magic" and "A New Alarum" are gems of their kind. "Round the World to the Relay" is this month devoted to South Africa, in which country a number of important "Relay" installations are already working.

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ELECTRICITY SUPPLY.

Extension of Darwen's Public Electric Lighting—Crewe's Hire-Purchase Scheme—Nantwich Council House Lighting—Ballycastle Lighting Scheme—Unemployment Relief Works at Nelson—Bermondsey Mains Extensions.

HULL Electricity Committee has obtained sanction for a loan of £79 000 for extensions.

Manchester Electricity Committee has obtained sanction to borrow £17 200 for extensions for electricity mains.

Boston (Lincs) Corporation has decided to promote an electricity supply scheme, estimated to cost £20 000.

Ballymena U.D.C. is applying for a Special Electricity Order. The Council has decided to take a supply from the Antrim Co.

The Northampton Electric Light and Power Co., Ltd., is to extend electric light mains in London Road and Wellington Street, Northampton.

Stoke-on-Trent Electricity Committee has obtained sanction to borrow £35 920 for mains, plant and cost of changing consumers' apparatus.

Bolton Electricity Committee seeks sanction to borrow £25 000 for sub-stations, transformer kiosks and equipment, and £75 000 for mains.

Darwen Highways Committee has decided that the main road from Anchor to Golden Cup shall be lighted electrically, instead of by gas lamps.

Harraton P.C. has entered into an agreement with the Lambton, Hetton and Joicey Collieries, Ltd. for a supply of electricity for public lighting.

Watford R.D.C. has withdrawn its objection to the proposal of the Central Electricity Board to construct an overhead transmission line from Watford to Luton.

Crewe T.C. has adopted a hire-purchase scheme for electrical apparatus in consumers' houses. Estimates are being prepared for the provision of an electrical showroom.

Plans are to be prepared for the lighting of the whole of Withernsea sea front electrically. Cables are expected to be laid in the town during the present month.

Doncaster T.C. has applied for a loan of £1 200 for an additional transformer station and h.t. feeder cable to meet the demands in the easterly part of Wheatley Hills.

The North Wales Power Co. has informed Nantwich U.D.C. that the company is in a favourable position to extend the supply of electricity to sixty houses which the Council proposes to build.

Ballycastle (co. Antrim) Lighting Committee has met representatives of the Ballycastle Electric Light and Power Co. regarding terms for street lighting and has come to an agreement.

Burnley T.C. has refused a request for compensation for alterations to home wireless sets necessitated by the change over of system and pressure of supply of electricity to houses at Rosehill.

Cheltenham Corporation has given approval to the proposal of the Shropshire, Worcestershire and Staffordshire Electric Power Co. to erect an overhead electric cable through the town planning area.

The Antrim Electricity Supply Co. has offered to supply the town of Coleraine at £5 per kVA, plus 0·6d. per kWh, provided an arrangement is come to by Coleraine, Portrush, Portstewart and Ballymoney.

The North-West Midlands Electricity Authority is opposing the application of the Trent Valley and High Peak Electricity Co. for a Fringe Order under which a transmission line would pass through Abbots Bromley.

Lichfield R.D.C. has consented to an application by the Trent Valley and High Peak Electricity Co., Ltd., for permission to erect an overhead transmission line through Colton, on the route from Rugeley to Abbots Bromley.

Shardlow R.D.C. has decided to be heard by the Ministry of Transport with reference to the proposal of the Leicestershire and Warwickshire Electric Power Co., Ltd., to use an overhead transmission line in the vicinity of Melbourne.

Inverness Electricity Department is granting special terms to the L.M. and S. Railway Co. and other large consumers. The charges for power will be for the first 100 000 kWh 1½d. per kWh; for the next 50 000, 1¼d.; and for all current thereafter 1d. per kWh.

Purfleet U.D.C. has resolved to object to the proposed overhead transmission line in the district of the County of London Electric Supply Co. on the grounds that it will pass over private dwelling houses, the Council's housing estate at Aveley, and that portion of the district which would become the civic centre of the district.

Nelson T.C. has decided to submit schemes for approval by the Unemployment Grants Committee for financial assistance for works, amounting to £55 865 and including renewal of mains, services, etc., in connection with the change-over from d.c. to a.c.—cost, £55 865.

As the outcome of an interview with the Commissioners, Abergavenny Council has decided to obtain terms for a bulk supply from the South Wales Electrical Power Distribution Co., the West Gloucestershire Co. and the Worcestershire and Shropshire Electric Power Co.

A Government inquiry was held at Eastbourne on Wednesday into the proposed scheme for the erection of overhead cables across the Sussex Downs from Brighton to Eastbourne. The opponents of the scheme contend that it would destroy some of the most beautiful spots on the Downs.

The Hampshire Electricity Co. has applied to Droxford R.D.C. for consent to a Special Order to supply electricity in the area. The Council considers that the distributing mains proposed to be laid within a period of two years are insufficient and is not prepared to give its consent unless better facilities are arranged.

It has been reported that 78 of the Torquay Corporation houses on the Westhill estate require re-wiring and that the cost would be £6 19s. 1½d. per house or a total of £542 11s. 9d. The Housing Committee has decided that inquiry be made of the Electricity Committee as to whether it will carry out the work, leaving the payment therefore to be spread over a period of years.

The negotiations between Southport Electricity Committee and the Birkdale District Electric Supply Co. for a revision of the price for electricity supplied in bulk to the Birkdale area have had a satisfactory outcome. As from October 1st, the charge to be made by the Corporation will be £4 per kWh of maximum demand per annum, plus a charge of 0·35d. per kWh.

Lurgan U.D.C. has decided to communicate with the Electricity Commissioners in Belfast and if necessary to send a deputation to the Commissioners to get expert advice on the present capacity of the electricity plant at the generating station in William Street to cope with the supply, and to ascertain whether additional plant or another engine at the works is necessary.

Southend T.C. has received sanction to a loan of £6 645 for the installation of a 1 500 kW motor-generator. An inquiry by the Electricity Commissioners will be held into the application for a loan of £66 000 for the installation of generating plant and accessories, in place of the existing steam generators and Diesel plant. The Commissioners think it advisable that the question of bulk supply should be considered.

Luton Electricity Committee has decided that a discount of 2½% be allowed off the total amount of electricity supply accounts, including meter rents, on the condition that the accounts are paid within fourteen days, and that the existing charge of 2½% for interest on ordinary accounts not paid within one month be discontinued.—The Committee is to extend cables to supply the "Half-Way" estates, Dunstable Road, Caddington.

Kettering U.D.C. has decided to oppose an application by Mr. R. Borlase Matthews for an Order to supply electricity in an area covering 584 square miles, in the counties of Leicester, Rutland, Northampton, and the Soke of Peterborough. The Council also decided to apply for an Order to distribute electricity in an extensive rural area including the parishes of Corby, Cottingham, Great Oakley, Great Weldon, Little Weldon, Stanton, Gretton, Rockingham, Ashley, and Stoke Albany.

Bermondsey (London) Electricity Committee has considered proposals by the Borough Electrical Engineer for the laying of mains in a large number of streets in the borough and installing electricity in the houses in such streets. The estimated cost is £93 247, and application for sanction to borrow £30 000 has already been made to the Commissioners. The Committee has been instructed to inform the Unemployment Grants Committee that it is prepared to submit to the Council a scheme for the carrying out of the works referred to, subject to financial assistance being available from the Government.

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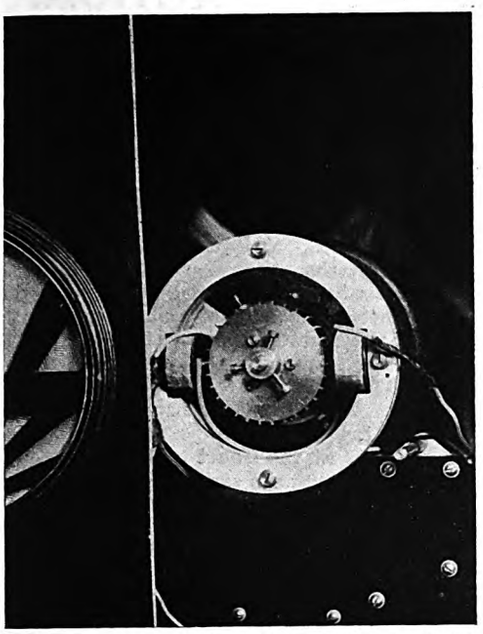
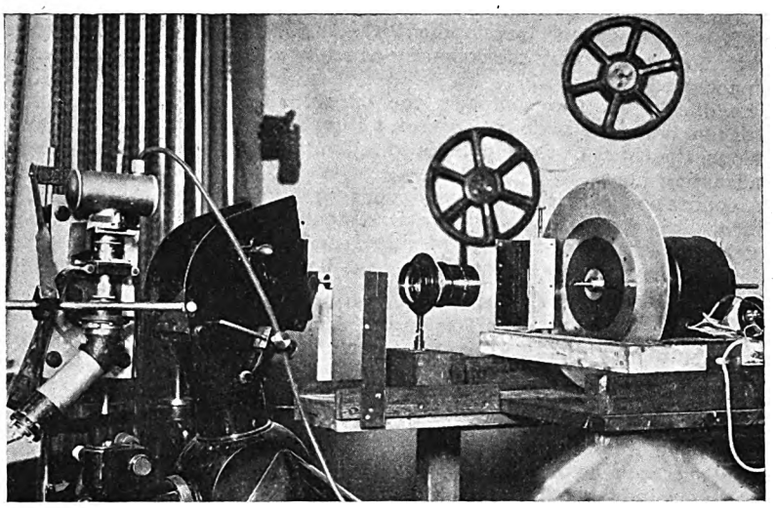
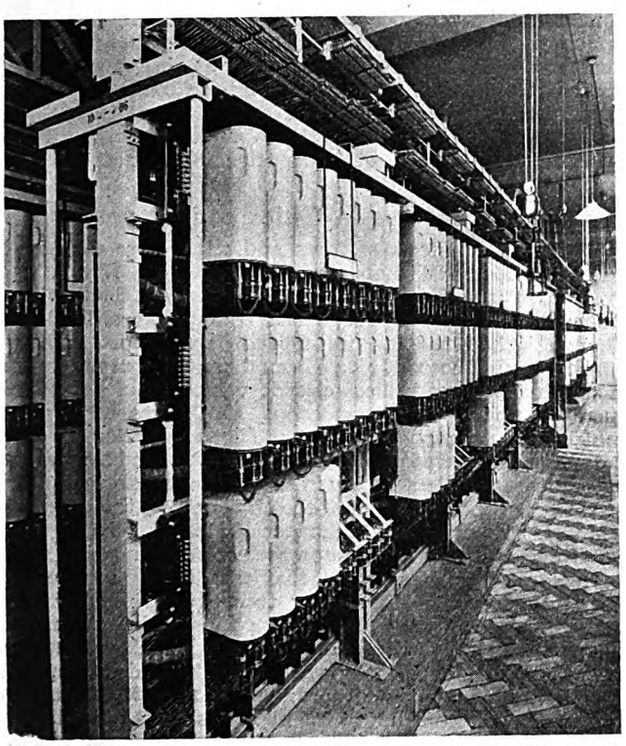
ELECTRICAL NEWS OF THE WEEK IN PICTURES.



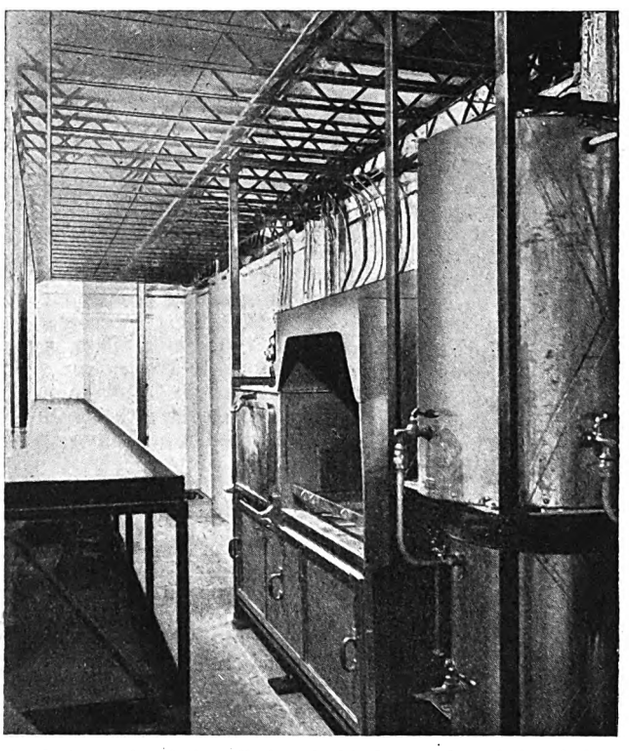
The automatic synchronising device as fitted to "Baird televisors." Though no licences have yet been granted we are given to understand that arrangements are soon to be made for the general manufacture of television receivers.



A general view of the Baird tele-talkie film transmitter as employed for television. Apparatus of this type is to be used, on occasion, when the transmission of television by radio through the B.B.C. stations commences. Though at the time of going to press no official date has been fixed for the first transmission it is believed that it will take place quite soon.



The rotary time-switch units at the new Metropolitan and National automatic exchanges, recently put into service in the Greater London telephone area. The whole of the equipment was manufactured by the Automatic Telephone Manufacturing Co., Ltd., and installed to the order of the Post Office.



A photograph of the all-electric kitchen on board the airship R.100. The ship, which is nearing completion in its shed at Howden, Yorks, has a capacity of 5 000 000 cubic feet, is driven by engines totalling approximately 4 000 H.P., and is capable of lifting 63 tons. All cooking and water heating is done electrically.

Marylebone electricity department has been informed that both the Commissioners and the Central Electricity Board desire the Council to proceed with the plant extension suggested, as bulk supplies will not be available from the grid in time to meet the Council's additional requirements. The Commissioners, however, will make the granting of the necessary loan conditional upon the Council giving an undertaking that it will take the best-known precautions for the due consumption of smoke and for preventing the emission of grit and the evolution of oxides of sulphur and, generally, any nuisance from the operation of the extension. Certain experts have been retained to report on the subject.

Stoke-on-Trent Housing Committee has approved the proposal of the Electricity Supply Committee to supply electricity to the houses to be erected on the Vivian Road site, Fenton, at a fixed price of 1s. per week.—The electrical engineer is to report as to the cost of applying electricity for cooking purposes at the isolation hospital.—A low tension distributor is to be laid to supply the houses in Blurton Road and Heron Street, Fenton, at a cost of £1 600.—A bulk supply is to be given to the Mossfield and Parkhall Collieries at £3 per kVA per annum, plus ½d. per kWh, on a coal basis price of 15s. per ton, subject to 0·015d. per kWh increase or decrease for each rise or fall of 1s. per ton in the cost of coal.

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WIRELESS NOTES.

Experimental Transmissions of Television to be Made Through B.B.C. Stations.

A NEW offer for facilities for television transmission has been made by the British Broadcasting Corporation to the Baird Television Development Co., Ltd. The offer, though not regarded by the company as really adequate, has been accepted.

The offer gives the company the opportunity to make use of five half-hour periods per week for experimental transmissions, the times of these periods to fall outside the normal broadcasting hours.

In connection with these transmissions, it is interesting to note that it is stated that a definite agreement has been made whereby nightly transmissions of television will shortly be made from the Brussels station, from 10.30 p.m. to 11.30 p.m.

New "Columbia" Project.

According to "The Daily Telegraph," Mr. Louis Sterling, managing director of the Columbia Graphophone Company, announces that the company has decided to enter the radio field. The intention is to manufacture radio sets in this country on a large scale.

"It is possible," said Mr. Sterling, recently, "that as our scheme succeeds as much as £1 000 000 will be absorbed by the new industry here during the next twelve months. Employment will be found for some hundreds of workers.

"The radio business in England has not really started yet," added Mr. Sterling. "Since 1920, the progress made has been so rapid that sets soon become obsolete, and it is not surprising that the public are demanding better radio at much cheaper cost. This is what the Columbia Company intends to provide.

"In two years from now," prophesied Mr. Sterling, "practically all gramophones, except portable ones, will be combined gramophone-radio sets."

"Regional" Progress.

It is understood that the new high power B.B.C. station for the North of England will be known as Moorside Edge, and will be erected at Slaithwaite. The station will operate on two wavelengths, and contracts for the building of the station have, we understand, now been arranged. It is hoped to open the station in the middle of next year.

A number of buses travelling from Berlin into the country are shortly to be equipped with wireless apparatus for the reception of concerts.

The Japanese Department of Communications which established wireless communication with Europe in April last through the Nippon Wireless Telegraph Co., is about to establish a wireless station to communicate with the South Sea Islands. The station will be located near Tokyo and is expected to be completed by the spring of 1931.

THE NATIONAL REGISTER.

List of Applications for Registration Accepted at Last Meeting of Executive Committee.

AT a meeting of the Executive Committee of the National Register of Electrical Installation Contractors on September 6th, 23 applications for registration from electrical installation contractors were considered. Of this number 20 were accepted, two were declined, and one was withdrawn.

The names and addresses of the successful applicants are as follows :—

Pounder, John, Ltd., 58 and 60, Stockton Street, West Hartlepool.
Martin, J. E., and Son, 7A, Russell Street, East Parade, Leeds.
Taylor, George, and Co., 49, Clowes Street, West Gorton, Manchester.
Rayton, Thomas, 4, Eldon Terrace, Leeds.
McCrudden, J., and Son, 53, Duncairn Gardens, Belfast.
Fairey and Goodenough, Pontefract Road, Castleford.
Wrigley, John R., 46A, Virginia Street, Southport.
Johnson and Dare, 237, Lozells Road, Handsworth, Birmingham.
Smith, Horace, 177, Dewsbury Road, Wakefield.
Frampton, Percy J., 25, Birley Street, Blackpool.
Alderson and Beaty, 3, Commercial Street, Darlington.
Friend and Horton, 6, North Bridge, St. David's, Exeter.
Elvins, John, 112, Stoney Lane, Sparkbrook, Birmingham.
Wallis, G. E., and Sons, Ltd., 30A, High Street, Ashford, Kent.
Estall, Henry, 20, Thackeray Street, Kensington Square, London, W.8.
Shepperson and Dooley, 291, Archway Road, London, N.6.
Lummus, Thomas F., 49, South Street, Chichester.
Porter, W. T., and Co., 67, Stapleton Road, Bristol.
Main, E. V., and Co., 11, Hale Lane, Mill Hill, London, N.W.7.
Jackson, Alfred, and Co., 129-131, Granby Street, Liverpool.

ELECTRIC TRACTION.

Committee to Consider Electrification of Main Line Railway Systems.

THE Minister of Transport announces that the Government has had under consideration the advisability of obtaining a report upon the problem of the electrification of the main line railway systems of Great Britain. A Committee has accordingly been appointed, consisting of the Rt. Hon. Lord Weir of Eastwood (chairman), Sir Ralph Wedgwood, and Sir William McLintock, K.B.E., with the following terms of reference: "In view of the progress which is being made towards widespread availability of high tension electrical energy, to examine into the economic and other aspects of the electrification of the railway systems in Great Britain, with particular reference to main line working, and to report their conclusions." The secretary to the Committee will be Col. A. H. C. Trench, Ministry of Transport, 6, Whitehall Gardens, London, S.W.1.

During the proceedings at the Court of Inquiry regarding the Dublin United Tramwaymen's strike, Mr. F. Fitzgibbon, K.C., for the company, said of the whole of the operation charges borne by the company over 50% was the wages bill. There were charges which were imposed on the company when it had a monopoly. The increased competition—mainly 'bus competition—had destroyed the company's virtual monopoly. At the end of the last half-year the net receipts had fallen from £93 000 to £64 000. Mr. G. M. Harris, manager of the company, said the shareholders were not getting anything like a return on their money. The dividend last year was 4%. The proposed reduction of wages and salaries would represent £22 000. After the hearing of evidence and addresses on behalf of the various interests concerned, the inquiry was concluded on September 7th, when the chairman, Judge Davitt, announced that a report could not be presented for ten days, and that report would not arbitrate on the wages question. He suggested that the parties interested should consider (1) agreeing to accept a report on the wages issue; (2) resuming the services pending the submission of a report; and (3) endeavouring to reach a solution of the wages question on the basis of a report.

Tamways in Cities and Towns.

Transport problems of town and cities were discussed by Mr. W. I. Marshall, manager of Messrs. Dick, Kerr's Works, Preston, in an address to Preston Rotarians, on September 5th. He said the tramcar for dense traffic was still supreme, Though it had the heaviest initial capital cost, it had the lowest running cost. It had been definitely proved in towns in which tramcars, railless electric vehicles and petrol 'buses operated under equal conditions, the electrically-propelled vehicles were slightly the faster. The railless electric car was the passenger vehicle of the future. They avoided heavy capital expenditure, had less to pay in rates, were cheap to maintain, easy to run, and had none of the objections of the petrol 'bus.

Mr. R. Pilcher, general manager of Manchester Corporation tramways, states, in a report on the subject of noise in relation to the working of tramways, that with regard to the rolling stock used on the Manchester tramway system, the large double-bogie cars weigh roughly 14 tons each, and, fitted as they are with eight wheels, he believes that they cause more noise than single-truck four-wheel cars. The department has special cars fitted with carborundum blocks which grind out corrugations on rails during the night, and this work has been going on for some years. The crossings at tramway junctions are made of manganese steel. As the wear on the castings increases, the worn part causes a bigger gap or space, and consequently as the wheels pass over a greater noise is made. He has arranged to fill up the worn crossings and worn points by depositing steel by means of electric welding plants. The chains used to check the bogie from turning beyond a certain angle in the event of the car becoming derailed or taking a wrong point cause a deal of noise as the car passes over a crossing. He is of the opinion that a steel check can be fitted on the truck quandant and be quite as effective as the chains. The chains are now being removed, and checks are being fitted. Experiments have been made with a new type of hand brake, which causes the braking effect by pressing Ferodo blocks against steel discs fitted on the axles. Arrangements have been made to equip the forty new single-truck cars with this type of brake. A new motor suspension has been designed, and arrangements have been made to fit the new suspension on to all the present cars and on the new bogies on order.

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COMPANY NEWS.

Improvement of Cables and Wireless "B" Stock—Marconi Marine also Rising—Edison Swan Co.'s Increased Profit—Crompton Parkinson's 30 % Dividend—Communications Co.'s Progress—Burndept's Record Output.

THE English Electric Company's ordinary shares have only slightly relapsed after last week's jump, the price remaining above 8s. General Electric shares are on the move again, advancing during this week 3s. 9d. Henley's, too, have improved half-a-crown, but Siemens shares are 1s. 3d. lower, and Ever Readies and Brush each 1s. Cables and Wireless "B" stock has regained favour, recovering 5 points to over 70; the "A" and preference stocks, after a slight weakening tendency, are back at last week's figure. Marconi Marine shares have risen 5s. to £3. South Metropolitan Tramways 4% debenture stock is 2 points higher at 70, and London United at 55 are 2 points down.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
(*d*)	Brompton & Kensington Ord. ..	26/–	26/6	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/–	26/–	51/–	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/6	25/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	33/1½	33/1½	52/10½	26/–
6	,, ,, ,, ,, 6% C.P.	23/–	23/–	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	57/6	57/6	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	23/–	23/–	24/–	21/3
(*c*)	Kensington & K'bridge Ord. (£1)	26/–	26/–	27/6	23/9
1/9⅜	Lon. Elec. Sup. Ord. (£1).. ..	27/6	27/6	37/6	23/–
1/9⅜	Metro. Elec. Sup. Ord.	45/7½	45/–	53/–	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2⅝	N'castle-upon-Tyne Elec. Sup. Ord.	26/10½	26/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P.	23/–	23/–	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/–
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/6	36/6	38/9	24/6
6	,, ,, ,, 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	127½	127½	152	117
7·67	,, ,, ,, 6% Pf. Stk.	127½	127½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4	,, ,, ,, 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	,, ,, ,, ,, 4% pf. Stk.	71	71	77	68
4	,, ,, ,, ,, 4% Deb. ..	76½	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	55	57	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	,, ,, ,, 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	61	59½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	61	61	67	60½
3½	,, ,, ,, 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	72½	72½	77½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	79½	79½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	70	68	70	64½
7	Underground Electric Rlys. Ord.	23/6	23/6	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	,, ,, ,, 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/–	75/–	86/3	56/–
6	,, ,, ,, 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	22/6	22/6	24/9	19/7
7	,, ,, ,, 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	129½	130½	153½	120
15	Callender's Cable Ord.	75/–	75/–	91/3	66/–
6½	,, ,, 6½% C.P. ..	25/–	25/–	25/9	22/–
7½	,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	,, ,, 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/–	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/–	15/–	32/6	23/6
7	,, ,, 7% C.P. ..	21/3	21/3	22/9	21/–
—	English Elec. Ord.	8/1½	8/9	15/9	5/–
—	,, ,, 6% C.P.	8/1½	8/1½	18/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	21/6	22/6	92/3	18/1
6	Ferranti 6% Pref.	18/–	18/–	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord..	61/3	57/6	46/6	26/6
25	W. T. Henley's Ord.	127/6	125/–	120/–	69/3
10	Johnson & Phillips Ord.	40/–	40/–	67/11	34/–
7½	Lon. Elec. Wire & Smith's Pref.	23/9	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	28/9	30/–	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	82½	82½	—	—
	"B" Ord. Stk.	70½	65½	—	—
	5½% Cum. Pref. Stk. ..	95	95	—	—
3½	Eastern 3½% Pref. Stk.	60½	60½	70½	59
4	,, 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Gt. Northern Telegraph (£10) ..	31	31	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	60/–	55/–	90/–	16/6
4	Western Tel. 4% Deb. Stk. ..	77½	77½	82	76

(*a*) 19.8*d.* per share. (*b*) 1*s.* 9·3*d.* per share. (*c*) 1*s.* 6·949*d.* per share.
(*d*) 1*s.* 8·706*d.* per share. (*e*) 1*s.* 7·1281*d.* per share.

YARRA FALLS, LTD.—Div. at rate of 5% will be payable on Oct. 1 in respect of part-paid shs.

WARD AND GOLDSTONE, LTD.—Intm. ord. div. of 3½% actual, less tax (same rate as last year) is announced.

POSTAL TELEGRAPH AND CABLE CORPORATION.—Regular qrtrly. div. of 1¾% on 7% non-cum. pfd. stk. will be payable on Oct. 1.

ENGLISH ELECTRIC CO., LTD.—Directors announce that they are unable to recommend paymt. of an intm. div. on the pref. shs.

GLOBE TELEGRAPH AND TRUST CO., LTD.—Transfer books will be closed from Sept. 13 to 19, inclusive, for preparatn. of 1st intm. div. in respect of year to May 31, 1930, payable on and after Sept. 28.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Applications are invited until September 24 for an issue of £250 000 6% "D" consol. stk. at par, maturing in 1944. Existg. deb. stk. hldrs. have prior right of application.

Official Quotations.—The Stock Exchange Committee has granted official quotations to 12 612 £1 fully paid ord. shs. of the Underground Electric Railways Co. of London Ltd., and £85 000 6½% participatg. pref. stk. of the West Gloucestershire Power Co.

EDISON SWAN ELECTRIC CO., LTD.—Net pft. for the 18 months to Dec. 31, 1928, £76 991, agst £59 508 for year ended June 30, 1927, which, added to £31 903 brt. fwd., makes total £108 894. With the paymt. of 5% now proposed, total div. for the period on the ord. shs. is 15%, agst. 10% for 12 months. It is also proposed to transfer £50 000 (agst. £30 000) to res., making total of that acct. £250 000. Fwd. £18 929.

PETTIGREW AND MERRIMAN, LTD.—After writing down stks., fittgs., etc., and writing off premium acct. for lease of Bucknall Street premises, accts. for the 19 months ended July 31, 1929, show loss of £26 482. A further £44 297 has been written off other assets, and, after taking credit for a res. of £3 283 no longer required, net result is that adverse blce. of £13 102 brt. in is increased to £80 598. No div. has been paid on cum. pref. shs. since Jan., 1927.

MARCONI IRISH SHAREHOLDERS' ASSOCIATION.—At a gen. mtg. of this associatn. on Sept. 5, it was decided unanimously to wind up the associatn., as the shs. are now merged in Cables and Wireless. It was also unanimously decided to form a new associatn. under the title "Cables and Wireless Shareholders' Association," with the same chairman and officers. It was also decided to send a letter to the Board of Cables and Wireless suggestg. that the quotatn. of shs. on the Stock Exchange should be in pound units.

CROMPTON PARKINSON, LTD.—Net pft. for year ended June 30, 1929, after provisn. for depreciatn., deb. int., directors' fees, etc., £82 572, plus £44 550 brt. in. Div. on 8% 1st pref. shs. for six months to Dec., 1928, £6 829; div. on 6% 2nd. pref. shs. for same period, £9 803; intm. div. at rate of 11¼% actual on ord. shs. paid on March 31, 1929, £11 250. To gen. res., £13 500. Divs. of 4% on 1st pref. shs., makg. 8% for year, div. of 3% on 2nd pref. shs., makg. 6% for year and fin. div. on. ord. shs. of 18¾% actual, makg. 30% for year, are recommended. Fwd. £50 359.

IMPERIAL AND INTERNATIONAL COMMUNICATIONS, LTD.—The company announces that the purchase of the Imperial cables has been completed and the lease of the beam wireless stations taken up by the company. The other necessary agreemts. in connectn. with the cable-wireless merger have been exchanged with the Government, and it is anticipated that the Imperial cable and beam wireless services will be operated by the Communications company at an early date. These arrangemts. are in accordance with the recommendatns. of the Imperial Wireless and Cable Conference for the unificatn. of the telegraph services of the British Empire.

BURNDEPT WIRELESS (1928), LTD.—Accts. to June 30, 1929, covering a period of ten months' tradg., show net pft., subject to income tax, of £15 979. Bonus to staff, £375; premises res., £1 200. It is proposed to write off: goodwill, £1 660; one-third prelim. exs., £1 790; and one-third underwritg. commissn., £1 875; and to declare div. of 5%, less tax (equivalt. to 6% p.a. for the period). Fwd, £2 878. Directors consider these results entirely satisfactory, havg. regard to particular circumstances which were present during the period. Although the company acquired the business with

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effect from Sept. 1, 1928, the receiver and manager remained in possessn. until Nov. 14, 1928, consequently the essential early preparatn. for the ensuing radio season was somewhat hampered, but despite this the output effected was much larger than in any correspondg. period in the history of the Burndept business. Directors are satisfied that the company continues to maintain its reputatn. for the excellence and high quality of its products, and look fwd. to an increased demand during current year for which the outlook is distinctly encouraging. In spite of keen and increasing competitn. at home and from abroad, the " Burndept " name is still prominently identified with the radio industry.

MUNICIPAL FINANCE.

Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1928–9 of the 104 undertakings included in the following table and in the table which appeared in our issue of August 9th, was £18 710 480. The gross profit on the year's working of the undertakings was £8 780 983 and the aggregate sales of electricity amounted to 3 266 383 189 kWh, while 46 undertakings out of the total number have contributed out of the year's profits or from reserve an aggregate of £400 293 to the relief of rates. In many cases the costs include items of a capital nature, and net profits have been reduced as the result of reduction of charges for current. As it is desired to make these tables as complete as possible, the Editor will be pleased to receive similar particulars of other municipal electricity undertakings.

Authority	Total Revenue. £	Gross Profit. £	Net Profit (+) or Deficit (−). £	(*a*) Working Costs per kWh sold.	Total Costs per kWh (inc. capital charges).	Electricity sold (kWh).	Increase (+) or Decrease (−) in kWh sold.	Maximum Simultaneous Load in kW.	(*h*) Load Factor.	Radiators and Cookers Connected (total) in kW except where otherwise stated.	Other Domestic Appliances connected (total) kW.	Contributed in Aid of Rates.
Amble U.D.C.	3 455	1 677	+ 856	1·170d.	2·650d.	141 594	+ 8 624	382	20·87	95	63	4
Aylesbury T.C.	51 063	26 637	+ 9 486	1·086d.	1·952d.	4 900 483	+ 1 711 300	2 400	23·30	4 403	1 125	—
Bath C.C.	97 234	52 223	+ 8 713	0·860d.	1·690d.	12 556 735	+ 3 797 648	6 450	26·40	3 551	2 689	—
Bedford T.C.	109 429	52 455	+ 3 605	0·767d.	1·540d.	16 807 521	+ 1 608 642	7 150	26·80	(*c*) 10 000	1 050	1 250
Belfast C.C.	371 373	223 637	+ 69 218	0·597d.	1·221d.	59 383 301	+ 3 170 444	30 600	22·15	(*b*) 8 353	See footnote (*b*)	—
Bexhill T.C.	39 476	12 327	+ 3 028	1·750d.	2·360d.	3 716 045	+ 1 030 937	2 652	15·95	4 659	1 147	—
Bexley U.D.C.	27 730	12 753	+ 4 051	1·375d.	2·173d.	2 614 937	+ 445 540	1 626	18·30	3 321	2 513	700
Bolton T.C.	310 332	179 005	+ 53 444	0·457d.	0·913d.	66 121 996	+ 1 655 542	30 800	28·22	7 922	4 862	10 000
Bradford C.C.	574 159	237 309	+ 13 756	0·558d.	1·436d.	91 086 929	+ 4 328 623	41 000	25·36	9 564	5 173	21 000
Brighton T.C.	259 227	98 563	(*r*) + 18 794	1·070d.	1·640d.	32 247 835	+ 5 087 050	18 700	20·60	(*b*)(*d*) 1 148	See footnotes (*b*) and (*d*)	15 500
Cardiff C.C.	261 812	141 877	+ 46 503	0·600d.	1·280d.	40 117 108	+ 1 777 249	17 301	26·47	(*b*) 23 453	See footnote (*b*)	12 792
Cheadle and Gatley U.D.C.	24 281	(*e*) 11 150	+ 1 118	1·300d.	2·300d.	2 409 272	(*f*) + 178 815	1 140	24·20	(*b*) 2 134	See footnote (*b*)	—
Coventry C.C.	324 543	141 175	+ 15 258	0·534d.	0·913d.	81 273 271	+ 11 057 619	35 151	29·87	See footnote (*g*)	See footnote (*g*)	—
Crewe T.C.	30 612	14 023	+ 6 704	1·575d.	2·076d.	2 527 849	+ 340 131	1 757	16·38	888	116	—
Croydon T.C.	299 693	145 581	+ 54 403	0·627d.	1·500d.	39 368 211	+ 7 453 587	19 000	23·65	(*b*) 27 314	See footnote (*b*)	9 000
Darlington T.C.	83 288	44 746	+ 14 051	0·401d.	0·719d.	27 057 123	+ 3 398 564	10 650	24·73	6 679	—	—
Derby T.C.	211 093	123 402	+ 42 672	0·572d.	1·153d.	33 320 044	+ 2 010 857	15 336	24·81	20 765	2 626	6 000
(*h*) Dumfries T.C.	22 067	12 579	+ 714	1·773d.	3·970d.	1 245 342	+ 40 873	1 097	13·00	—	—	—
Eastbourne T.C.	126 290	51 167	+ 15 794	1·050d.	1·570d.	13 292 679	+ 2 523 841	8 015	20·15	22 199	140	—
Fulham (London) B.C.	138 779	55 247	(*i*) + 12 252	0·990d.	1·583d.	20 292 725	+ 2 266 041	8 900	26·03	—	—	5 000
Gillingham T.C.	43 008	20 197	+ 10 838	1·230d.	1·740d.	4 147 748	+ 1 266 191	1 530	33·20	(*c*) 700	(*c*) 120	800
Grays U.D.C.	22 671	6 338	+ 328	1·730d.	2·650d.	2 014 170	+ 306 088	908	25·30	2 500	600	—
Great Yarmouth T.C.	92 387	59 499	+ 6 066	0·590d.	0·944d.	8 546 276	+ 2 872 649	5 730	21·10	(*b*) 5 139	See footnote (*b*)	—
(*h*) Hamilton T.C.	27 550	12 332	+ 754	1·130d.	1·940d.	3 258 210	+ 488 751	1 554	23·10	578	207	700
Hoylake and W. Kirby U.D.C.	33 116	11 111	+ 2 007	2·663d.	3·765d.	1 983 094	+ 422 159	1 542	18·90	(*b*) 3 429	See footnote (*b*)	—
Islington (London) B.C.	232 190	104 902	+ 32 624	1·050d.	1·670d.	27 978 605	+ 2 804 605	20 438	15·63	(*b*) 4 589	See footnote (*b*)	8 500
Kendal T.C.	11 457	6 037	+ 1 557	2·171d.	3·785d.	599 072	+ 115 098	543	16·59	(*k*) 145	30	344
Lancaster T.C.	48 834	20 737	+ 3 565	0·860d.	1·400d.	6 563 851	+ 1 958 026	3 236	23·00	1 190	See footnote (*g*)	—
Leicester C.C.	413 725	229 164	+ 68 208	0·740d.	(*l*) 1·390d.	59 543 496	+ 5 113 688	30 480	28·32	21 671	—	—
Lincoln C.C.	98 657	50 692	+ 5 120	0·497d.	1·115d.	20 105 756	+ 453 930	9 200	24·95	(*m*) 7 255	See footnote (*g*)	—
Lytham St. Anne's T.C.	88 897	25 448	+ 2 485	1·402d.	2·205d.	7 227 621	+ 872 688	3 930	21·00	(*c*) 20 500	(*c*) 5 300	—
Maidenhead T.C.	30 817	12 650	+ 8 558	1·760d.	2·170d.	2 463 417	+ 583 000	1 338	21·05	See footnote (*g*)	See footnote (*g*)	500
Middlesbrough T.C.	92 138	37 130	+ 11 039	0·889d.	1·260d.	10 471 688	+ 262 423	5 800	24·60	(*c*) 2 000	(*c*) 2 000	4 166
Middleton T.C.	40 678	11 218	+ 5 504	0·735d.	0·880d.	9 554 071	+ 761 994	4 524	24·10	See footnote (*g*)	See footnote (*g*)	—
Neath T.C.	17 427	2 983	+ 932	4·198d.	4·794d.	825 837	+ 73 832	698	16·70	—	—	—
Newcastle-under-Lyme T.C.	15 055	7 770	+ 2 506	2·070d.	3·570d.	840 098	+ 79 389	600	15·98	See footnote (*n*)	See footnote (*g*)	—
Nottingham C.C.	353 717	221 638	+ 28 415	0·775d.	1·800d.	43 564 607	+ 6 111 399	22 950	21·66	—	—	23 170
Portsmouth T.C.	255 216	101 886	+ 17 604	0·930d.	1·890d.	29 480 872	+ 4 195 014	15 500	26·64	(*d*) 10 273	(*d*) 96	—
St. Helens T.C.	125 614	59 192	+ 20 425	0·481d.	(*o*) 0·767d.	32 555 256	+ 2 624 716	9 600	38·70	(*c*) 1 382	124	—
St. Pancras (London) B.C.	289 931	151 172	+ 37 586	0·820d.	1·650d.	36 749 593	+ 7 134 764	22 400	18·73	(*d*) 5 321	(*d*) 566	—
Salford C.C.	307 697	136 142	+ 38 150	0·631d.	1·006d.	62 707 512	+ 2 010 876	25 240	28·30	(*b*) 23 081	See footnote (*b*)	12 700
Scunthorpe and Frodingham U.D.C.	21 150	8 666	+ 4 985	2·023d.	2·503d.	1 360 712	+ 243 046	770	23·48	—	—	563
Southampton T.C.	232 927	109 393	+ 24 445	0·928d.	(*p*) 1·566d.	31 946 362	+ 5 458 874	15 820	23·06	(*b*) 21 145	See footnote (*b*)	8 500
Stalybridge Hyde, etc., Bd.	133 760	62 201	+ 29 280	0·377d.	0·576d.	39 673 217	− 355 407	17 000	26·55	(*b*) 1 952	See footnote (*b*)	—
Stoke Newington (London) B.C.	52 358	21 935	+ 6 920	2·143d.	2·330d.	4 056 830	+ 707 278	2 200	20·99	(*r*) 3 102	See footnote (*r*)	—
Swindon T.C.	81 563	44 069	+ 19 071	0·860d.	1·450d.	10 243 006	+ 859 798	4 740	28·64	—	—	3 000
Todmorden T.C.	29 875	8 382	− 488	1·097d.	1·705d.	4 271 451	− 108 896	2 130	26·40	—	2 806	—
Torquay T.C.	111 534	58 299	+ 16 727	0·800d.	1·470d.	15 139 808	+ 2 848 616	7 350	28·36	(*d*) 6 127	(*d*) 1 224	—
Warrington T.C.	134 301	56 986	+ 18 464	0·598d.	0·898d.	23 714 107	+ 2 569 577	10 200	26·54	3 212	1 208	—
West Ham T.C.	407 851	163 121	+ 18 161	0·550d.	0·930d.	90 786 354	+ 7 975 793	33 210	31·20	(*b*) 7 233	See footnote (*b*)	13 491
Willesden U.D.C.	181 168	56 042	+ 3 072	1·148d.	1·646d.	25 787 227	+ 3 768 791	12 780	23·03	13 608	1 145	—

(*a*) Usually include management, repairs and maintenance, rates and taxes and special charges. (*b*) Including other domestic electrical appliances. (*c*) Approximate. (*d*) On hire only, No. of privately owned appliances unknown. (*e*) After placing £2 000 to reserve. (*f*) Small increase due to one large power consumer ceasing to work a night shift. (*g*) Not available. (*h*) Year ended May 15th. (*i*) After payment of £6 677 for house services and £7 095 schedule D tax. (*k*) Radiators only. (*l*) Include special expenditure and expenditure of capital nature, £18 647 (=0·07d. per kWh). (*m*) Cookers and washboilers. (*n*) Cookers 58 kW; radiators unknown. (*o*) Include grant towards equipment of engineering laboratories at Municipal Technical School, £500. (*p*) Include £16 055 capital expenditure out of revenue and £938 special expenditure. (*r*) After provision of various amounts for works of a capital or special nature, including £10 016 for new meters, £6 121 for meter repairs and renewals, £2 185 for repairs and maintenance of motors, etc., on consumers' premises, and £1 241 for festoon illumination and floodlighting. (*s*) Total domestic. (*t*) After provision for expenditure of a capital or special nature amounting to £14 811.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ALLEN, A. E. AND Co., Wayside, Regent's Park Road, Southampton, electrical engineers. £21 10s. July 12th.

AVENT, Albert Robert, Spa Radio Stores, 16, Clarence Street, Cheltenham, wireless engineer. £14 3s. 9d. July 30th.

HELLIWELL, A., The Neuk, Hackney, Matlock, electrical factor. £32 2s. 11d. July 9th.

KELLETT, H., 36, Chapel Street, Woodhouse, electrical engineer. £54 5s. 6d. July 17th.

LUCAS, S. B., 2, Nuttall Road, Blackpool, electrical engineer. £29 8s. July 17th.

ROCHDALE MAGNETO AND BATTERY SERVICE, 20, Oldham Road, Rochdale, engineers. £19 10s. 4d. July 22nd.

SANDELL, J. G., 20, Hart Road, Dorking, electrical engineer. £35 4s. 6d. July 25th.

SAVAGE, Frederick George, 58, Rowden Road, Beckenham, electrical engineer. £11 6s. 2d. August 2nd.

SUTTON INSULATION Co., Oldfield Farm, Rose Hill, Sutton, contractors. £10 5s. 1d. July 26th.

TAYLOR, S., 11, Furzedown Market, Tooting, wireless dealer. £29 16s. 10d. July 15th.

Deeds of Arrangement.

COOMBES, Walter John, trading as W. J. COOMBES AND Co., 36, School Road, and residing at 16, Hereford Street, Sale, electrical engineer and radio specialist. Dated September 5th, filed September 9th. Trustee, H. K. Poppleton, 76, Cross Street, Manchester, C.A. Secured creditors, £25; liabilities unsecured, £462; assets, less secured claims, £289.

HODGSON, George Arthur, Beacon View, Wakefield Road, and DENNIS, Herbert, 49, Victoria Place, Churwell, trading at Stump Cross Works, Britannia Road, all Morley, as G. A. HODGSON AND Co., electrical engineers, etc. Dated August 30th, filed September 6th. Trustee, G. Astle, 22, Park Row, Leeds, I.A. Secured creditors, £50; liabilities unsecured, £1 250; assets, less secured claims, £660.

RICHMOND, John Hunter Macnair, 6A, High Street and Arcana, Tuesley Lane, Godalming, electrical engineer. Dated September 2nd, filed September 7th. Trustee, W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., Cert. A. Liabilities, unsecured, £2 229; assets, less secured claims, £1 041.

Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ADELAIDE ELECTRIC SUPPLY Co., LTD., London, E.C.—Registered August 29th, acknowledgment of indebtedness (supplemental to Trust Deeds dated June 11th, 1918) securing £250 000 D consolidated debenture stock, making in all £1 500 000 secured by said Trust Deed; floating charge on company's undertaking in Australia (excluding Dividend Equalisation Fund and uncalled capital). *£1 300 022. November 26th, 1928.

BRITISH ELECTRICAL INSTRUMENTS, LTD., Manchester.—Registered September 3rd, £400 debenture, to Mrs. A. E. Millward, 91, Chorlton Road, Brooks Bar, Manchester; general charge. *Nil. December 17th, 1928.

ELECTRIC PETROL SERVICE, LTD., London, S.W.—Registered August 30th, £2 500 (not ex.), mortgage or charge, to Lloyds Bank, Ltd.; charged on property in Finchley Road, Hendon. *£1 400. November 21st, 1928.

ELECTROLUMINATION (ABADIE PROCESS), LTD., London, W.C.—Registered August 20th, series of £2 000 debentures, present issue £1 000; general charge. *Nil. January 24th, 1929.

MEXICAN HYDRO-ELECTRIC DEVELOPMENT SYNDICATE, LTD., London, E.C.—Registered September 2nd, series of £20 000 debentures and premium of 100% on redemption, present issue £3 950; general charge (ranking in priority to £6 000 existing debentures). *£4 450. December 31st, 1928.

WATFORD ELECTRIC AND MANUFACTURING Co., LTD.—Registered August 26th, £3 000 debenture to Mrs. M. Anstee, Cassio Bridge, Watford, and another; general charge. *£8 900. December 31st, 1928.

Private Meetings, etc.

[Inclusion under this heading does not necessarily imply failure Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.]

PAGE ELECTRICAL EQUIPMENTS, LTD.—Unsecured trade liabilities of £1 187 were disclosed by the statement of affairs submitted to the statutory meeting last week of the creditors in the voluntary winding-up of this Birmingham company. There were also loan creditors for £440, making total liabilities of £1 627, as against which net assets were expected to realise £739, leaving an estimated deficiency of £888. The company was registered in the middle of December, 1926, with a capital of £500, which represented the excess of assets over liabilities (including an item of £300 goodwill) of the business formerly carried on by Mrs. E. M. Page. The cash creditors have undertaken to withdraw their claims, so that the trade creditors may receive the full benefit of the realisation.

London Gazette, etc.

Bankruptcy Information.

HINE, George Edward, trading as WIRELESS MAINTENANCE SERVICE, 17, The Promenade, Church End, Finchley, and 28, Mayfield Avenue, Finchley. First meeting, September 16th, 11.30 a.m., 29, Russell Square, London, W.C.1. Public examination, October 3rd, 1.30 p.m., Court House, Barnet.

SHAPLAND, Albert Edwin, Chippenham Cottage, Exmouth, Devonshire, journeyman electrician, formerly at 13A, High Street, Budleigh Salterton, electrical engineer. Receiving order, September 6th. Debtor's petition.

Notice of Dividend.

CHARNOCK, John Richard, top of Meanwood Road, Meanwood, Leeds, electrical engineer. Supplemental dividend, 1s. 2d. per £, payable September 26th, Official Receiver's office, 24, Lower Bond Street, Leeds.

Notices of Intended Dividends.

JOHN, Daniel Blodaufryn, trading as D. B. JOHN AND BROTHERS, 8, Commercial Place, Pontycymmer, and at Nanthir Stores, Nanthir Road, Blaengarw, electrical engineer. Last day for receiving proofs, September 20th. Trustee, E. Owen, 34, Park Place, Cardiff, Official Receiver.

RADCLIFFE, Harold Howe Delmé, and HADDLETON, Frank, 51, Islington Row, Birmingham, trading as CITY ELECTRIC SERVICES, electrical engineers. Last day for receiving proofs, September 25th. Trustee, C. Hoult, 191, Corporation Street, Birmingham, Official Receiver.

Partnership Dissolved.

HARRY BIBBY AND Co. (Eleanor Saunders BIBBY and Henry HORROCKS), electrical engineers, 4A, Bold Street, Warrington, by mutual consent as from August 31st, 1929. Debts received and paid by H. Horrocks, who will continue the business.

METAL AND CHEMICAL PRICES.

TUESDAY, September 10th

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£80 0 0	£1 5 0	—
Electro Wirebars .. .. „	£85 5 0	10s. 0d.	—
H.C. Wires, basis .. .. per lb.	11¾d.	⅛d.	—
Sheet .. .. „	11⅞d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2⅛d.	⅛d.	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet „ .. .. .. „	10⅛d.	—	—
Wire „ .. .. .. „	11⅛d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£25 0 0	—	—
Foreign or Colonial .. .. „	£23 10 0	—	—
Tin—			
Ingot .. .. per ton	£205 5 0	—	£1 5 0
Wire, basis .. .. .. per lb.	2s. 8¼d.	—	—
Aluminium Ingots .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£24 10 0	7s. 6d.	—
Mercury .. .. per bottle	£22 10 0	—	5s. 0d.

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals), „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¾d.
Sodium Bichromate—Per lb. 3¼d.
Rubber—Para fine, 10⅝d.; plantation, 1st latex, 10⅛d.

***. The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

The market was not so active last week, but, according to James Forster and Co., prices were well maintained and closed at the highest. The official price in New York was raised fifteen points to 6·90 cents on September 5th.

Closing prices on September 6th were £23 12s. 6d. for all positions, or 1s. 3d. to 2s. 6d. per ton higher on the week.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

314 889 P. H. Fuller. Sound amplifiers. (2/4/28.)
299 416 Deltavis Co. Contact plugs. (26/10/27.)
303 873 Deltavis Co. Contact plug for currents of great amperage. (13/1/28.)
314 836 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Electrical connecting plugs. (3/4/28.)
314 837 J. Neale. Police control of electric-lighting circuits of shops, banks, and the like. (3/4/28.)
314 838 C. Ruzicka. Light sensitive cells. (3/4/28.)
315 013 W. E. Barber. Electric terminals, bolts and the like. (3/4/28.)
314 839 General Electric Co., Ltd., and C. W. Stopford. Resistance elements for electrical heating apparatus. (3/4/28.)
314 890 H. H. Berry. Signs. (3/4/28.)
315 014 W. C. Tingey and Dubilier Condenser Co. (1925), Ltd. Dials for electrical condensers and the like. (4/4/28.)
315 015 W. E. Groves. Electrical socket-connections. (4/4/28.)
315 016 J. A. Kuyser, A. G. Ellis, and Associated Electrical Industries, Ltd. Electrical reactance coils. (5/4/28.)
314 929 J. E. Pollak (Hermsdorf-Schomburg-Isolatoren Ges.) Determination or measurement of voltage. (5/4/28.)
304 712 Electrical Research Products, Inc. Speed-regulating systems for electric motors. (25/1/28.)
315 018 H. Baron (Compagnie Lorraine de Charbons pour l'Electricite). Electric couplings and method of making same. (5/4/28.)
299 694 Ateliers de Constructions Electriques de Charleroi. Stator windings for alternating-current dynamo-electric machines. (29/10/27.)
289 030 British Thomson-Houston Co., Ltd. Electric resistances. (20/10/27.)
315 029 E. B. Moullin. Instruments for the measurement of alternating currents of any frequency. (21/4/28.)
315 039 Brandes, Ltd. (Federal Telegraph Co.). Variable-coupling transformer. (4/5/28.)
315 040 B. S. Cohen. Electro-acoustic converter, such as a loud-speaker.. (4/5/28.)
315 043 W. J. Tennant (American Multigraph Co.). Feed mechanism for keyboard operated embossing or like machines. (9/5/28.)
290 227 E. Aumuller. Apparatus for electrically lighting a railway train from the turbo-dynamo carried by the locomotive and from a battery provided in one of the carriages. (10/5/27.)
315 045 F. A. Eastwood and Associated Electrical Industries, Ltd. Dynamo-electric machines. (10/5/28.)
315 047 S. G. Williams, R. J. Williams, P. Pearson, and J. W. Templer. System of automatic signalling at cross-roads. (14/5/28.)
295 371 Sulzer Freres Soc. Anon. Absorption refrigerating machines. (11/8/27.)
315 049 J. G. Statter and G. S. Marston. Oil-break electric switchgear arrangements. (17/5/28.)
315 052 S. Gowan and Associated Electrical Industries, Ltd. Liquid rheostats or controllers. (19/5/28.)
291 103 British Thomson-Houston Co., Ltd. Electric condensers. (27/5/27.)
293 021 Forges et Ateliers de Constructions Electriques de Jeumont. Compensated asynchronous electric motors. (1/7/27.)
292 166 Telefonaktiebolaget L. M. Ericsson. Electric excess supply meters. (16/6/27.)
315 079 J. Neale. Method and means for the illumination of a light-sensitive cell. (19/6/28.)
315 085 English Electric Co., Ltd., and G. Schroeder. Synchronous dynamo-electric machines and synchronous electric motors. (26/6/28.)
315 094 P. Freedman. Electric arc devices. (5/7/28.)
294 538 Akt.-Ges. Brown, Boveri et Cie. Arrangement for preventing the entrance of air into spaces under partial vacuum, such as refrigerating plants. (25/7/27.)
315 106 P. Schmidmeier. Electric lamp holders of the bayonet type, and like electric connections. (24/7/28.)
315 114 Holophane, Ltd., and S. English. Illuminating appliances. (31/7/28.)
315 116 H. Hope and Sons and D. G. Page. Electric switches. (2/8/28.)
312 333 Naamlooze Vennootschap Philips' Gloielampenfabrieken. Illuminating devices. (26/5/28.)
299 841 G. Schapringer. Electric switches. (2/11/27.)
315 136 Chesterton, Jones, and Co., Ltd., and F. F. D. Davidson. Electric irons. (31/8/28.)
315 140 Ideal Werke Akt.-Ges. fur Drahtlose Telephonie. Loud speakers. (4/9/28.)
297 436 British Thomson-Houston Co., Ltd. Methods of protecting electric equipments. (21/9/27.)
308 765 G. de Gasenko. Incandescent electric lamps having means for giving different degrees of luminous intensity. (31/3/28.)
305 525 Condit Electrical Manufacturing Corporation. Self-contained rural transformer sub-stations. (6/2/28.)
303 148 Akt.-Ges. der Maschinenfabriken Escher, Wyss-et Cie. Apparatus for automatically controlling the operation of a refrigerating machine driven by a single-phase motor with a short-circuit armature. (30/12/27.)
308 676 Siemens-Schuckertwerke Akt.-Ges. Furnaces for annealing stampings. (26/3/28.)
300 588 British Thomson-Houston Co., Ltd. Transformers. (15/11/27.)
314 844 H. H. Berry. Signs. (3/4/28.)
315 175 E. D. Feldman. Electric motors. (20/11/28.)
315 179 Metallges. Akt.-Ges. and J. Zagorski. High-tension conductors. (23/11/28.)
315 183 H. Schonecker. Electric hand-signal lamp. (6/12/28.)
315 186 C. R. Burch, F. E. Bancroft, and Associated Electrical Industries, Ltd. Vacuum distillation. (19/7/28.)
314 845 H. H. Berry. Signs. (3/4/28.)
314 846 H. H. Berry. Signs. (3/4/28.)
315 191 A. E. White (Central Electric Tool Co.). Electromagnetic reciprocating motors. (13/4/28.)
314 891 G. W. Pierce. Magnetostrictive vibratory systems and apparatus for use in subaqueous and other signalling systems. (3/1/28.)
315 194 General Electric Co., Ltd., and E. H. Croft. Electric switches. (12/4/28.)

Applications for Patents.

June 17th.

18 622 T. H. Barnard and A. C. Goodwin. Suspension clamps for electric conductors.
18 585 J. Bauer. Electroplating metals with chromium.
18 629 P. Bitterman. Telephone covers.
18 633 S. Cox. X-ray apparatus.
18 630 L. E. Currah, and Igranic Electric Co., Ltd. Frame aerials.
18 610 J. Y. Johnson (I.G. Farbenindustrie A.G.) Production of electrodes for secondary cells.
18 637 K. G. Johnson, and Telefonaktiebolaget L. M. Ericsson. Circuit arrangements for relay switches.
18 626 Marconi's Wireless Telegraph Co., Ltd. Picture, etc., telegraph systems. (16/6/28, U.S.)
18 559 C. Marshall and Co. and W. B. Wilkinson. Synchronising sound reproduction and kinematography. (27/7/28.)
18 616 A. L. Muirhead and Muirhead and Co., Ltd. Electrical condensers.
18 613 N. V. Philips' Gloeilampenfabrieken. Electric discharge tubes. (16/7/28, Holland.)
18 555 Patent-Treuhand Ges. fur Elektrische Gluhlampen. Machine for evacuating and closing ampoules, etc. (16/6/28, Germany.)
18 632 Pye Radio, Ltd., and E. V. Root. Radio-receiving apparatus.
18 627 G. Unterberg. Magneto-electric ignition apparatus. (2/8/28, Germany.)
18 451 T. F. Wall. Electromagnetic testing of wire ropes.
18 615 Westinghouse Electric Manufacturing Co. Television systems. (23/6/28, U.S.)
18 542 Firm of C. Zeiss. Illuminating devices. (23/6/28, Germany.)

June 18th.

18 734 E. Asch. Control of high frequency generators. (5/7/28, Germany.)
18 705 E. A. Bitton, H. A. Storry, Ltd., and H. G. Bawtree-Williams. Inductance coils.
18 706 E. A. Bitton, H. A. Storry, Ltd., and H. G. Bawtree-Williams. Thermionic valve amplifiers.
18 702 British Thomson-Houston Co., Ltd., and F. H. Clough. Transformers.
18 742 Burgess Battery Co. Battery hand lamp. (19/6/28, U.S.)
18 709 Consortium fur Elektrochemische Industrie Ges. Process for uniting materials. (26/6/28 Germany.)
18 674 G. Halliday. Electrical geysers.
18 652 F. M. Lewis. Automatic voltage regulators.
18 698 S. Lipman. Electric signalling systems.
18 724 C. Lorenz Akt.-Ges. Picture transmission. (27/4/28, Germany.)
18 725 C. Lorenz Akt.-Ges. Signalling apparatus for aeroplane landing places. (13/3/29, Germany.)
18 720 Telefunken Ges. fur Drahtlose Telegraphic. Insulating material. (12/7/28, Germany.)
18 687 Telehor Akt.-Ges. Television apparatus. (17/12/28, Germany.)
18 688 Telehor Akt.-Ges. Transmission of pictures at a distance. (5/3/29, Germany.)
18 689 Telehor Akt.-Ges. Transmission of pictures and sound. (22/3/29, Germany.)
18 660 J. Wilson. Electric reproduction of sound.

June 19th.

18 806 Associated Electrical Industries, Ltd. Thermostatic controlling means for electric ovens.
18 886 Associated Electrical Industries, Ltd. Automatic electric control systems. (23/6/28, U.S.)
18 860 Associated Telephone and Telegraph Co. Recording at a distance. (28/6/28, U.S.)
18 815 A. D. Blumlein. Submarine signalling systems.
18 900 Brecknell, Willis and Co., Ltd., and A. M. Willis. Posts for supporting l.t. cables.
18 880 W. R. Bullimore. Cathodes for thermionic valves.
18 801 J. K. Burkitt, H. Langley and E. W. Marchant. Apparatus for indicating electric potentials, etc.
18 806 N. Dennes. Thermostatic controlling means for electric ovens, etc.
18 864 M. E. Elliott. Electrical sound reproducing apparatus.
18 840 General Cable Corporation. Oil-filled cables. (19/6/28, U.S.)
18 887 Hazeltine Corporation. Electric coupling systems. (14/7/28, U.S.)
18 901 A. E. Hughes and Liverpool Electric Cable Co., Ltd. Insulation of electric cables.
18 902 A. E. Hughes, and Liverpool Electric Cable Co., Ltd. Cleats.
18 903 A. E. Hughes, and Liverpool Electric Cable Co., Ltd. Electric junction boxes.
18 847 International General Electric Co., Inc. Means for preventing telephone cables being inductively affected. (21/6/28, Germany.)
18 892 Koch and Sterzel Akt.-Ges. Transformers. (15/12/28, Germany.)
18 898 Koch and Sterzel Akt.-Ges. Means for connecting earthed choking coils, etc., in cascade. (24/12/28, Germany.)
18 776 E. N. Kent-Lemon. Frame aerials.
18 859 J. E. Pollak (Excel Magneto Co.) Magnetos.
18 805 E. Potter (C. Kingsley). Means for testing magnetisable bodies.
18 838 Pye Radio, Ltd., and T. A. W. Robinson. Socket holders for thermionic valves, etc.
18 888 C. O. Roehrich and K. Wahl. Production of sound images on films, etc. (20/6/28, Germany.)
18 874 Siemens-Schuckertwerke A.G. Regulating transformers working in parallel. (22/6/28, Germany.)
18 875 Siemens-Schuckertwerke A.G. Oil-filled communication cables, etc. (28/6/28, Germany.)
18 820 G. E. Spero, and Truphonic Radio Co. Radio sets.
18 815 Standard Telephones and Cables, Ltd. Submarine signalling systems.
18 816 Standard Telephones and Cables, Ltd. Electric signal transmission systems. (26/6/28, U.S.)
18 817 Standard Telephones and Cables, Ltd. Means for reducing interference in signalling circuits. (20/6/28, U.S.)
18 830 J. Stone and Co., Ltd. Refrigerator plant
18 812 T. G. Weaire and J. G. Wright. Variable electric condensers.
18 905 W. E. Williams. Directional aerials for electromagnetic signalling. (9/11/28.)

June 20th.

19 002 Associated Electrical Industries, Ltd., F. E. Bancroft, C. R. Burch and N. R. Davis. Electric discharge tubes.
19 036 J. L. Baird and Television, Ltd. Speed governing devices for television apparatus, etc.
19 021 British Thomson-Houston Co., Ltd. Means for obtaining constant pressure in electrical apparatus utilising fluid insulation. (26/6/28, U.S.)
19 038 H. E. F. Connolly. Telephone instruments.
18 913 A. Davies. Apparatus for electromagnetic separation of metals.
19 039 Gramophone Co., Ltd., and A. Whitaker. Slow discharge devices used in sound recording.
18 938 C. M. Longfield. Electric protective system.
18 996 Marconi's WirelessTelegraph Co., Ltd. Signalling systems. (13/8/28, U.S.)
19 010 H. Pender. Electrical resistance devices.
19 009 A. L. Pugh. Electric resistance devices.
19 037 I. Silberstein. Fixing connecting wires to resistances. (30/6/28, Germany.)
18 918 T. F. Wall. Alternating current rectifiers.
18 988 W. J. Ward. Portable wireless receiving, etc., apparatus.

June 21st.

19 137 Associated Electrical Industries, Ltd., A. J. Hall and H. K. Ramsden. Motor control systems.
19 078 Associated Electrical Industries, Ltd., and R. Brooks. Electric current collectors for overhead conductors.
19 161 P. Baxter and J. L. Hills. Television apparatus.
19 095 British Thomson-Houston Co., Ltd. Selective circuit control. (22/6/28, U.S.)
19 096 British Thomson-Houston Co., Ltd. X-ray tubes. (25/6/28, U.S.)
19 105 Callender's Cable and Construction Co., Ltd., and A. B. F. G. Richardson. Machine for winding strip material on cables.
19 101 Cie Generale d'Electricite. Regulating supply of triple valves. (21/6/28, France.)
19 075 Electric Construction Co., Ltd., and W. N. Ringrose. Electric switchgear.
19 091 G. M. Gauvain. Apparatus for heating water by electricity.
19 134 E. S. Kreis and Lissen, Ltd. Alternating current rectifiers.
19 140 C. Lorenz Akt.-Ges. Direction finding. (19/7/28, Germany.)
19 176 G. Maché. Electrostatic telephone receiving instruments. (30/4/29, Germany.)
19 087 Metallges Akt.-Ges. Solid conductors for high voltages. (25/6/28, Germany.)
19 152 D. von Mihaly. Glow lamps.

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THE ELECTRICIAN

Vol. CIII.—No. 2677. Friday, September 20, 1929. [Registered at the General Post Office.] Sixpence

Hackbridge Electric Construction Co. Ltd.

The Hackbridge Electric Construction Co. is prepared to deal with any transformer or voltage control problem. Specialist engineers with 30 years' manufacturing experience are at your service.

Advertisement of the Hackbridge Electric Construction Co., Ltd., Walton-on-Thames.

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REGISTERED "ZENITE" TRADE MARK

VITREOUS ENAMELLED, EMBEDDED

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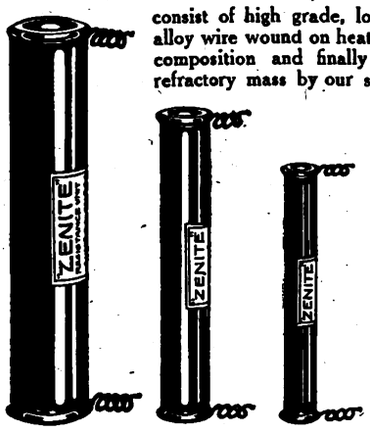

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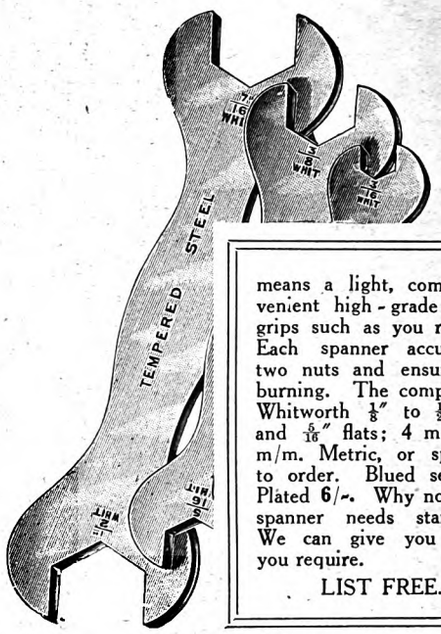

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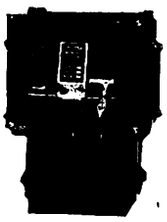

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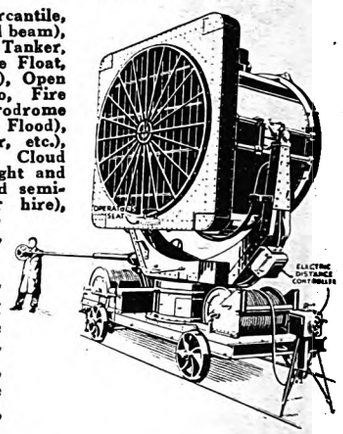

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Current Topics.

Public Lighting.

THE Sixth Annual Conference of the Association of Public Lighting Engineers, reported elsewhere in this issue, which has just taken place in Bournemouth, was an agreeable function, and, considering the tropical weather and the attractions of the sea-front, visitors proved conscientious in their attendance at meetings. The papers, whilst not containing anything very novel, furnished a useful survey of problems in street lighting, and the exhibition was a representative one. The chief impression one receives is the growing scope for service by public lighting engineers, who may in the future be called upon to undertake numerous additional duties, and who should lose no chance of educating themselves to meet these prospective demands. Even if they are not called upon to deal with "the lighting of a city as a whole," as was suggested in one of the papers, it is quite possible that the supervision of luminous traffic control devices and the lighting up of names of streets and house-numbers will come within their scope. We may also expect that public authorities will, in the future, be more keenly alive to the possibilities of artificial light in rendering their cities attractive. Decorative units of the type found in many American cities should prove specially suited to the lighting of seaside towns, and in the floodlighting of public buildings, gardens, bathing pools, etc., there are great possibilities. Apparently the present lighting of Bournemouth does not present any very striking features, though visitors had not a very good opportunity of judging during their brief stay. It would, no doubt, add to the interest of these conferences if some data on the local lighting conditions could be prepared beforehand, and if a tour through selected streets at night could be arranged as a regular practice. We would also like to endorse the suggestion, thrown out by Mr. J. S. Dow, that the Association might consider the preparation of an annual report surveying progress in public lighting in the chief cities of the United Kingdom. The paper by Messrs. COLQUHOUN and STEWART contained an excellent review of American street lighting progress. Why should we not have similar information about our own cities?

Some Startling Figures.

ONE does not look for technical accuracy in the columns of the popular newspapers, but seldom have we seen so patently improbable a story as that which appeared the other day in a London paper of large circulation. It purported to describe a conference attended by four experts in spinning and weaving, who "decided" on the general use of glass fibre for the insulation of electric cables. Although we believe the British Electrical and Allied Industries' Research Association investigated the possibilities of glass as a general insulator some years ago, the technical difficulties seemed insuperable, and nothing more has been done in this direction. The newspaper concerned, however, has not only discovered the way out, but has applied the method to cable manufacture. But this is not all. It has made two other astounding discoveries. The first is that the use of glass fibre "may result in the saving of a large proportion of the £22 500 000 which insulating materials for electric cables cost every year." If we roughly estimate the insulation as costing one-third of the total cost of the cable, our cable makers have an annual production worth no less than £67 500 000. The second discovery is no less astonishing, for we are told that the object of the experts was "to find a cheaper way of insulating the 78 million miles of cable that provide electrical power in this country." This surely refutes the suggestions, so often made in the past, that Britain is behind other countries in the use of electricity.

Railway Electrification Economics.

A REVIEW of Press comments on the announcement of the establishment of the new Government committee on main line railway electrification shows that while the advantages of electrical working are appreciated, there is a growing realisation of the importance of economic considerations. This modified outlook is definitely to be welcomed by those who wish to see the British main line railways electrified, for, as we have more than once pointed out, this is the one important factor upon which consideration should be focussed. Similar topics are in the news in the U.S.A. following the announcement of several ambitious main line electrification projects, estimated to cost about £40 000 000, in addition to schemes representing a capital expenditure of £27 000 000, which are now under way. The largest of the schemes that has been started is that of the Pennsylvania Co., which is electri-

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fying its main line from New York to Wilmington with a view to eventual electrification to Washington. The largest prospective scheme, and one which would surpass that of the Pennsylvania, is that of the New York Central, which for some years has been contemplating the electrification of its line from New York to Buffalo. This scheme alone is expected to cost nearly £30 000 000. In considering these projects, however, allowance is made for the fact that where coal is plentiful it is not economical to electrify solely to reduce fuel costs, and that the only adequate reason for long-distance electrification on railways near ample coal supplies is to avoid traffic congestion. Already traffic on many of the lines is so dense that steam will soon be unable to cope with it, and it is instructive to note that all the lines which are being or are about to be electrified have very dense traffic conditions.

The New B.B.C. Station.

THE London regional transmitting station at Brookman's Park, which made its debut on Monday, is a worthy example of the skill and ability of the B.B.C. engineering staff. From the point of view of appearance, both inside and out, there is little to be desired, while the layout from an electrical point of view is also beyond serious criticism. Apart from these facts, it must not be overlooked that the main object of the station is to provide London listeners with alternative broadcast programmes at sufficient signal strength to cause sets of all types to respond. Whether or not the radiation of the new station will be such as to please listeners in all districts, time alone can tell, but we say, here and now, that it is doubtful. Crystal set users in the outskirts of the city are now comparatively near to the Oxford Street station, and it is reasonable to assume that these sets, when tuned to Brookman's Park, will not, in all cases, give the volume to which their users are accustomed. Though the B.B.C. engineers have done all that appears possible to avoid dislocating the service, it must be remembered that any temporary embarrassment will be followed by a general improvement all round when the remaining regional stations "take the air." A point of more importance, perhaps, will arise when the new station transmits on two wavelengths, for, though any modern receiver will separate the two programmes without difficulty, many of the older sets, and in particular, direct coupled sets, may give disappointing results. The reason for this lies not in the B.B.C. transmitter, but in the receivers, and it behoves every electrical contractor to read the special B.B.C. literature which has been prepared on the subject of selective reception. With the departure of Capt. P. P. ECKERSLEY from the B.B.C. so near at hand, the Brookman's Park station assumes added interest, as he was foremost in the creation of the regional scheme, and the station will be the last of his work as the chief engineer of the Corporation.

Salesmanship by Telephone.

THE possibilities of the telephone service as a means whereby manufacturers can make known to the trade throughout the United Kingdom the merits of their goods was demonstrated at a luncheon in London, on Monday, at the instigation of the Mullard Wireless Service Co. From Frascati's Restaurant to the General Post Office and thence relayed to Manchester, Birmingham, Leeds, Glasgow, Newcastle and Bristol, speeches were heard by parties assembled at similar luncheons in those cities. In this way the Mullard Company was able to announce details of its programme for the coming season, simultaneously to the whole trade, thus introducing a definite step forward in modern sales organisation by means of the telephone service. Both the Mullard Co. and the Post Office are to be congratulated on the success which attended the experiment, which, in the words of Mr. J. T. MOULD, chairman of the R.M.A., "was only a prelude to the time, not far distant, when similar conferences would be held, not merely in Great Britain, but all over the world simultaneously, enabling London manufacturers to speak to their representatives." It suggests itself to us that those responsible for selling the telephone service should do all in their power to develop this side of trade promotion. Visiting manufacturers and acquainting them with the advantages attending such broadcasting should do much to make the service generally attractive, while the Post Office authorities might even go further and arrange with other countries for interconnection with continental and American networks. The possibilities are vast and, with radio co-operation, universal.

British Export Trade.

SHIPMENTS of United Kingdom goods during August, at £63 045 000, were £3 475 000, or a little over 5·2% below the exceptionally large exports of July, but £828 000, or over 1·3% greater than in August, 1928. Taking together the first eight months of the year, exports totalled no less than £488 307 000, or £9 973 000 in excess of those in the corresponding period of last year. There was a fall of about 2·1% in the average export values in the first half of 1929, compared with the same period of 1928, so that it is probable that there was a greater increase in the quantity of exports in the eight months of this year than there was in the monetary value. Comparing August with July, there was a reduction in exports of £2 392 000 in articles wholly or mainly manufactured. Owing chiefly to an increase of £964 000 in the raw materials class, exports of imported produce were, at £9 020 000, greater by £1 050 000 in August than in July; there was also an increase of £264 000 when compared with August last year. From the point of view of visible excess of imports over exports for the eight months of 1929, the position is improving, the surplus being £209 481 000, or £28 016 000 less than in the corresponding period of 1928.

Trend in Electrical Trade.

THE position so far as our own industry is concerned is also reassuring, for, as will be gathered from the detailed figures of the Board of Trade Returns published on another page, electrical exports during August were £242 356 in excess of those for the same month last year. Similar imports for the month increased, by the same comparison, by £172 302. An analysis of the returns shows that the British electrical trade, so far as exports are concerned, is holding its own, for though the excess of exports over imports during August was as high as £930 469, for the eight months, the excess reached the even better level of nearly £8 000 000. Trade during the month under review was largely improved by shipments of wires and cables, which, between them, accounted for an increase of £164 882, while telegraph instruments, excluding valves, improved by £87 494. Strangely enough, wires and cables, excluding submarine cables, and telegraph instruments, were largely responsible for the increased import total, and though electrical machinery also increased in value, the remaining items either declined or increased only slightly. On the whole, the position may be regarded without anxiety, although it is the popular custom to hope for better things, and we feel that so long as we continue to put our backs into the export side of the electrical industry there should be little difficulty in attaining figures far in excess of last year's total.

Central Board Contracts.

INCREASED electrical export activity is accompanied by a further useful batch of orders, totalling about £808 000, for materials required by the Central Electricity Board in connection with its schemes for South-East and Mid-East England. The Board's policy of spreading out over a period the placing of orders for its various schemes is helpful to the British manufacturers concerned, in that it enables them to handle their normal home and export work without much disturbance of plant or workpeople, but we understand that inability to take delivery of equipment at the appointed time has caused some embarrassment to manufacturers needing room to proceed with work on new orders.

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THE ECONOMIC CHOICE OF ENGINEERING PLANT.

The Importance of Considering Efficiency as well as Price—Total Annual Cost the Criterion—How to Compare Tenders.

By A. S. FENEMORE, B.Sc.(Hons.), D.I.C., A.M.I.E.E.

IT is generally recognised that it is not wise to purchase engineering plant on the basis of price alone, since the efficiency of the plant is also an important factor. A machine which has a low first cost, together with a poor efficiency, may be considerably more expensive to the customer in annual cost than one of higher efficiency, even though the latter may be appreciably higher in first cost. From the frequency with which orders are placed with the manufacturer who submits the lowest tender, it would, however, appear that due allowance is not always made for the poor efficiency which often accompanies a low price.

Assuming that all tenders comply with the requirements of the specification, the criterion to be used in a comparison of tenders is that of total annual cost. This is made up as follows:—

(1) The interest on the capital required for the purchase of the plant.

(2) The annual cost of the energy which must be supplied to the plant to enable it to perform the duty for which it is designed.

(3) The amount annually allowed for depreciation.

The interest referred to in item (1) is that already being earned by invested capital, and which will, of course, lapse on the withdrawal of the latter in order to effect the purchase; or where the capital is not already available, is that which must be paid on a new issue to provide the capital required.

The cost of the energy to be supplied will depend upon the output and efficiency of the plant and the load factor at which it is operated, as well as upon the price per unit quantity of energy, in whatever form the latter may be.

The value of all plant decreases with usage and the lapse of time, until finally it reaches some small value representing its worth either as second-hand equipment, or (if this is out of the question), as scrap. In either case, so far as the original purchaser is concerned, the equipment has reached the end of its useful life, and possesses only some small salvage value. It is then necessary to have a sum of money available, which, added to the salvage value, will equal the original cost, and so permit the purchaser, either to pay off the loan instituted for the purchase of the plant, or to purchase new equipment to do the same work. It is the function of whatever provision is made for depreciation to provide this sum of money, representing the difference between the original cost and the salvage value.

Allowing for Depreciation.

There are several methods of allowing for depreciation, but in determining the annual cost we are not much concerned with the actual method, since, whatever method is used, a certain sum has to be provided, and we are chiefly interested in knowing how much this is going to cost.*

We may suppose the provision consists of investing equal sums of money each year in an investment that is absolutely secure.† The usual method of effecting this is to institute a sinking fund. Equal sums are paid into the fund every year (or at more frequent intervals), and these sums allowed to accumulate at compound interest until at the end of the useful life of the plant the amount of the fund is equal to the first cost of the plant, less its estimated salvage value.

Let P = first cost of the plant (in pounds).
S = estimated salvage value (in pounds).
n = estimated useful life of the plant (in years).
r = rate of compound interest per annum for the sinking fund.

If a sum £A is invested at the end of each year at compound interest (the rate of interest being r), then:

Amount at end of
First year = £A.
Second year = £A + £A $(1+r)$.
Third year = £A + £A $(1+r)$ + £A $(1+r)^2$,

so that the amount at the end of n years is the sum of a G.P., of which the first term is A and the common ratio $(1+r)$, i.e.:

$$\text{Amount at the end of } n \text{ years} = \frac{A(1+r)^n - 1}{r}$$

and this must be equal to £$(P-S)$. Hence the annual charge of a sinking fund when payments are made into the fund at the end of each year is:

$$A = \frac{(P-S)r}{(1+r)^n - 1} \text{ Pounds.}$$

The Electrical Application.

The foregoing is of general engineering application. In what follows we shall be concerned with the particular application to electrical machinery.

Let η = efficiency of the plant.
N = hours per annum plant is run on load.
e = cost of energy (in pence per kWh).
i = rate of interest on the capital.

Then the total annual cost in pounds is:‡

$$C = Pi + \frac{(P-S)r}{(1+r)^n - 1} + \frac{G.N.e}{240\eta} \quad .. \quad .. \quad .. \quad (1)$$

Usually in a comparison of tenders all the quantities in this expression will be constant with the exception of the cost of the plant P, and its efficiency η. Strictly speaking, if S is taken to be a definite percentage of P, it will vary also, but since S will be small compared to P, variations in the value of S may usually be neglected. Should, however, there be a tender from a manufacturer whose products, in the opinion of the customer, do not represent the best practice, allowance can be made for this by taking a smaller value for the estimated life in this case.

The expression for the total annual cost contains so many variables that it is difficult to deal with in a general way, though its application to actual cases where all these quantities have definite values is straightforward enough. We may, however, illustrate its use by considering an example, and for this purpose reasonable values for some of these quantities must be established.

No general value can be given for the useful life of engineering plant, since this depends on many factors, all of which are liable to vary in particular cases. An average of the estimates of various authorities, however, gives about twenty years. The second-hand value of engineering plant is not likely, in general, much to exceed 10% of the first cost, while as scrap the value may be in the region of 5% of the cost.

For the purpose of illustration, we shall assume an estimated useful life of twenty years and a salvage value of 7·5% of the first cost. For these conditions, and making payments at the end of each year into a sinking fund at 5% compound interest, the annual charge for depreciation becomes:

$$A = \frac{P(1-0{\cdot}075)\ 0{\cdot}05}{(1+0{\cdot}05)^{20} - 1.} = 0{\cdot}0279P \quad .. \quad .. \quad .. \quad (2)$$

If the rate of interest, i, on the capital is also taken to be 5%, the total annual cost is then:

$$C = 0{\cdot}05P + 0{\cdot}0279P + \frac{G.N.e}{240\eta} = 0{\cdot}0779P + \frac{G.N.e}{240\eta} \quad .. \quad (3)$$

If tenders are invited for a machine for a particular duty, and one manufacturer "A" offers a machine with an efficiency η_1 at a price P_1, while another manufacturer "B" offers a

* See D. J. Bolton, "Electrical Engineering Economics," Chaps. 2 and 3.

† It is obvious that this is preferable to allowing these sums to lie idle year after year, since if this were done a larger sum would have to be set aside each year in order to reach the required amount at the end of the life of the plant, and the provision for depreciation would thus be more costly without giving any advantage in return.

‡ It should perhaps be stated that this is the total relevant cost so far as the question of economic choice is concerned; actually, there are additional costs, such as that of oil, stores, maintenance, etc., but in a comparison of tenders these items will be taken to be the same for all. These costs can therefore be omitted in the present problem.

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machine with a lower efficiency η_2 at a lower price P_2, the total annual costs to the customer, with the values we have assumed, would be respectively :—

$$C_1 = 0{\cdot}0779P_1 + \frac{G.N.e}{240\eta_1} \quad \text{for A's machine;}$$

$$C_2 = 0{\cdot}0779P_2 + \frac{G.N.e}{240\eta_2} \quad \text{for B's machine;}$$

and the customer will make an economic choice by selecting the machine which has the lower annual cost. The difference between the annual costs of the two machines is :—

$$C_1 - C_2 = 0{\cdot}0779\,(P_1 - P_2) + \frac{G.N.e}{240}\left\{\frac{1}{\eta_1} - \frac{1}{\eta_2}\right\}$$

$$= 0{\cdot}0779\,(P_1 - P_2) - \frac{G.N.e}{240}\left\{\frac{\eta_1 - \eta_2}{\eta_1\,\eta_2}\right\} \quad \ldots \quad (4)$$

When this expression is negative, A's machine is the cheaper proposition, for then C_1 is less than C_2, and conversely, B's machine would be selected when $C_1 - C_2$ is positive. Alternatively, we may split up the annual cost into two parts :—(*a*) standing, or overhead, charges, and (*b*) running costs. Since A's machine, though more expensive is more efficient, we have :—

Increased standing charges for A's machine

$$= 0{\cdot}0779\,(P_1 - P_2) \quad \ldots \quad (5)$$

Saving in running costs for A's machine

$$\frac{G.N.e.}{240}\left\{\frac{\eta_1 - \eta_2}{\eta_1\,\eta_2}\right\} \quad \ldots \quad (6)$$

and when (5) is less than (6), then A's machine has the lower annual cost.

As an example we may consider the following alternatives for a 1 340 H.P. (1 000 kW), 1 000 r.p.m. d.c. motor, which is required to run on full load for 2 000 hours per annum, the cost of energy being 1d. per kWh.

Alternative	A	B
First cost	£1 250	£1 100
Efficiency at full load	94·3%	94·0%

In view of the appreciable difference in price and the small difference in efficiency, one might suppose that under the running condition specified (which is not unusual), machine B would have the lower annual cost. Let us see if this is so.

Increased standing charges for A $= 0{\cdot}0779\,(P_1 - P_2)$

$$= 0{\cdot}0779 \times 150 = £11{\cdot}7$$

Saving in running costs for A $= \frac{1000 \times 2\,000 \times 1}{240}\left\{\frac{0{\cdot}943 - 0{\cdot}94}{0{\cdot}943 \times 0{\cdot}94}\right\}$

$$= £28{\cdot}2,$$

so that the customer would save about £16 10s. per annum by selecting the machine with the higher efficiency, in spite of the fact that this machine costs £150 more in the first place.

An Unexpected Result.

This result is surely somewhat unexpected. One is led to wonder how many customers, when offered a machine at £1 100 with an efficiency of 94·0%, would be prepared to offer the manufacturer an additional sum of £150, representing about 13·6% of the price, to improve the efficiency of the machine to 94·3%. Yet, by so doing, the customer would save £16 10s. a year when running the machine on the duty specified, and in most cases the manufacturer would be able to effect this improvement in efficiency for less than the amount stated, with still further advantage to the customer.

The saving in question is certainly not large, but occurs with a load factor of 22·8%. If this load factor were doubled the saving in annual cost would be £ (28·2 + 16·5) = £44·7. On the other hand the running costs will vary in proportion to the cost of energy, and would, for instance, be halved where the cost of energy is ½d. per kWh.

The higher the load factor, the more important does it become to have the highest efficiency which is obtainable without too great an increase in first cost. In certain cases, for instance, motors driving ventilating fans for mines where the load factor may be in the region of 90%, or generating or converting plant for electrochemical work where the load factor may reach 100%, the effect of efficiency and the cost of energy become relatively of much greater importance.

Thus, in the example above, if the load factor had been 100% the annual saving in running costs, due to selecting machine A would be £123·7 with energy at 1d. per kWh, and the net saving would be £112. With these conditions the more expensive, but more efficient, machine, would save a sum equal to its own cost in the first eleven-and-a-quarter years of its life. Even with energy at ½d. a kWh the net annual saving would be £50·2 at this load factor.

The extraordinary importance of a good efficiency, from the customer's point of view, can be illustrated by further consideration of the example above, all quantities being as before, with the exception of the efficiency of machine B which will now be taken to be 93·27% in place of 94·0%. The annual saving in running costs for machine A now becomes £97·4, and we can proceed to find what difference in first cost must exist between the two machines for the saving in standing charges if machine B is selected, to equal the saving in running costs when machine A is selected. For this we must have :—

$$97{\cdot}4 = 0{\cdot}0779\,(1\,250 - P_2)$$

or :— $P_2 = 0$,

so that however small the price B asked for his machine, it would still be cheaper to buy A's machine for £1 250. Only by *giving his machine away*, could B place his offer at no economic disadvantage compared with A's offer.

Frequently in practice a machine runs on a varying load, and since the efficiency is dependent on the load, to make an accurate comparison in such a case the actual running time must be divided into such a number of intervals that during each the load is substantially constant. If the running costs for each interval are determined, their sum gives the total running cost.

In general, an average " load/time " curve is required :

(*a*) For one complete cycle, in the case of a machine operating to a succession of duty cycles ;

(*b*) For one day (or other convenient period), in the case of a machine operating on a load which changes arbitrarily ; this curve gives the output required from the machine at any point of the cycle, or period.

Another Example.

We shall assume as before that offers are received from two manufacturers, A and B, and that we have to make an economic choice between them. Each manufacturer will submit an " efficiency/load " curve of the machine he offers, or else the information from which such a curve can be plotted. The efficiency of each machine at any load can be read from its efficiency curve, and thus the input $I = G/\eta$ at each load determined, and hence an " input/time " curve deduced for each machine. If T is the time in hours occupied by one cycle (or period), the energy input per cycle (or period) is :—

$$\int_{t=o}^{t=T} I\,dt \quad \text{kW hours.}$$

and the difference between the inputs required by the two machines is :—

$$\int_{t=o}^{t=T} (I_2 - I_1)\,dt$$

The value of this integral is represented by the area between the two " input/time " curves, and is conveniently obtained by means of a planimeter if both curves are plotted with the same axes. If A's machine is more costly, but on the whole more efficient, than B's machine, then B's machine will require a greater input, and $\int (I_2 - I_1)\,dt$ will represent the additional energy which must be supplied to this machine due to its lower efficiency. In this case the annual increase in running costs which will occur if B's machine is selected, is :—

$$\frac{Me}{240}\int_{t=o}^{t=T} (I_2 - I_1)\,dt \quad \text{Pounds.}$$

where M denotes the number of duty cycles, or periods, per annum. The difference in standing charges is obtained as before, and it is then apparent which machine represents the better economic choice.

Where more than two competitive offers are received in response to an invitation for tenders, the same method can be applied by selecting one offer as a basis of reference, and determining the increase and decrease in running and standing charges, relative to this offer, for each of the remaining tenders.

BOOKS RECEIVED.

" Operational Circuit Analysis." By Vannevar Bush. With an Appendix by Norbert Weiner. (London : Chapman and Hall.) Pp. x + 392. 22s. 6d. net.

" The Transactions of the Fuel Conference " (World Power Conference, London, 1928). With a Foreword by C. H. Lander. (London : Percy Lund, Humphries and Co.) Vol. I, Pp. cxx + 853 ; Vol. II, Pp. xiii + 1 384 ; Vol. III, Pp. xiii + 1 495. Price £12.

Researches of the Electrotechnical Laboratory. No. 258. The Measurements of the Field Intensities of Some High-Power Long-Distance Radio Stations. By E. Yokoyama and T. Nakai. (Tokyo : Electrotechnical Laboratory, Ministry of Communications.) Pp. 78.

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STRENGTH OF WELDED JOINTS AND VESSELS.

Results of An Insurance Company's Investigation into Use of Welding for Pressure Vessels—Efficiencies of the Principal Joints.

THE annual Technical Report of the British Engine Boiler and Electrical Insurance Co., Ltd., is alway an interesting document. The issue for 1928, which has just been published (price 7s. 6d.), is, however, of particular interest, in that attention is almost exclusively directed to the results of the company's investigation into the use of welding for pressure vessels, a subject which is of growing importance to all those concerned with the welfare of power plant.

The report is so extensive in scope and detailed in treatment that it is impossible within present space limitations to do more than refer to some of the outstanding expressions of opinion which it contains.

It is pointed out in the preface that the use of welding for pressure vessels is extending and it is of the utmost importance that this use should be controlled and confined to legitimate channels. It would no doubt have been preferable had some authoritative body taken steps in the matter, but since none in this country has done so the company, as being to some extent in a tutelary position in regard to the public, decided to conduct its own investigations and to publish the results and the inferences drawn therefrom. It is thought that if as a result, official regulations are issued, the position which now exists—some claiming that welding is suitable for all purposes and others damning it for any—will be simplified.

During recent years, the report states, there has been an increasing tendency to employ fusion welding in the production of pressure vessels, and the absence of any official rules or regulations in this country which would guide design has resulted in a state of affairs which is utterly unsatisfactory to all concerned. So far as the company is concerned there can be no question but that the riveted joint is preferable to the welded joint, of which the actual efficiency depends so largely on the individual skill of the operator and the quality of the metal deposited.

At the same time, in view of the fact that welding is very often the most economic method of making a joint, and that it is a convenient means of obtaining tightness, a welded joint is entitled to consideration as an approved form of construction for an unfired pressure vessel, provided that it is properly designed and constructed.

Holding strongly that where there is risk of explosion safety must be the first consideration, the company decided to inquire closely into the various processes of fusion welding, the influences affecting the production of good work, the strength of the most common forms of joint, and any other matters germane to the subject—the immediate object being to obtain sufficient knowledge on which to decide what constructions should be permitted for pressure vessels, and what limitations, if any, should be set. The investigation, which has included the carrying out of many hundreds of mechanical tests, was limited in the main to the construction of vessels subject to air or gas pressure.

Though there certainly are elements in welding that are far from desirable, the disfavour with which welding is sometimes regarded is in a large measure due to the lack of control in matters of design and manufacture, whereas with vessels made to rigid regulations the undesirable elements would to a large extent disappear.

Causes of Accidents.

There can be no doubt that the bulk of the accidents that have occurred has been due to the welding having been carried out in a manner that no supervising authority could tolerate. For example, butt welds with the weld metal not penetrating the full thickness of the plate, fillet welds with far too small radii or with insufficient surfaces of contact, joints in vessels being situated where there is severe breathing, defective junctions due to inadequate preparation of the edges of the plate, and the use of low grade weld metal.

Though there may be a natural desire among manufacturers that their methods should not be interfered with, it was pleasurable to find that the better-class makers were by no means adverse to the inquiry. Some had already reached the opinion that it was inevitable that definite standards governing construction would sooner or later be called for, while others realised that a too rapid extension of welding in the absence of approved standards would react unfavourably on the trade. Several realised that the absence of restriction would undoubtedly lead to a set-back in the use of welded pressure vessels, owing to the resulting failures and accidents, while the imposition of reasonable regulations would assist the better manufacturers to compete with makers of an inferior article.

Investigation of welded boilers was for the most part limited to the construction of non-fired pressure vessels and as, judging from the criticisms that from time to time are levelled against the attitude of the engineering insurance companies towards fusion welding, the distinction between the two classes of vessel is not always appreciated, some of the differences in the working conditions are briefly described.

Arduous Conditions.

Where there is risk of explosion it is essentia' that there shall be no doubt of the ability of a seam to stand up to the working conditions. However, in the numerous examinations the company has made of faulty joints, faults have never been found of the same magnitude in a riveted as in a welded seam, and there is considerable doubt whether welded seams, as made at present, will stand up for a prolonged period to the arduous conditions imposed in a boiler.

It is to be remembered that a boiler is working under conditions that are far more strenuous than exist with a non-fired vessel. A boiler may have large temperature differences at the two sides of the plate, and an uneven temperature along the same side of the plate owing to its being covered partially by water and partially by steam. These temperature differences are augmented by improper circulation and by scale or oily deposit, and they give rise to stresses that even a solid plate is not always successful in withstanding.

The stresses brought about by uneven expansion are a serious consideration, more particularly where surfaces of welds are made with an irregular finish, while if the plate is undercut at the edge of a weld it is quite unsuitable for withstanding the normal breathing.

A common cause of trouble with riveted constructions is lack of circularity, and there is greater liability of trouble if distortion results from the heat of welding.

Though welded boilers are in service on the Continent evidence is still lacking that this class of construction, even when of the highest order, will reduce the troubles so common at seams.

If welded seams of a boiler are to have the same margin of safety as riveted seams, a radical departure from present designs and practices will be necessary, and this will make the welded construction less attractive to the manufacturer. Even if he himself were satisfied he would still have to satisfy the user that the cost of repairs to leaky seams and corroded joints would be no more than with the usual constructions.

For these reasons and because the design of non-fired pressure vessels working under much less arduous conditions is as yet far from satisfactory, it can hardly be expected that any responsible authority will sanction the welding of boilers, and in so doing depart from the Board of Trade rule whereby it is laid down that no joint in tension shall be welded. Self-generating pressure vessels are therefore only considered in so far as they contain parts on which welding is permissible.

Section II of the Report explains the basis adopted in testing and computing the relative value of the strength of the various forms of joint. It is pointed out that a statement that a joint of a particular form has a given strength is of little value, for a butt weld made by one process may have a strength of 20 tons per sq. in., but when made with another welding rod or by a different process or operator, 40 tons per sq. in. Another factor to be considered is that the strength of a weld made with electrodes of the same type will vary with the strength of the plate on which the weld is made. For the purposes in view the company has considered the absolute strength of a joint of a particular form to be of no consequence, and has found the most convenient information to be the strength expressed as a percentage—described as the "joint efficiency"—of a single-V butt weld made on similar material with the same welding rod by the same operator, the surfaces of the butt weld being machined down to the level of the plate.

As the strength of a reasonably well-made butt weld made with a given welding rod under standard conditions is gene-

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rally a known quantity, knowledge of the joint efficiency gives at once the absolute strength of a particular form of joint made with any welding rod.

Though excellent pioneer work has been done with a view to ascertaining the strength of certain forms of joint, the company has found that available information is not always complete and that, owing to incorrectly designed test pieces, tests have not always been interpreted correctly.

FORM OF JOINT	η	REMARKS
NON-REINFORCED BUTT WELD.	100%	
LAP WELD WITH SINGLE FILLET. (SUBJECTED TO BENDING).	50%	UP TO 1" PLATE FOR CIRCULAR SEAMS. RATE UNLIMITED FOR LONGITUDINAL SEAMS OF PRESSURE VESSELS.
SINGLE BUTT STRAP (OF THE SAME THICKNESS AS THE PLATE.)	50%	ditto. FOR MODIFICATION OF STRENGTH WITH SHAPE OF FILLET SEE SECTION III, FIGS. 8 TO 10.
LAP WELD (NO BENDING).	60%	
LAP WELD WITH TWO FILLETS (SUBJECTED TO BENDING)	100%	NOT LESS THAN St. ONLY. SUITABLE FOR LONGITUDINAL SEAMS OF PRESSURE VESSELS WHEN t DOES NOT EXCEED ⅝".
HALF-LAP JOINT WITH TWO FILLETS (NO BENDING). (OF THE SAME THICKNESS AS THE PLATE.)	120%	
DOUBLE BUTT STRAPS. (OF THE SAME THICKNESS AS THE PLATE.)	120%	
JOGGLED LAP JOINT.	133⅓%	NOT LESS THAN 2t. ONLY SUITABLE FOR LONGITUDINAL SEAMS OF PRESSURE VESSELS WHEN t DOES NOT EXCEED ⅝".
JOGGLED LAP JOINT.	133⅓%	ditto.
BUTT WELD WITH SINGLE STRAP OF HALF THE PLATE THICKNESS.	-	AN UNSATISFACTORY FORM OF JOINT. BENDING STRESSES ARE INTRODUCED & COMPLEX STRESSES SET UP AT THE FILLET WELDS, WITH THE RESULT THAT THE STRAP ONLY INCREASES THE STRENGTH OF THE JOINT INAPPRECIABLY ABOVE THAT OF A PLAIN BUTT WELD.
BUTT WELD WITH SINGLE STRAP OF FULL PLATE THICKNESS. (OF THE SAME THICKNESS AS THE PLATE.)	SAY 120%	AN UNSATISFACTORY FORM OF JOINT NOT RECOMMENDED FOR PRESSURE VESSELS.
BUTT WELD WITH DOUBLE STRAPS OF HALF THE PLATE THICKNESS.	160%	
SPECIAL FORM OF LAP JOINT. WELD METAL IN SHEAR.	60%	STRENGTH IN SHEAR AS INTENDED. OWING TO THE DIFFICULTY IN MAKING A WELD OF THE FORM SHOWN, THE EFFICIENCY SHOULD BE TAKEN AS NOT HIGHER THAN 70%.
TRANSVERSE COVER STRAPS, WELDED AT THE SIDES ONLY.		THE STRENGTH DEPENDS ON THE FORM OF FILLET & IN GENERAL FRACTURE TAKES PLACE AT THE PLACE INDICATED BELOW.
DOUBLE STRAPS OF HALF THE PLATE THICKNESS, OPPOSITE ONE ANOTHER. (FRACTURE)	90%	THE STRENGTH OF THE WELD PER UNIT LENGTH IS 75% THAT OF A LAP WELD AT THE END OF THE STRAP.
SINGLE STRAP OF FULL PLATE THICKNESS.	75%	
SINGLE STRAP OF HALF THE PLATE THICKNESS.	45%	THE RESULT IS RELATIVELY HIGHER THAN BEFORE, OWING TO THE STRAP RECEIVING GREATER SUPPORT AGAINST BENDING.
TRANSVERSE COVER STRAPS WELDED AT ALL SIDES.		
DOUBLE STRAPS OF HALF THE PLATE THICKNESS, OPPOSITE ONE ANOTHER.	150%	FOR INFORMATION ON BUTT JOINTS WITH COVER STRAPS, SEE SECTION III., TABLE I & THE SUBSEQUENT LETTERPRESS.
SINGLE STRAP OF FULL PLATE THICKNESS.	125%	
WELDED FLANGES.	-	SEE SUBJECT MATTER RELATING TO FIGS. 24 TO 31 IN SECTION III.
BRANCHES & OTHER FITTINGS AFFIXED BY A FILLET WELD.	-	SEE SUBJECT MATTER RELATING TO FIG. XXVII., SECTION III.

Table showing efficiencies of some of the principal joints.

With a joint of higher tensile strength than the plate there is difficulty in determining accurately the strength of the weld. Several methods of overcoming the difficulty are suggested, none being free from some objection.

Section III contains notes on strengths of welded joints. A chapter is devoted to fillet welds and special forms of lap joints, and Section V is concerned with tests to determine the strength of samples representing joints of pressure vessels and other structures.

Joint Efficiencies.

Numerous tensile tests on plates varying between ¼ and 1 in. in thickness have been made on a great many forms of joint. Since a description of all these would be voluminous, and since a mere statement of tensile results, without reference to certain factors that enter into the making of a joint, would be of but slight value for the purpose in view, it has been considered that the information could best be given in a summarised form by a statement of the joint efficiencies.

For this purpose a non-reinforced butt weld made with the same welding rod, by the same operator, and on the same quality of plate is taken as standard for each determination, and all efficiencies have been given on this basis.

The efficiencies of some of the principal joints are given in the accompanying table. The values given have been found readily obtainable with reasonably well-made welds.

For fusion-welded pressure vessels a basic principle is that the strength of a joint shall be deemed to be not higher than half the strength ascertained by test, with the welding reasonably well carried out. Accordingly the efficiencies given are based on average results where the weld has been free from noticeable defect.

Emphasis must be placed on the fact that the figures given in the table are not the strengths that will be credited to a joint. They are for general guidance and it must not be assumed that even half the figures will necessarily be credited by responsible authorities.

The table should be studied in conjunction with the following explanatory notes :—

1. The efficiencies compare the strength of joints in plates of thickness t with the strength of a plate of the same thickness when butt welded, but without reinforcement.

2. The efficiencies refer to joints of the same width as the plate.

3. With fillet welds the efficiencies apply when the fillets have an approximately straight contour, lying at 45° with the surfaces of the plate. The efficiencies also apply to other contours as long as the throat thickness is not less than $\cdot 69t$.

4. A joint may readily be made stronger than the body of the plate away from the joint. As the efficiency refers to the joint itself and not to the plate, it follows that a higher efficiency than 100% can readily be obtained. It has been possible to record efficiencies, where they exceed 100%, by the adoption of specially designed test pieces.

5. It must not be inferred that all the joints shown are permissible for pressure vessels ; the figures given apply to a static tensile test, and it does not follow that the behaviour of joints subjected to the stresses of service will be in proportion to the efficiencies given.

6. The strengths given apply only when the load is applied in the manner shown in the sketches. The efficiency is therefore in some instances superior with the joint applied to the circumferential seam of a pressure vessel, and sometimes inferior when it is applied to a longitudinal seam.

Desirable Electrode Properties.

The report gives under the following heads what are considered to be the most necessary properties for metallic electrodes used for welding pressure vessels :—

(1) The electrode should contain not more than 0·03% of phosphorus, not more than 0·05% of sulphur, and not less than 0·50% of manganese. A higher percentage of manganese is strongly recommended.

(2) The rod should have a covering which has strong deoxidising properties, and which will react chemically with the mill scale and any rust on the plate being welded, and cause a slag to be formed, which will protect the surface of the weld from exposure to the atmosphere.

(3) The covering should have a melting temperature below that of the steel, preferably not more than 1 000 deg. C., in order that the operating current may be kept low, reducing the expansion of the welded part and the liability for the metal to be overheated, and allowing the molten slag to separate readily from the weld metal.

(4) The slag should have a coefficient of contraction greater than that of the metal, so that it may be removed easily.

(5) The electrode should be protected against rusting in a damp atmosphere, either by the covering or some other suitable means.

(6) The covering should be capable of withstanding temperature changes and the usual rigours of service that are to be expected during manipulation, without cracking.

(7) The electrode should deposit weld metal free from porosity and high in ductility.

The following additional properties are deemed necessary to meet special conditions of service :—

(8) When an electrode is used in a position where it has to be bent, the covering should be sufficiently plastic for a portion of the electrode, 9 in. long, to be bent to a right angle without the covering showing any sign of flaking off, the test being made after the electrode has been dipped in water and redried.

(9) When the electrode is for use on fireboxes of boilers, the quality of the deposited metal should be such that strips cut from welded plates can, while at a red heat, be bent and flattened without showing defect.

(10) When welds are hammered hot while metal is being deposited, or when the welded article is subsequently forged or subjected to deformation when hot, the quality of the weld metal should be such that strips of welded plate can, when at a red heat, be forged down to half their original area without showing defect.

In conclusion, it is not denied that many most excellent welds are made, and indeed a number has been examined during the course of the inquiry, but the quality of the ordinary commercial weld falls far short of the ideal, while many welds are definitely bad. Regulations are required if the legitimate development of welding is not to be retarded, and until such regulations are framed and enforced the company thinks it is inevitable that trouble and disappointment will be the lot of makers and purchasers alike.

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PUBLIC LIGHTING ENGINEERS.

Proceedings at Association's Sixth Annual General Meeting and Conference at Bournemouth—Interesting New Equipment Shown at Exhibition—Applications of the Selenium Cell—An Arc Lighting Revival.

THE sixth annual conference and exhibition of the Association of Public Lighting Engineers was held in Bournemouth from September 9th to 12th. On arrival visitors were received by the Mayor of Bournemouth (Ald. C. H. Cartwright), at the Town Hall, where the meetings and exhibition were held. A preliminary opportunity was then afforded of viewing the exhibits, a description of which is given later.

On the following morning, when the Conference opened, an address of welcome was delivered by the Mayor, and the President (Mr. J. F. Colquhoun) briefly responded.

Presidential Address.

The new President, Mr. S. B. Langlands, was then inducted.

Mr. Langlands delivered a brief address, commenting on the progress of the Association, whose work had received recognition from kindred associations and public bodies. He urged that every city should have a public lighting department served by a well-equipped laboratory. In Glasgow the lighting laboratory had saved much money, and the systematic tests conducted therein had led to continuous improvements.

Reference was made to the comparative merits of underground and overhead mains for lighting, tariffs for gas and electricity, and the choice of materials for roads. Mr. Langlands suggested that a standard rate of 1d. per unit should be aimed at for public lighting in towns having more than 100 000 inhabitants, that more attention should be paid to the reflecting qualities of road-surfaces, and that supply cables for public lighting might often be safely and more cheaply installed if carried overhead.

Reference was also made to the International Illumination Congress to be held in England in 1931, and the hope was expressed that everyone would do his best to render this a success.

Lighting and Rating.

A paper entitled "Lighting and Rating" was then read by Ex-Baillie James MacDougall (Glasgow). The author reviewed legislation of the past bearing on public lighting, which, he suggested, should be placed under a special officer and dealt with by a separate department, such as had been adopted with success in Glasgow. A list of the expenditures of various cities on public lighting was given (see Table I), and it was

TABLE I.

City	Expenditure on Public Lighting per head of Population per annum. s. d.
Leeds	4 4
Glasgow	4 2
Manchester	3 6
Newcastle	3 4
Dundee	3 4
Liverpool	2 0
Leicester	2 7
Edinburgh	2 5
Aberdeen	2 4
Sheffield	2 4
Birmingham	2 2

pointed out that the allocation, which varied from about 2s. to 4s. per head of population per annum was considerably below the figure adopted by many American cities, where two dollars per head was considered a minimum figure. In the United Kingdom, however, lighting was not infrequently covered by a general rate, which included other items of expenditure.

The data for the various cities showed considerable variation in expenditure on street lighting in relation to population and rateable value (see Table II). Some effort should be made to arrive at standard procedure, and the first step should be to press to secure a special lighting rate in all cities. In the United Kingdom practically all expenditure on public lighting was met by public assessment, though in the United States the practice of defraying lighting partly out of special contributions by merchants was quite usual.

In conclusion the author referred to the variation in charges for gas and electricity, and to the high price of electric lamps in this country as compared with the United States. In both directions, he said, concessions would be welcome.

TABLE II.

	Population.	Ratable Value. £	Value Per Head. £ s. d.	Product of 1d. in £ Rate. £	Total Rates.
Glasgow ..	1 034 174	11 599 163	11 4 3	43,000	14/0·3
Birmingham	955 300	6,689,011	7 0 0	25,472	14/6
Bradford ..	293 200	2 548 035	8 13 10	9 856	14/2
Leeds ..	483 952	3 386 257	6 19 11	13 234	15/8
Leicester ..	245 000	1 504 000	6 2 10	5 858	14/11
Liverpool ..	875 900	7 246 549	8 6 0	25 423	14/9
Manchester	751,900	7 015 912	9 6 7	27 300	13/4
Newcastle ..	288 500	2 449 923	8 9 10	9 508	12/5
Sheffield ..	524 900	2 620 155	4 19 10	9 872	18/8

Following the morning session visitors were entertained to luncheon by the Bournemouth Gas and Water Co.

Compromise in Public Lighting.

On resuming, a paper on "Compromise in the Use of Illuminants for Public Lighting," was read by Mr. C. H. Woodward (Lighting Superintendent, Bournemouth). Compromise, Mr. Woodward remarked, occurs in two chief forms —compromise in policy, and technical compromise. The public lighting engineer frequently found that his decisions were governed by one or the other. Ordinary public lighting was in itself a compromise, seeing that the "tunnel" effect furnished by street lamps differed widely from the unrestricted natural illumination from the sky. A feature of public lighting was that the vertical illumination was frequently much higher than that on a horizontal plane. Compromise was again necessary when one attempted to modify the natural distribution of light by means of globes or reflectors. He had found, that even 500 W lamps could be exposed to weather without protection, as illustrated by the series of lamps mounted along the sea front. Another difficulty was the effect of trees. Foliage on either side of the street added to its beauty, but was apt to prove troublesome to the lighting engineer.

As illustrating the "pulling effect" of light on traffic the author described an interesting experiment. A friend was asked to drive his car with a single headlamp along the Undercliff Drive, whilst a camera was directed on the road from the top of the cliff. When developed the film showed a marked ripple in the course of the headlight. The driver had involuntarily hugged the curb at the parts of the road where the illumination was weakest.

In the later portion of the paper Mr. Woodward urged that extreme uniformity of lighting was not desirable, and put in a plea for artistry and decorative effect. Lamp-posts were either too plain or decorated, with too much elaboration.

Finally it was pointed out that ordinary street lighting consists in part of "positive" impressions similar to those produced by daylight, such that an observer sees an object illuminated in its entirety, and "negative" effects such that the object is seen merely as a silhouette against a light background. It was, as a rule, only in the immediate vicinity of lamps that the positive effect was experienced, but the proportion of positive and negative effect might be taken as an index of the quality of street lighting.

American Public Lighting Practice.

The morning of September 11th was occupied mainly by the lengthy paper by Messrs. J. F. Colquhoun and E. J. Stewart reviewing "American Practice in Public Lighting." This paper, which was illustrated by numerous lantern slides, was in essence a summary of the authors' experiences in connection with their visit to the International Illumination Congress held in the United States last September. The lighting conditions in a number of American and Canadian cities—New York, Boston, Lynn, Philadelphia, Washington, Cleveland, Detroit, Chicago, Niagara Falls, etc.—were briefly discussed. The authors also gave a summary of the discussion of the proposals put forward by the Secretariat Committee dealing with public lighting, in which the B.E.S.A. standard specification for street lighting figured prominently. The main feature of this specification is that it is based on measurement of minimum illumination, whereas in other countries average illumination is usually adopted. The final resolution recommended that in general both values should be given, and there

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were other resolutions designed to initiate further study of suitable portable photometers, glare and visibility, and luminous traffic-con rol signals and their use.

Reviewing experience in American cities, the authors remarked that such defects as were encountered in that country were mainly due to excessive spacing and insufficient height. In American cities many very fine examples of lighting in main thoroughfares were noted, but it appeared that less attention was paid to side streets than was usual in this country. Principles of lighting, as indicated in the contributions of the American Illuminating Engineering Society, would nevertheless ensure good quality lighting. An average of 0·25 foot-candle, obtainable with an expenditure of 50—100 lumens per linear foot of street, was recommended for thoroughfares; 0·05 foot-candle, and 10 lumens per linear foot were proposed for residential streets. Lamps of less than 100 W were rarely seen in American cities. It was recommended that at least 1 000 lumens, and preferably 2 500 lumens per ft. should be used, and that the mounting height should not be less than 15 ft.

In the United States decorative appearance was regarded as of considerable importance, and pleasing examples of designs of posts and diffusing glassware were usual. In some cases, however, an incongruous assembly of decorative designs and unsightly wooden poles was found. Other features were the pleasing layout of installations in the parks, the introduction of special lighting in important thoroughfares by private effort, and the " booming " of street lighting by the manufacturing firms and local electric supply undertakings. In common with other authors Messrs. Colquhoun and Stewart emphasised the cheapness of electric lamps in America, as compared with prices ruling in this country.

The paper was concluded by a reference to the forthcoming International Illumination Congress to be held in this country in 1931, when an effort should be made to show visitors examples of well designed installations of public lighting.

Private Aids to Public Lighting.

The final paper, by Mr. J. S. Dow, was entitled " Private Lighting as an aid to Public Lighting." The author commenced by pointing out the inherent difficulties of public lighting, by means of lamps at infrequent intervals which were seen against a background of dark and feebly illuminated surfaces of buildings. In such circumstances the eye was in an abnormal " dark-adapted " condition, and was highly sensitive to glare. Uniform illumination could only be attained by accentuating the candle-power at angles slightly below the horizontal, and this almost inevitably led to glare. Really satisfactory street lighting could only be obtained by much closer spacing than was usual at present. In some Continental cities closer spacing was now being adopted, notably in Cologne where the ratio was only 3 : 1.

Redesigning a public lighting installation naturally meant expense, but it was possible that in dealing with important business thoroughfares the plan of inviting private support, which was quite general in America, might be tried. Lighting by private enterprise might also aid in the solution of another difficult problem, the lighting of arterial roads, passing through numerous country areas but designed for long distance motor-traffic between cities. In order to hold in check the unsightly effect of luminous traffic signals, illuminated placards, petrol stations, etc., on rural roads, some measure of control seemed desirable. Already our roads were coming to resemble railways.

In cities private lighting, whether in the form of illuminated signs and placards, floodlighting and architectural lighting, already added materially to the illumination received from public lamps. Here again, unsightly effects should be guarded against, but as the tendency was towards concealed lighting in such cases, the diffused light thus obtained might be very valuable, and might do much to limit the extreme contrasts found in unaided public lighting. Local authorities might themselves, in the future, make fuller use of these systems of lighting. They might also initiate the lighting up of house numbers and street names, and even the identification of important public buildings by means of unobtrusive but informative illuminated signs. Authorities in seaside towns, in particular, should recognise the possibilities of light in rendering such towns attractive by night.

In the future the public lighting engineer should take a wide view of his duties, and should ultimately feel himself responsible for the lighting of his city as a whole. In the course of his address Mr. Dow showed a variety of lantern slides, illustrating the part played by floodlighting in revealing buildings by night, and referred to the " festivals of light " recently organised in various Continental cities, which had proved beneficial not only to supply undertakings and makers of lighting appliances but to local traders as well.

DISCUSSION.

Several of the papers led to a considerable amount of discussion, one point that received special attention being the lighting of arterial roads. Mr. LENNOX pointed out the difficult position of parish councils in dealing with sections of rural thoroughfares. Mr. COLQUHOUN suggested that possibly such sections should be under the control of the County Surveyor, but it was hinted that parish councils were sometimes averse to interference. Mr. T. WILKIE thought that possibly the larger towns might assist their less wealthy neighbours, but the general impression seemed to be that as the lighting of arterial roads is essentially a national duty aid ought to be given by some such body as the Ministry of Transport.

The paper by Messrs. Colquhoun and Stewart naturally led to discussion on American practice. It was suggested that the ornamental diffusing fittings usual in large American cities might be more freely used in this country—especially in towns having considerable natural charm, such as Bournemouth.

Mr. A. C. CRAMB thought that a detailed comparison of costs of gas and electricity in this country and the United States might prove useful, and various speakers dealt with the question of the prices of electric lamps. It was pointed out that the United States had a great advantage in the fact of a single voltage being almost universal; also that their manufacturers, who produced large quantities of standard types, were naturally able to manufacture more cheaply than is possible in this country where outputs are smaller and the variety of types of lamps in use is so much greater.

The idea that traders in important thoroughfares might be asked to make a special contribution towards improved lighting created interest, and it was suggested that local authorities might make fuller use of light in order to advertise their towns —*e.g.*, by erecting floodlighted placards with the name of the town (and possibly particulars of places of interest, hotels, garages, etc.) for the benefit of approaching motorists.

The street lighting in Bournemouth itself excited some comment. Interest was expressed in the floodlighting of the War Memorial in the gardens, and an arrangement of three 1 000 W lamps in concentrating reflectors mounted on a high mast in front of the pier, which served to illuminate a very extensive area.

A useful suggestion put forward by Mr. J. S. Dow was that the Association should compile a yearly report, surveying progress in street lighting in the chief cities of the United Kingdom, for presentation at each annual conference.

The Exhibition.

The exhibition was again a comprehensive one, over 20 firms taking part; practically all the leading firms concerned were represented.

At the stall of the General Electric Co., Ltd., there was a complete exhibit of lanterns of the " Wembley " type, and photographs were on view showing the appearance of the Thames Embankment before and after the installation of these units. Other typical street lanterns were exhibited by Holophane, Ltd., Metro-Vick Supplies, Ltd., the Edison-Swan Electric Co., Ltd. (where the familiar units manufactured by the British Thomson-Houston Co., Ltd., were included), Korting and Mathiesen Electrical, Ltd., The Electric Street Lighting Apparatus Co., Ltd., Engineering and Lighting Equipment, Ltd., Revo Electric Co., Ltd., and the Wardle Engineering Co., Ltd. At the Holophane stall one of the chief features was the display of directional prismatic refractors, the range of which has recently been extended, and a highly ingenious chart to facilitate calculations with such units.

The " Street-Ray " unit, shown for the first time by Metro-Vick Supplies, Ltd., is an ingenious novelty, comprising a bowl-shaped reflector with a metal " flap " of special contour which, it is believed, will aid considerably in obtaining a directive effect, and will prove simple and inexpensive in operation.

As in former years a sharp division in design was evident in " directive " and " diffusing " lanterns. Perhaps the display of the Electric Street Lighting Apparatus Co. furnished the best example of " directive " design to obtain high candle-power at angles slightly below the horizontal, with a view to securing uniformity of illumination between posts. These

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units, built up out of a series of mirror surfaces are now available in a great variety of types, one of the most recent being a conical " symmetric " unit.

A pleasing feature at the Edison Swan stand was the pictorial representation of " Rugby " units, composed of rippled diffusing glass. The Engineering and Lighting Equipment Co., Ltd., had a good range of diffusing lanterns of a new type which have, we understand, proved very popular in South Africa. The stall of Messrs. Korting and Mathiesen Electrical, Ltd., was noteworthy for the variety of lighting units displayed, and for the exhibit of the " Dia " long burning flame arc, the only arc lamp on view. These lamps have given a new lease of life to arc lighting, and types of very high candle-power have recently applied to the lighting of large squares in some Continental cities. The familiar range of units with mirror-reflectors (" Throlite," " Mirrorlite," etc.) was on view, and also the recently developed " Glowband " lanterns, which utilise a band of diffusing material, and have been widely adopted in Continental cities.

The Screening Band.

This idea of the screening band is also familiar in the Benjamin " Biflector " unit, which, with the standard R.L.M. and Rodalux units, was included in the display of Messrs. Siemens and English Electric Lamps and Supplies, Ltd. In common with other exhibitors, this firm did not confine itself to street lighting apparatus, but had on view a representative series of industrial and commercial units which included some pleasing totally enclosed diffusing glassware suitable for public buildings, etc. Many firms exhibited floodlight projectors.

Most of the stalls contained examples of the latest electrical accessories, in which notable improvements have recently been made. Some particularly ingenious mechanical devices for supporting and releasing glassware or reflectors were shown at the Edison Swan stall. Messrs. Venner Time Switches, Ltd., had a representative display, and Acme time switches were on view at the stall of Messrs. Engineering and Lighting Equipment, Ltd.

Finally, reference may be made to one or two special models and appliances. Luminous traffic control apparatus was displayed by Siemens and General Electric Railway Signal Co., Ltd., Metro-Vick Supplies, Ltd., and other firms. A particularly ingenious item at the G.E.C. stall was a model box with a peep-hole, through which the observer could see a typical street, illuminated by miniature lamps. So far as possible, the scale was adapted to give the correct order of illumination. By a simple adjustment perspective views of typical street-frontages could be inserted at the side, and by a mirror-device the final section of the roadway could be caused to run uphill or downhill. Similarly, by the turn of a knob, an apparently wet and shiny street surface could be substituted for a diffusing and dry one. By operating different combinations of miniature lamps quite a variety of street lighting arrangements could be shown.

The General Electric Co., Ltd., also included a demonstration of the action of a selenium cell and relay in operating street lamps, and this was shown on a more extensive scale at the stall of Radiovisor Parent, Ltd., whose system is now being experimented with in quite a number of cities. During recent years automatic control of street lamps by means of time switches has become very usual, but the application of the photo-electric cell is a novel development which should ensure that public lamps will be automatically lighted up whenever daylight has diminished to a predetermined value.

The Annual Dinner.

At the annual dinner, which was held in the Town Hall on the evening of September 11th, the toast of " The Corporation of Bournemouth " was proposed by ex-Baillie James MacDougall (Convener, Watching and Lighting Committee, City of Glasgow). The Mayor of Bournemouth (Ald. C. H Cartwright), in responding, sketched a charming picture of Bournemouth of the past, and showed how its adjacent pine-forests, portions of which are still in evidence throughout the town, have influenced the system of public lighting. The toast of " The Association of Public Lighting Engineers " was proposed by Coun. J. C. McKechnie (Convener, Lighting and Cleansing Committee, City of Edinburgh) and the President (Mr. S. B. Langlands) responded. The final toast of " The Visitors " was given by Mr. C. C. Paterson, and was responded to by Lieut.-Col. K. Edgcumbe and Mr. Harold E. Copp.

In the course of the Conference Ald. Bell extended an invitation to members to visit Leicester for the Annual Conference of 1930. This offer was gratefully accepted.

BROOKMAN'S PARK.

Brief Description of the New London Station—The Aerial Systems.

THE London regional transmitting station at Brookman's Park, which commenced test transmissions on a wave length of 356·3 metres on Monday, stands about 400 ft. above sea level. Power is generated by means of four Diesel engines coupled to a 220 V d.c. generator, while a 2 000 Ah floating battery used for light loads, can, if necessary, take full load.

The main motor generator room contains six large machines and a number of smaller types. In the centre of the room are three 160 kW machines for applying potentials between 7 000 and 12 000 V d.c. to the anodes of the main transmitting valves. The sets consist of three machines on one bedplate, the driving motor being coupled to two generators, each with two commutators capable of producing a voltage of 3 000, making 12 000 V maximum in all. The station is capable of transmitting two programmes simultaneously on two wavelengths, when two generators will be in use—one for each transmitter—with the third as a spare for either transmitter. The remaining three large machines are for filament heating, and give 1 300 A at voltages between 15 and 30. The arrangement is the same as in the h.t. machines, that is, one machine for each transmitter and one spare. The small motor generator sets supply grid negative voltages and separate anode supplies for the drive and modulated amplifier stages of the transmitters.

The transmitter hall contains the two transmitters and main switchboard. In the middle of the room are two control tables, one for each transmitter. Directly underneath each transmitter and the switchboard is a vault 7 ft. deep, which contains all wiring between the switchboard and the transmitters, and various accessories such as the pumps for the circulating water for the transmitting valves. There are also two small storage batteries for heating the filaments of the drive valves for which a steady voltage is necessary to prevent any risk of slight frequency changes.

The transmitters normally deliver 30 kW to each aerial and employ modulation at low power.

Operation of Transmitters.

The first operation in the transmitters is a drive stage, for which special precautions are taken to keep the frequency constant to within about 200 cycles. The output from the valve is applied to the separator stage, followed by the modulated amplifier, where the power level is approximately ¼ kW. The output from the modulated amplifier operates the first power stage, consisting of two water-cooled valves, the output of which operates the final stage of a maximum of eight valves on either side of a neutrodyned push-pull system.

The output circuit is coupled to a feeder system which runs straight out from the building and is carried overhead on steel standards to small buildings containing the aerial transformers and tuning circuits.

The circulating system for the water-cooled valves in the transmitters is of the enclosed type and is arranged so that water stored in two large closed tanks circulates through the valve jackets to two larger tanks in the vault.

Leading out of the main transmitter hall are two control rooms where the programme is received from the underground telephone lines running to Savoy Hill. These rooms—one for each transmitter—contain the necessary amplifiers, controlling and monitoring gear. In addition, the front portion of the building is occupied by offices, mess rooms, kitchen, etc., two sound-proof listening rooms, one for each transmitter, for quality checking by loud speaker, and a test room for taking measurements of the performance of either transmitter. A small studio for local speech or music tests is also provided.

There are four masts, two carrying the aerial for each transmitter. These masts are of the self-supporting type, insulated from earth at the base, but they are only 200 ft. high. This is lower than would have been chosen from the engineering point of view, but Government limitations would not allow of the height being exceeded. The span between each mast is 600 ft., and there is 900 ft. between the centre line of each aerial. The earth system, which radiates from the aerial transformer houses, consists of a number of wires buried 1 ft. below the surface of the ground, the ends of which form an oval extending about 200 ft. to each side of the aerial and 150 ft. beyond each mast.

Photographs of the station are published on page 343.

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KILLING A YOUNG INDUSTRY.

Thoughts on the Eve of the Radio Exhibition—Relationship of Programme Interest to Listeners' Purchasing Capacity—Some Lessons from Other Fields.

By "HORAX"

THE Radio Exhibition opens next week, and the result of research and its application in this field will be on view to those who go to Olympia.

The radio industry will be "doing its bit," but the public is not increasingly wireless-minded. It cannot be expected to spend its money on equipment for the express purpose of being bored almost every evening.

That, frankly, is the position so far as many thousands of owners of wireless sets are concerned. Their sets are hardly used at all—not just because the novelty has worn off, but because the programmes offered to a long-suffering public are so heavy that they cease to be entertaining, and become a burden instead of a means of recreation.

Losing the Buyers.

We are not all high-brow or even medium-brow musical folk. Quite a lot of us are not musical at all, and yet we must endure concert after concert if we want to use our wireless set at all. Many of us do not, and so we cease to be potential buyers of wireless equipment. We do not much care if the battery is run down, and the accumulators can stay uncharged week after week, as the wireless set departs from a place of honour in the home to a corner in the lobby. We are not interested in better reproduction because we have had our fill of reproduction of Bach and Brahms, and we are weary of being instructed on subjects we do not desire to learn.

All this is not suggested as novel. It has been written and said *ad nauseam*. But the matter has passed beyond the stage of mere complaint so far as the person who pays the licence is concerned. It is hitting a new industry hard, and will continue to hit harder as more and more people become disinterested in the B.B.C., and consequently in their wireless sets. The gravity of the matter has been commented upon by a number of leaders in the trade, and the time is ripe for those so vitally affected to take steps to redress the position before it is too late.

What is wrong at Savoy Hill? "Too much Oxford and not enough Oxford Street," one shrewd writer remarked epigrammatically, and I think there is a lot of truth in the quip.

There is far too much desire to teach and to teach obviously. There is far too little of the popular mind in the direction of the B.B.C. Quasi-Governmental it may be; but it cannot remain on Olympus and yet try to maintain hourly contact with its mass of subscribers.

The success of wireless has been a spontaneous recognition of a great new force, and that recognition remains to be capitalised. We have not 50% of the sets we should have in this country, and we are losing as an industry all the new business we should obtain in this direction, with a great deal of the replacement trade as well.

We are agreed that the average programme is directed to the chosen few—chosen because those who make the choice are also of the "elect." We need programmes directed to the millions, since it is the millions who buy sets and would keep their sets up to date if they wanted to hear the programmes.

Assuming that the leaders in the world of radio manufacture are alive to the danger which confronts the industry, how do they propose to counteract the menace? They cannot sit still and hope, like Mr. Micawber, for something to turn up. If they do, the only thing that will "turn up" will be compulsory liquidation—that is no sort of an end for an undertaking in an industry so pregnant with prosperity as is radio—if only it can be given the right impetus.

Let us see if we can work out some suggestions for providing the "non-elect" mass of listeners with programmes that will encourage them to rescue their wireless sets from oblivion, and to bring them up to date with new and improved equipment.

In the first place, the preparation of the programmes needs to be entrusted to people who are in touch with the man in the street and the woman in the home—those thousands of homes into which the great popular papers go, the dailies and the weeklies.

If the majority of the nation were readers of "The Times" and the "Spectator" we should not have a "Daily Mail" or "Answers" with circulations running into enormous figures. The bookstalls would not be featuring popular periodicals by the score, and the picture houses would be empty and the music halls non-existent by reason of an almost complete lack of patrons. We come to this position then: the majority of the people of this country do not want education thrust down their throats. They want entertainment, and they are prepared to pay for it in the shape of popular fiction and features, and in the form of romance and humour in the picture houses and music halls.

Since popular journalism is palpably successful it would be a sound plan to get the assistance of the men who conduct these sections of the press; and since the picture houses and music halls secure patrons by the million each week, it can be assumed that those responsible for these undertakings are competent to gauge the public taste with a considerable degree of accuracy.

These would seem to be the men and women the B.B.C. might look to for assistance in providing the public with the form of entertainment that is required if the industry is to move on from strength to strength.

Would they approve of an evening's entertainment made up of: (*a*) A promenade concert; (*b*) a British composers' concert; (*c*) a pianoforte recital, to while away the hours between 8 and 10.30 of an evening, with interpolations of news bulletins as added attractions?

Just think for a moment what this class of "entertainment" means to the non-musical. Whether we like it or not, there is a large percentage of people who are not musical in the full sense of the word. They have no ear for music, and are not any the worse members of society for that reason. They can enjoy a jolly song with a rousing chorus. But Bach and Brahms leave them unmoved, and the works of modern composers of the higher school leave the ordinary listener quite cold. You do not get this sort of entertainment when you go to the halls or to the picture houses, nor do you read learned discourses on anthropology or the theory of relativity, when you pick up an illustrated paper or a monthly magazine.

A Programme Suggestion.

There is obviously a considerable body of informed opinion amongst the foregoing classes of "caterers" of entertainment, and it is not incredible that some of these qualified people should be formed into committees for the preparation of the various programmes provided by different stations of the B.B.C., and even if it were necessary to remunerate some or all of those who served on such committees it would not strain the financial resources of the B.B.C. unduly. At present they have an income running into some £1 000 000 a year at least, and even in these days that represents a sum which takes a bit of spending.

These committees would be responsible for the compilation of broadcast programmes in general, and their composition would secure a much more varied bill of fare for listeners. Such committees would be in touch with the world's activities and thought. They would know by their combination of experience what subjects interest the multitude, and they would so arrange each programme that every type of listener would get his or her fair share. They would not allow any one section—however worthy—to monopolise the air evening after evening whilst the remainder of those who own wireless sets seek entertainment elsewhere.

If we can once establish the principle that those who pay the piper are entitled to some voice in calling the B.B.C. tune, we shall have begun the work of "stopping the rot" which so indisputably threatens the British radio industry.

A revised directory of Central Electric Stations in Canada may be obtained, price 50 cents, from the Dominion Water-power Branch of the Department of the Interior at Ottawa. A Press bulletin on this subject also states that on January 1st last the available water power in the Dominion was 20 197 000 H.P. at ordinary minimum flow, 24-hour power at 80% efficiency, and the total turbine installation was 5 349 232 H.P. Of this turbine installation, no less than 4 445 693 H.P. is in central electric stations, the balance being in pulp and paper mills and in other industries.

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RETAIL ADVERTISING IS AN INVESTMENT.

Some Practical Hints for Electrical Contractors—The Correct Appropriation for a Small Business—Circularising Possibilities.

By "SALES MANAGER."

WHEN one speaks of advertising to many a retailer, his eyebrows go up in mild horror. He seems to think that advertising means full pages in the big daily papers, at a cost of some hundreds of pounds. He does not realise that modern advertising expenditure is based for the most part on a percentage of turnover, and is, accordingly, an agreed amount fixed arithmetically, and not a series of haphazard sums spent on the impulses of the passing moments.

The average retailer is proportionately in just as good a position to advertise as national advertisers, if only he will follow a well-thought-out plan spread over a year.

Too many retailers allow themselves to be influenced by the persuasiveness of a representative in this matter of advertising, just as in the matter of stock. And it has been no uncommon thing to find retailers overstocked with advertising commitments just as they are carrying too heavy a line in certain goods. To these advertisers one can only reiterate the advice given by a leading sales manager, "Buy within your capacity," and so we need to see what is the capacity of a retailer to buy advertising.

We can assume that he knows his cost of doing business on a given turnover. If his turnover is increased, his cost of doing business will fall proportionately, and so he must be prepared to make some reasonable sacrifice in the present to secure a larger prosperity in the future. Every penny spent in sound, intelligent advertising is an investment, and there are many competent business men who regard the item of goodwill on a balance-sheet as a sort of relation to advertising expenditure. They maintain that money spent in advertising has created goodwill and they are prepared to pay for goodwill only when it is represented by pounds, shillings and pence spent in advertising.

There is a good deal to be said for this method, and the time will come when those who may wish to dispose of their businesses will point with justifiable pride to a reasonable annual expenditure in this direction.

A reasonable expenditure, it has been calculated, is represented by 10% on the projected turnover for the first year of a new business, 6% for the second year—the sum resulting from this 6% equalling the sum represented by the 10% by reason of the increased estimated turnover due to the advertising and percentage in the neighbourhood of 4% thereafter.

These figures have been tested and proved a thousand times, and they represent the most modern basis of calculating advertising expenditure. This expenditure is spread over the whole of 12 months, 52 weeks, 365 days. It is not a sudden drain on the financial resources of the advertiser. It is an allocation so imperceptible that it is hardly noticeable if the appropriation decided upon in January is maintained accurately until the end of December.

It is a sum, however, which can produce very important results. If we assume that a new venture has reasonable expectation of doing £3 000 turnover the first year—and these figures are not out of the way in a progressive business such as electrical retailing—there is a sum of £300 to be spent with judicious care.

It is not a great sum in itself as advertising figures go, but it is a handy bit of money to use in a localised effort.

Remember that the people you wish to reach are your fellow townsmen and fellow townswomen. You do not expect to sell all over the country, do you ? Your local papers are far more valuable to you than a great daily paper would be.

Space in local papers varies, of course, according to the circulation of the paper; but, for a sum in the neighbourhood

DISPLAYING LIGHTING FITTINGS.

THE approach of the lighting season turns the attention of electrical contractors and other retailers of domestic electrical appliances to window displays of lighting equipment. The new styles of fitting demand novelty in presentation, and the cube fittings introduced last year by the E.D.A. are useful adjuncts for a window showing modern lamps and shades. The accompanying picture shows how a modern setting imparts freshness to designs which are not particularly new.

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of £2, you may expect to buy an imposing space of 4 inches across two columns—a large enough space to attract attention if it is filled with the right matter.

Assume there are two local papers, each of equal merit. To spend £2 a week in each would cost £208 a year and each paper would value your support. They would very reasonably appreciate the fact that something in the way of editorial assistance might be expected and they would doubtless be glad to give favourable notice to your displays and demonstrations. They would send a reporter round to see you whenever you had something novel in stock and they would regard your opinion on questions affecting electricity and electrical devices. Your £208 would mean a weekly message to your customers and would-be customers, and it would be your job to make that message interesting.

Remember that you have a subject of real interest to discuss. Everywhere the coming of the electrical age is welcomed; it brings new ease to the housewife, new interests to the whole household with better light and more leisure for study and recreation. It is only "in its infancy" and hardly a week goes by without something new and interesting being put on the market.

In short, there is real news in the new industry, and you can capitalise that fact to your advantage. Crisp statements backed up with facts and illustrated by blocks, the majority of which you will find your supplier glad to send you, and that 4-inch across two columns of space will become an item of interest every week to the readers of those local papers.

It is worth while to insist upon the same position in the paper being given you every week. People come to look unconsciously for a given advertiser's name in the same place when that name has appeared a few times.

All advertising is cumulative in value, and every insertion adds to the value of the next. In advertising it is "dogged as does it" and of all the requirements for success continuity is the most important.

Of our £300 we have £92 left to use if we are courageous to maintain our intention to spend 10 % of our conjectured turnover.

We can use this by direct methods of circularising, using to the utmost advantage the facilities provided by the post office. We shall have a number of leaflets sent to us by progressive manufacturers who will be glad to have our name and address overprinted in the appropriate space.

Choosing our leaflets so that the most suitable articles are pushed at the right season, we can keep up a steady fusillade of well-written, properly illustrated booklets and brochures, each of which is designed to interest the customer in a different line.

If we spend £2 a fortnight on circularising, we can cover 600 customers regularly, allowing for postage, envelopes and time for filling the envelopes.

If we alternate our first 600 names with another 600 we can send 12 messages to 1 200 people a year and if the 14 400 messages do not produce 5% of orders we must be going wrong somewhere. If we sell to 10% we shall be doing quite well, but taking the 5% only we may expect 720 orders from our campaign. If we only do 2½% we shall get 360 orders, and, at the low figure of £1 per order, we shall have got our money back with something to spare. What is even more important in this our first year of business, we shall have impressed our prospective clientele with our up-to-date methods and our anxiety to give service. We shall reap the benefit of this over the next year as well if we keep up our pressure and we can vary our campaign as our experience of the locality's requirements teaches what will go and what won't.

Our first year's expectation is £3 000, and our next year's is £5 000, of which 6 % equals our figure of £300, and the following year £7 500, with £300 again our advertising expenditure, the increase of business being due to our advertising, backed up, of course, by sound salesmanship, the greatest adjunct of which is courtesy and a realisation of the effect that penny wise is pound foolish.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

A Mystery Explained.

[To the Editor.]

Sir,—Your contributor "Battery Electric" affects to be mystified regarding the destination of the "electrics of yesteryear." He wonders where they are and why they have disappeared, as undoubtedly the majority have done.

His various suggested reasons are distinctly ingenious; but in my view the real explanation—apart from batteries—is to be found in the appalling lack of enthusiasm displayed by electrical men generally for anything electrical. Instead of asking "where are the 'electrics'?" why not ask "where are the members of the Electric Vehicle Committee, and what are *they* doing to generate enthusiasm for the fullest possible ecomonic use of electric road vehicles?"

I am, etc.,

September 12th. "Etubrute."

"Blackburn Again."

[To the Editor.]

Sir,—I would be glad of the opportunity to comment on the astonishing position revealed by the opening paragraphs of "Current Topics" in your issue of September 13th. As I understand it, the officer responsible for the Blackburn electricity undertaking has been summarily dismissed with a small honorarium without reason. I note that his Council has criticised to the extent that it was necessary to request outside authorities to investigate the undertaking, but, observing that their reports appear to have been a vindication of his action or behaviour, we are left with the uncomfortable feeling that the officer in question is being sacrificed for the faults of his Council or their Committee, and if this is actually the case, surely it amounts to wrongful dismissal?

With the greatest respect I would venture to disagree with the editorial opinion on competence or otherwise to dismiss servants. The fact is that damages (I believe that they have been assessed at ten years' salary) have been awarded under some or other sets of circumstances, and therefore masters are *not* always free under any or every circumstance to dismiss their servants. Not being a lawyer, I am unable to discuss the legal aspect, but in equity surely no man should be dismissed without good and sufficient reason, and if the reason stated is demonstrably unjust or incorrect, there ought to be grounds for damages.

I would suggest that this is far too important a matter to be treated locally, as it vitally concerns all professional municipal officers, and if the facts are as stated, the matter ought to be taken up legally by the national organisations with a view to defence of status.

I will conclude by quoting Baillie J. P. Dollan (sub-convener of the Glasgow Corporation Tramways) speaking at the recent Municipal Tramways Association Convention at Yarmouth:—"... What is the use of appointing managers and experts at large salaries to conduct the business of transport if corporations will not allow them to manage? If corporations are more competent to settle every question of detail affecting transport than the management, then they are wasting money in paying managerial salaries; they should undertake the duties themselves. Committees ought to be reduced drastically in number, and in a large city the maximum should be ten members, who should be carefully selected because of their interest in and knowledge of transport." He also remarks elsewhere that "municipal committees are cumbersome and their personnel excessive." If we read "electricity" for "transport" in the above remarks, they appear to be applicable to Blackburn in this instance.—I am, etc.,

J. G. B. Sams.

Advertising by Supply Authorities.

[To the Editor.]

Sir,—Although many of the suggestions made for advertising the electrical service given by supply undertakings are potentially beneficial, most of them require expenditure, either of time or money, on keeping the message readable. An example which I have noticed recently in certain London streets is not subject to such drawbacks, and though other suppliers may have used it, I have never previously seen so simple and effective a device. It consists of a sheet of brass or similar metal set into the covers of the mains inspection boxes in the footpaths, and bears in neat raised letters the words "Metesco Electricity Service." The constant passage of pedestrians serves to keep the metal bright, and the message must be read by a large proportion of those who pass by. It would be interesting to know whether other supply undertakings have tried this form of advertising.

I am, etc.,

September 14th. "Publicitas."

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LAMP PUBLICITY FOR 1929—30.

Special Lamp-Selling Material for the Coming Season—What the Manufacturers are Doing.

AS is usual at this time of the year, manufacturers of electric lamps are making preparations for various publicity campaigns and the issuing of new posters, showcards and literature with a view to increasing the sales of lamps during the forthcoming winter. The campaign for the "Mazda Five" for instance, includes the "Mazda" dancing girl, reproduced from the painting by Forster, which has already proved a popular feature of the last few months' Mazda publicity, and is given a prominent place in this season's campaign. It is reproduced in its natural colours for the purpose of window displays, showcards, catalogue covers, and for numerous pamphlets and folders. It will also form the basis of an attractive series of advertisements in the general press and trade papers.

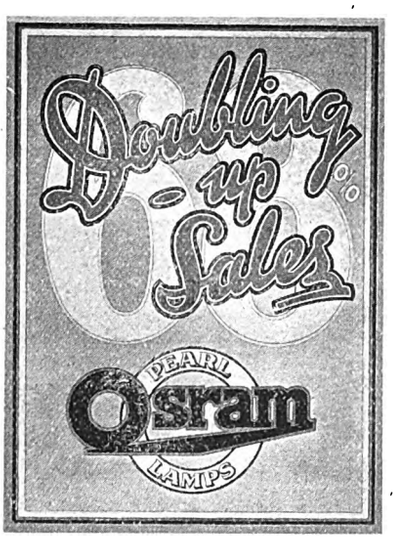
Advertising has been specially designed to drive home the advantages of "the Mazda Five"—the "simplified line" of pearl lamps—and a series of advertisements will appear in the London and provincial newspapers. The same appeal will be employed in the various engineering, industrial and retail trade papers. A new coloured cutout window display features the Mazda dancing girl and consists of a three-piece screen, the centre portion being recessed and illuminated from above. The display is supplied complete with lamp-holder, flasher (to fit lamp-holder) and adaptor. There is an aperture in the top of the recessed portion to take the lamp-holder, which should be fitted with a 60 W lamp, the only item which the trader has to supply. The dimensions of the display when fully extended are :—Height 37 in., width 49 in., depth from back to front 6in. Of course, the amount of space occupied in the window depends upon the width to which the side panels are extended.

This season's Mazda showcard is similar to the one issued last season. It measures 22 in. high by 16 in. wide, and the dancing girl picture covers the full size of the card. A second showcard dealing with Mazda automobile lamps is also available. On the front of this a design forms a background for a panel in which full particulars, including prices and illustrations, are shown. On the back of the card particulars are given of the voltage and type of cap required for all motor cars, commercial vehicles and motor cycles used in the United Kingdom. Another attractive display item is a lamp rack made to hold a sample of each of the five lamps of the "simplified line." It is printed in blue and silver and is suitable for either window or counter display.

This season's complete catalogue contains full particulars and prices of every type and size of Mazda lamp manufactured for all lighting purposes, while a number of leaflets and folders dealing with pearl and other types of Mazda lamps for domestic, commercial and industrial purposes, and a small folder devoted to automobile lamps, are available for over-

(*Continued on page* 334).

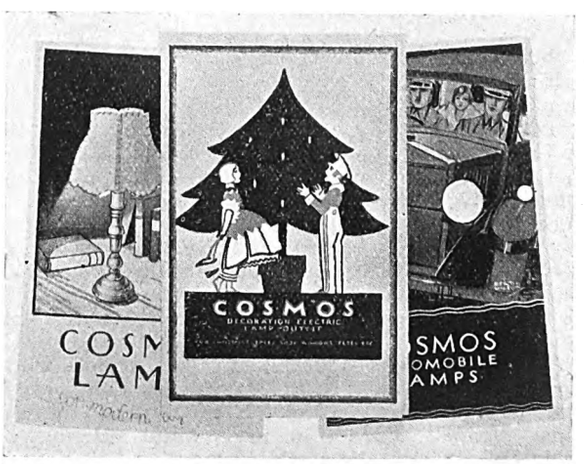
A new "Mazda" showcard.



The cover design of the new "Osram" booklet.

A "Cryselco" cut out.

A "Nox" window transfer.



Three new "Cosmos" folders.

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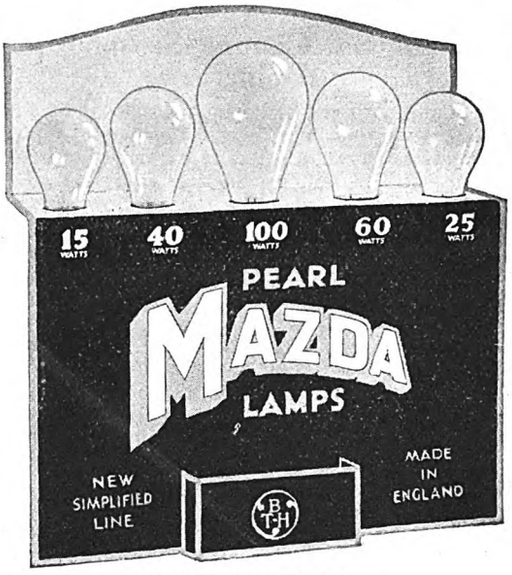
LAMP PUBLICITY MATERIAL.

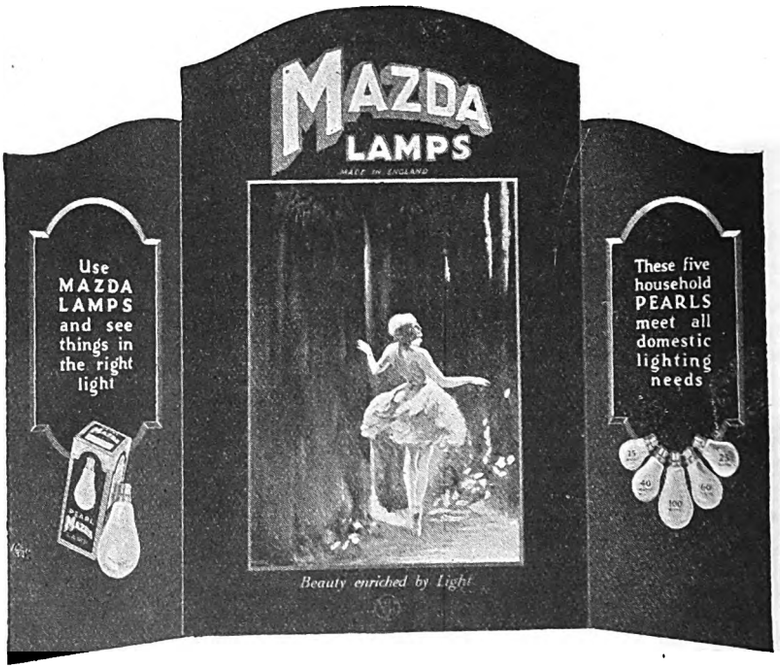
A new Philips' showcard.



The ' Mazda simplified line."

The special gramophone record which has been prepared by Siemens Electric Lamps and Supplies, Ltd., in connection with "The Popular Pair."

Another "Cryselco" showcard.



A new window cut-out of which details are given in the text.

printing with contractors' names and addresses. Finally, a special publication, to the trade only, entitled "The Mazda Five" book, gives some useful information about the 1929/30 advertising campaign.

The principal advertising features utilised in the campaign of SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., of 38–39, Upper Thames Street, London, E.C.4, is known as the "Popular Pair." The design depicts a small girl holding aloft a magnified Siemens pearl lamp, followed by a small boy supporting a Siemens Silvalux lamp of equally colossal dimensions. The boy and girl are dressed in quiet shades of yellow, shown up by a background of brilliant blue split up by curved and variously coloured dividing lines of different widths and radii. Above flames the word "Siemens" in red letters with yellow facings, followed by "Pearl and Opal" in white and "electric lamps" in yellow. The same golden yellow shade is used for the slogan "The Popular Pair" beneath the children's feet. In the right-hand bottom corner a circular monogram in blue contains "British Made" in neat white lettering. The colouring and, indeed, the whole of the design, is unusually attractive. This poster design is now appearing on panelled hoardings throughout the United Kingdom and the Irish Free State. In addition, framed reproductions of this design are appearing in the lifts of all "tube" railways and on the tube stations.

Turning to advertising in newspapers and magazines, the firm will insert display advertisements in the leading London dailies, and also in a large number of suburban newspapers and monthly magazines. To reach large users in trades other than electrical, display advertisements will appear in more than 50 different trade journals.

To enable contractors to link up with the poster campaign Messrs. Siemens are providing for window displays a large number of centrepieces featuring "The Popular Pair" design which opens out on struts. This does not need special window dressing, and when opened the girl and boy, holding a pearl and opal lamp respectively, stand out from the background.

The design used for showcards is the same as that of the poster, and features pearl and opal lamps.

Messrs. Siemens are also providing an effective cardboard reflector sign, which, when hung in position to catch the light, has the appearance of being illuminated. Another novel form of publicity is the providing of a quantity of double-

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sided 10 in. gramophone records bearing the firm's advertisement. It consists of a specially composed Siemens valse and a fox-trot entitled "The Popular Pair."

A forceful broadside entitled "Doubling up Sales," is issued by the GENERAL ELECTRIC CO., LTD., in which it is suggested that the pearl Osram "simplified line" is a straight line—the shortest distance between the consumer's need and its satisfaction.

With regard to the season's campaign, the services of the industrial and lay press throughout the country are being enlisted again this year, while the national advertising is being augmented by large quantities of multi-coloured showcards, window bills, signs and literature, overprinted with contractors' names and addresses.

The Osram showcard features a lion fashioned on cubist lines, yet poised to symbolise strength and grace of outline. It is designed to typify the supremacy, grace of outline and strength of the lamps. The moral underlying this season's Osram publicity scheme is well revealed by a cartoon which has been issued by the company. In this the dealer of yesterday who stocked "65 lines" is portrayed endeavouring to locate from his dust-ridden stocks a particular lamp to suit his customers of the same period. Alongside is shown a range of to-day's "simplified line," an up-to-date salesman and a typical customer whose needs can be met from a stock of five sizes only.

The publicity campaign to be launched from 145, Charing Cross Road, London, W.C.2, by PHILIPS LAMPS, LTD., will be to stimulate public demand through forceful "reminder" advertising. The trade will benefit directly through the demand thus created, while they will also be well supplied with price lists and window display material.

In addition to lamps, commercial and industrial fittings will be featured in many of the advertisements.

Briefly summarised, the principal London and provincial daily and evening papers will be used to bring the name "Philips" before the householder, and the outstanding advantages of Argenta and Duo-Savelite lamps will be emphasised. On the industrial side, the trade papers of the principal industries will be utilised. These advertisements will be devoted partly to lamps and partly to fittings, for which greatly increased sales are anticipated. Copies of four price lists will be supplied with quantities for distribution upon request. These are the general lamp price list (No. 101L), the Argenta (opal) price list (No. 181L), the Arlita (internally frosted) price list (No. 182L), and the Duo-Savelite folder (No. 173L). In addition, a comprehensive list (No. 100L) has been published for the use of traders. These publications are printed in several colours, with the exception of the Argenta list, which is a photogravure production.

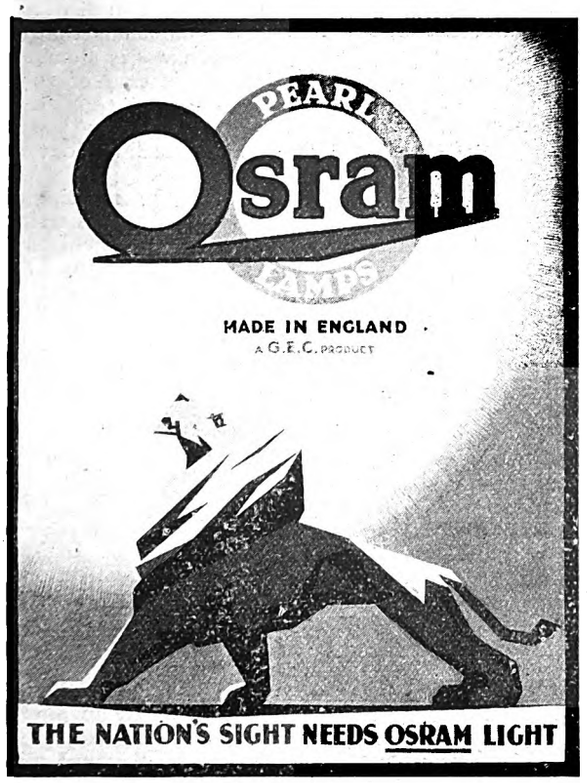
As in previous years, a staff of expert window-dressers will be employed. Their services can be obtained on the request of any trader willing to place his window for a short period at the disposal of Messrs. Philips. A limited number of large displays for windows of 8 ft. and over are available, a smaller display for windows of 5–8 ft., and a useful cut-out 3 ft. wide for smaller displays. Traders would also be well advised to apply for a useful selling device consisting of a counter demonstration stand showing a clear gasfilled and Argenta lamp side by side and inviting comparison. Three new showcards have been issued, size 15 in. by 10 in., showing respectively an Argenta lamp, motor car bulb and Duo-Savelite lamp.

One of the most notable features of the campaign to be started by CRYSELCO, LTD., Kempston Works, Bedford, is the publication of a booklet entitled "Night Lights." It purports to be written by "Col. Chris. Elco," of the Cryselco Light Brigade, and contains some quite original material.

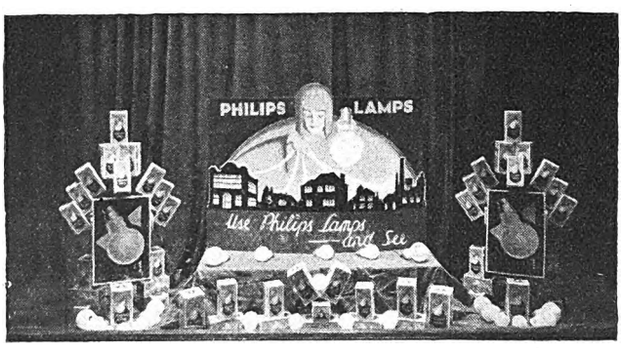
Among their display advertisements for this season Cryselco, Ltd., are retaining their well-known feature, "The Lamp with Two Skins."

The NOX ELECTRIC LAMP CO., LTD., of Clarence Road Works, Hunslet, Leeds, are issuing a special "Train of Thought" advertisement, and have transparencies for window display.

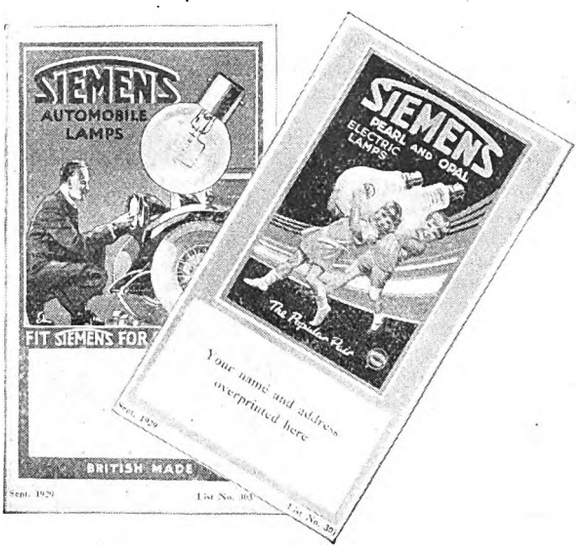
FURTHER AIDS TO LAMP SALES.



An attractive showcard issued by the General Electric Co., Ltd.



A suggested window display featuring Philips' Lamps.



The cover designs of two new Siemens folders.

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NEWS IN BRIEF.

South African Electrical Imports—Electricity Consumption in Switzerland—The E.D.A. Outlet Campaign—The Manchester Radio Show—Television by Radio.

NEWARK Corporation requires a chief engineer for its electricity undertaking.

The 13-ton bell at Erfurt Cathedral—the Gloriosa Gloche—is being equipped for electrical operation.

The new X-ray apparatus in Whinney House Tuberculosis Hospital is to be formally inaugurated shortly by the resident medical officer, Dr. Pearson.

In furtherance of its publicity scheme for encouraging new industries, Bristol Development Board is organising a poster competition The posters are to convey the idea that Bristol is the best place for new factories.

The Mitcham (Surrey) automatic telephone exchange was put into service on September 11th. It opened with about 750 lines, and has an ultimate capacity of 1 480.

The Customs and Excise Department of the Union of South Africa reports that imports during the March quarter of the present year included electrical machinery valued at £369 868 and electrical material £261 470.

Statistics of the trade of Estonia during June last show that the imports included electrical machinery, apparatus and implements valued at 282 000 krons, and exports of the same classes of goods amounting to 26 200 krons.

It is reported that during 1928 Swiss electric power works produced 5 300 000 000 kWh, compared with 1 700 000 000 in 1913. The consumption of electricity in Switzerland in 1928 was equal to 1 070 kWh per head of the population, compared with 907 in 1927.

A novel feature in the new Jewish Synagogue, Bury Old Road, Crumpsall, Manchester, which has cost between £25 000 and £30 000, and was consecrated last week-end, consists of electric lamps of various colours, which are located in the dome and project their light upon the Ark and the reading desk.

Sheffield Corporation Electricity Committee has decided not to support the resolution of the Newcastle-upon-Tyne Corporation for the certification and stamping of all electric meters.

In connection with a scheme for improving the water supply at the Hampshire Joint Mental Hospital Committee's Knowle mental institution, at a cost of about £10 500, electrical machinery is to be installed.

Bolton, which is said to be the third largest centre of population in Lancashire, is holding a "civic week" from to-day (September 20th) to September 29th. Lord Leverhulme will open to-day an exhibition wherein are shown the 300 manufacturing activities of the town, apart from the cotton industry, and amongst the interesting places which will be visited, in the course of special omnibus tours, are the electricity works and the tramways depot and workshops.

The Calendar of Brighton Technical College for the session 1929–30 contains lists of the governors and the teaching staff, information as to fees, scholarships, and the equipment of the electrical and engineering laboratories, syllabuses of the engineering and other courses, and a number of excellent illustrations, including views of the College, the engineering workshop, the laboratories and the Withdean recreation field. The new term's evening and day courses commenced on September 16th and 17th respectively.

Southend-on-Sea Corporation requires a mains engineer in the electricity department.

A demonstrator in electrical engineering is required at the City and Guilds (Engineering) College, London.

It is reported that an English company has submitted to the Portuguese Government proposals for a national telephone service, with connections to the international lines.

In connection with the E.D.A. Electric Homes (Outlet) Campaign an area conference will be held in the Demonstration Bureau, 4, Fountain Street, Manchester, on September 23rd at 3 p.m. Lt.-Col. W. A. Vignoles and other speakers will deal with the principles underlying the campaign and the methods which will be adopted to ensure its success.

The Aldershot Gas, Water and District Lighting Co., Ltd., will open in October electricity showrooms at Hindhead.

The "Manchester Evening Chronicle" Radio Exhibition will take place from October 16th to 26th. For further details application should be made to Provincial Exhibitions Ltd., City Hall, Manchester.

Mr. Bruce, the Australian Commonwealth Prime Minister, stated, last week, that a merger between the cable and the wireless interests had not been contemplated in Australia. Negotiations were proceeding for the co-ordination of the work of the two systems.

The Dublin tramwaymen, who have been on strike five weeks, have agreed to accept the report of the Court of Inquiry which has been considering the matter in dispute. The Court recommends that the reduction in wages should be 1s. per week instead of 10%. If the tramways' company also accepts this proposal the service will be resumed without further delay.

The opening meeting of the Illuminating Engineering Society will be held at the E. L. M. A. Lighting Service Bureau, 15, Savoy Street, Strand, London, W.C.2, on Tuesday, October 8th, at 6.30 p.m. A report on "Progress in Illuminating Engineering," prepared by the Papers Committee, will be presented, and there will be numerous exhibits of colour films, illuminated signs, and new lighting fittings.

The premises of Northants Electrical Installations, Ltd., Peterborough, were struck by lightning and set on fire on Wednesday, considerable damage being done.

The calendar of the Royal Technical College, Glasgow for 1929-30 (the 134th session) consisting of over 450 pages has been published, price 2s. 6d. (post free 3s.). In addition to a history of the college, lists of professors, lecturers and assistants, conditions of admission, fees, etc., it contains particulars of the subjects dealt with in the day and evening classes, information relating to bursaries, scholarships, prizes, etc.

The British Broadcasting Corporation and the Baird Television Development Co. have issued jointly an announcement that the experimental broadcasting of Baird television outside programme hours will begin on September 30th, through London (2 LO), from 11 a.m. to 11.30 a.m. daily except Saturdays and Sundays. Neither the Postmaster-General nor the B.B.C. accepts responsibility for the quality of the transmission or the results obtained.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated September 20th, 1879:*

The "New York Star" had an article denying that Mr. Edison had really invented anything in electric lighting.

A proposal to substitute electricity for the guillotine as a means of inflicting capital punishment was being discussed in France.

Electric lighting was used for a dance at Milford Haven. "Many of the ladies were apprehensive lest the intensity of the light might have an unpleasing effect. They were agreeably surprised to find that their fears were groundless."

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *dated September 23rd, 1904, stated that:—*

Tenders for wiring a London infirmary ranged from £366 to £995.

The Electrical Contractors' Association was registered as an incorporated body.

* * *

FIFTEEN years ago it was stated in THE ELECTRICIAN *dated September 18th, 1914, that:—*

A census of electric vehicles in use in the U.S.A. gave a total of 3 810 "pleasure" cars, but only 223 commercial vehicles.

Communication by the Pacific cable was cut off by a German cruiser which appeared at Fanning Island under French colours, and took possession of the cable station.

Dublin Electricity Committee recommended salary increases for the city electrical engineer and the chief engineer of the distribution department on the understanding that the increases were not to take effect until after the war.

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PERSONAL.

SIR Charles and Lady Parsons are expected to return to London from South Africa on September 23rd.

Examination results at Harris Institute, Preston, include, Electrical Engineering Course First year, Advanced Third position :—Frank Dakin.

Capt. P. P. Eckersley who resigned from the position of chief engineer to the B.B.C. last June has accepted a position with the Gramophone Co.

Mr. George A. Pirelli, managing director of Pirelli, Ltd., and chairman of Pirelli General Cable Works, Ltd., will sail tomorrow (September 21st) in the "Aquitania" for New York.

Bradford Education Committee recommends the appointment of Mr. E. M. Price, of Manchester, as lecturer in electrical engineering at the Technical College.

With reference to the paragraph on page 309 of our last issue, concerning Mr. H. J. Farrell, we are given to understand that he is Irish representative for Ferranti radio products only.

Richmond, Yorks, Town Council has appointed Mr. James B. Hood, of South Shields, as chief electrician in succession to Mr. W. L. Wickwar, who has become assistant chief electrical engineer at Bingley.

Bradford Electricity Committee has appointed Mr. William Dundas, resident engineer at Manchester Corporation's Barton power station, as deputy city electrical engineer, at a salary of £900 a year, rising to £1 000.

Mr. A. E. Vickery, foreman of the electrical branch at Devonport dockyard, has been appointed acting assistant electrical engineer in the department of the Director of Electrical Engineering at the Admiralty.

In accepting the resignation of Mr. H. P. Stokes, on his appointment as general manager of the United Automobile Services Co., Plymouth Tramways and Transport Committee offered him their congratulations and resolved to record their high appreciation of his valuable services.

Capt. R. C. Petter, a director of Petters, Ltd., left London last week on the Blue Star "Almeda Star," for Buenos Aires, from whence he intends to carry out a tour of South America with the object of studying trade conditions in that country.

Sir Ernest William Moir has accepted the invitation of the Council to become President of the Junior Institution of Engineers in succession to Lieut.-Col. J. I. C. Moore-Brabazon. His induction will take place at a meeting to be held at the Royal Society of Arts on December 13th.

Considerable gratification will be felt by their many friends in the electrical trade at the announcement, made this week by the General Electric Co., Ltd., that Mr. H. Wynne Roberts, sales manager of the company, and Mr. F. Winstanley, manager of the illuminating and domestic appliance departments, have been appointed directors of the company. Both Mr. Roberts and Mr. Winstanley joined the G.E.C. after leaving college, and have had some 30 years' service with the company, during which time they have gained experience which should be invaluable to the board. Mr. Roberts is personally acquainted probably with more electrical installation contractors than any other manufacturer's representative. He is a regular attendant at the E.D.A. Sales Conferences, where he can always be counted upon to say something stimulating and provocative. He has served on a number of trade committees and has represented the B.E.A.M.A. on the Registration Board of the National Register of Electrical Installation Contractors since its inception.

See page 343.

Obituary.

SIR JOHN MORICE AEMILIUS GATTI, on September 14th, aged 57 years. He was chairman of the London County Council in 1927-28 and received his knighthood last year. Apart from his association with the electrical industry as managing director of the Charing Cross Electricity Supply Co., Ltd., he was also a past President of the Electrical Development Association. Sir John was the son of Agostino Gatti, who came to London as a boy in the early 'fifties and with his brother Stefano acquired the old Adelaide Gallery in 1862, and turned it into a restaurant. He was educated at Stonyhurst and St. John's College, Oxford, and though called to the Bar at the Inner Temple at the age of 22, he did not practice, but turned his attention to the business of his father and uncle, to which he and his brother Rocco succeeded on the death of Agostino Gatti in 1896. In addition to restaurants the business included interests in the Adelphi and Vaudeville Theatres, an ice factory, and the Charing Cross Electricity Supply Co.

See page 343.

OVERSEAS TRADE.

Eight Months' Electrical Exports Exceed Imports by Nearly £8 000 000.

UNITED KINGDOM exports of electrical machinery, apparatus and material during August were valued at £1 678 755, representing an increase of £242 356 when compared with the same month last year. Similar exports for the eight months of this year amounted to £12 738 658, as against £12 224 888 for the corresponding period of 1928, the increase being £513 770.

Imports of electrical goods during August last were valued at £748 286, or £172 302 more than during August, 1928. Imports of similar goods for the eight months of the year amounted to £4 800 360, or £773 367 more than for the same period of last year.

An analysis of these figures shows that August exports were in excess of imports by £930 469, while for the eight months of this year the excess was £7 938 298.

Export items which showed improvement when compared with last year's return for the month of August include various motors and generators, other than railway and tramway machines, increase, £9 924; rubber insulated wires and cables, other than telegraph and telephone cables, increase, £36 723; and similar wires and cables, other than rubber insulated, increase, £36 862. Telegraph and telephone instruments, excluding wireless valves, also showed improvement, the increase being £87 494. On the import side, electrical machinery increased by £18 325, while telegraph and telephone instruments, excluding wireless valves, increased by £125 328.

The following are detailed figures :—

	Month of August.		Eight Months.	
	1928.	1929.	1928.	1929.
IMPORTS.	£	£	£	£
Electrical Machinery	159 346	177 671	1 186 088	1 209 964
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	14 377	24 628	108 955	162 581
Insulation other than rubber (not being Telegraph or Telephone Wires or Cables)	59 050	47 642	389 076	398 314
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	6 709	2 261	55 481	34 856
Submarine Telegraph and Telephone Cables)	—	—	—	—
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	55 327	180 650	391 533	903 983
Carbons, Electric	6 219	7 745	83 354	108 627
Electric Lamps and Parts thereof—				
Electric Glow Lamps	39 287	54 628	318 750	240 065
Arc Lamps and Electric Searchlights	588	617	4 890	5 419
Parts thereof (except Carbon Rods)	3 541	873	19 722	5 484
Batteries and Accumulators (including parts)	63 984	69 499	357 747	425 098
Electrical instruments (other than Telegraphic and Telephonic) : Commercial (excluding Ammeters, Voltmeters, etc), House Service Meters, and Scientific	21 734	21 248	185 932	222 400
Switchboards, other than Telegraph and Telephone	—	—	780	1 578
Electrical Goods and Apparatus, all other Sorts	141 022	160 824	924 685	1 081 181
Total of Electrical Goods and Apparatus	575 984	748 286	4 026 993	4 800 360
EXPORTS.	£	£	£	£
Electrical Machinery—				
Railway and Tramway Motors	23 545	17 735	349 127	217 177
Other Motors and Generators	225 677	161 675	1 681 761	1 469 043
All Other Sorts	326 082	336 006	2 547 824	2 575 579
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	105 737	142 460	927 006	1 093 050
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	91 414	128 276	984 353	1 056 083
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	50 910	86 936	612 903	746 097
Submarine Telegraph and Telephone Cables	39 415	94 666	157 147	188 325
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	162 136	249 630	1 874 032	1 925 787
Carbons, Electric	450	886	9 519	6 166
Electric Lamps and Parts—				
Electric Glow Lamps	36 455	66 444	334 556	424 912
Arc Lamps and Electric Searchlights	624	573	9 310	6 460
Parts thereof (except Carbon Rods)	87	34	5 559	7 719
Batteries and Accumulators (including parts	116 762	87 401	746 231	660 347
Electrical Instruments (other than Telegraphic and Telephonic) : Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	31 439	34 216	264 855	266 211
Switchboards, other than Telegraph and Telephone	9 795	6 914	55 511	43 164
Electrical Goods and Apparatus, all other Sorts	215 871	264 903	1 665 194	2 053 538
Total of Electrical Goods and Apparatus	1 436 399	1 678 755	12 224 888	12 738 658

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THE MANUFACTURE OF STORAGE BATTERIES.

Visit to the Works of the Chloride Electrical Storage Co.—Views on New Battery Inventions.

AT an informal luncheon preceding a visit last week to the works of the Chloride Electrical Storage Co., Ltd., at Clifton Junction, Mr. D. P. Dunne, sales manager and a director of the company, stated that there were frequent references in the lay press to new accumulators for which remarkable claims were made, but few of these batteries were ever heard of again. The company's attention had, during the course of a year, been drawn to several inventions which the inventors hoped would make their fortunes. Many were

A bay in the plate forming department at the "Exide" works.

old ideas rediscovered while others possessed no outstanding importance. Developments and improvements were constantly being made, but they were brought about by the laborious application of long experience and highly developed skill. There might be an epoch-making invention some day, and they were on the look out for it. The "Exide" Company was the largest accumulator-manufacturing concern in the British Empire, and one of the three largest in the world. The land occupied by the company had increased during the last four years by 40% and the covered part by 100 000 square feet.

The firm has developed a particularly effective ventilating system in the works, for the prevention of danger to the health of the workers from the presence of lead and lead oxide fumes and dust and with long experience, the company has, we understand, been able to give considerable assistance to the Ministry of Health in drawing up regulations.

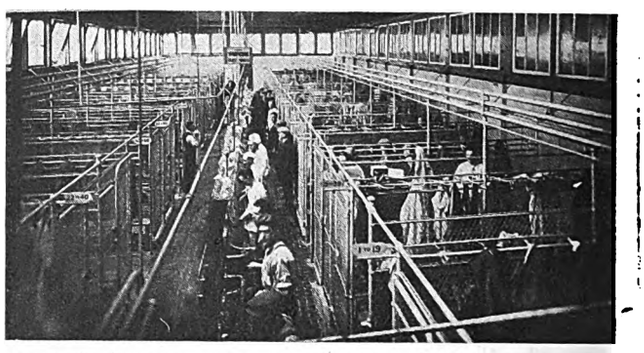
Four general types of batteries are made at Clifton Junction; "Chloride" and "Chloride Plante" batteries for stationary installations such as power stations, country house lighting plants, etc.; "Lux" batteries for lighting railway trains; "Exide" batteries for motor cars, wireless receivers, etc.; and "Exide-Ironclad" batteries which are used for the underwater propulsion of submarines, for land traction such as propelling electric vehicles, electric locomotives, trucks and cranes, and also for lighting motor buses and motor coaches. The first shop visited was the moulding department, where was seen in operation a press producing the lead tape used for banding and for rolling into the rosettes of Chloride R type plates. On the left of this process, sheet lead was rolled out and finely perforated to form an outer casement for box negative plates. Exide-Ironclad grids were being sheathed and trimmed, and cell connectors cast. Another casting operation seen was that of the spines which form the core of the tubes used for Exide-Ironclad positive plates. The pressure casting of box negatives is an interesting operation. The moulds are arranged around a circular cast iron pot containing molten antimonial lead and heated by gas burners. A thin sheet of finely perforated lead is placed in the mould and the two halves of the mould are brought together by hydraulic pressure; the molten metal is then forced into the closed mould by compressed air and the grid so formed is automatically attached to the sheet of perforated metal previously inserted. This forms one half of the box negative grid.

The casting of Exide grids, terminal posts and Plante plates were other casting operations to be seen in this department. The mechanics' shop was next visited, and here one half is devoted to repairs and maintenance jobs and in the other half are made the special moulds and tools used throughout the works. The first half includes a motor repair pit, electricians benches, acetylene burning equipment, and a blacksmith's shop. In the second half are electrically-driven planing machines, special rack-cutting machines, surface grinders, turning lathes, and milling machines working to 1 oooth part of an inch—all the apparatus for machinery and assembly of different parts of the moulds used in casting plate grids, and the making of assembly jigs for various parts of batteries. In the next shop the ebonite tube used in "Exide-Ironclad" plates are closely slitted by high speed precision machines—which were made on the premises—and the tubes are then threaded on to the metal spines. The metal buffers for Plante cells are also made here.

The next process is the filling of Exide-Ironclad tubes with red lead, which forms the active material. The red lead powder is inserted by shaking machines, after which the bottom and top bars are burnt up. In the pasting department lead oxides are applied to the grids in the form of paste, either by machines or by hand. In the case of box negatives a template is placed on one half of the grid and the paste is pressed in with a paddle. The template is then removed and the other half of the grid placed in position, after which machines press and rivet the two halves together. Finally the edges are trimmed and the plates are dried in ovens.

Above this shop are two floors. A barrel elevator raises the heavy drums of red lead from the makers' lorries to the top floor where they are tipped by special tipping gear into a dry mixer on the intermediate floor. From this it is transferred by an enclosed spiral conveyor to the red lead shaking machines which fill the Exide-Ironclad tubes on the ground floor. Similar airtight mixing machines on the intermediate floor churn and deliver the dry oxide powder to the ground floor where liquid is added to make the paste.

In the plate stores the plates are cut and sawn behind glass screens so that in effect the workman and the job are in separate rooms. An exhaust settling chamber is at the rear of the machines, and the air speed through the opening below the glass screen is 100 ft. per min. As a further preventitive of lead dust in the air, the floors are kept thoroughly wet.



One of the cloakrooms provided for the workmen. Note the washing arrangements along the aisle.

In the test house attached to the works, is carried out research work and capacity and continuous life tests on batteries. In the chemical laboratory raw materials, acids and waters are tested and chemical tests are conducted. Innumerable inventions are submitted to the company, and life tests, breakdown tests, developments and the investigation of new ideas and suggestions are in continual progress.

The elaborate precautions against lead dust in the works have already been noted. All these safeguards are under the meticulous supervision of a resident doctor who was appointed by the company at the end of 1927 to devote the whole of his time to the study of lead poisoning. The entire system is aided by blood examinations conducted periodically, by means of which any increase in the amount of lead absorption in the blood is detected immediately, long before there is any symptom or sign of trouble in the worker. In this way any defective process on which a man is employed is at once discovered, overhauled and effective measures adopted before lead poisoning has had the opportunity to develop. These preventitive measures have proved so efficient that since the end of 1927 there have been no cases of lead poisoning at the Exide works.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

SOUTHEND-ON-SEA CORPORATION.—Supply of 1 500 current limiters. Further particulars from Mr. A. C. Johnson, acting borough electrical engineer, Electricity Works, London Road, Southend-on-Sea.

CLITHEROE CONSERVATIVE CLUB, September 20th.—Electric wiring. Specifications from Messrs. A. R. Gradwell and Sons, 25, Victoria Street, Blackburn, until September 20th.

DEVON MENTAL HOSPITAL, EXMINSTER, September 20th.—Six months' supply of electric lamps, etc. Tender forms from the clerk, Mr. Cecil Masters.

NORTHERN IRELAND MINISTRY OF FINANCE, September 20th.—Electric light installation at the Custom House, Londonderry. Specifications can be seen and forms of tender obtained at the Custom House, Londonderry, and at the offices of the Ministry, 15, Donegall Square West, Belfast.

Lighting Installations.

WADDINGTON HOSPITAL TRUST, September 20th.—Work in connection with electric lighting of almshouses, vicarage, Reader's Old House, Lower Buck Inn and Carter Fold Farm, Waddington, near Clitheroe. Specifications can be seen at the almshouses.

WARRINGTON GUARDIANS, September 21st.—Twelve months' electrical supplies to Whitecross Institution, Warrington, or Cottage Homes, Padgate. Tenders (separate for the two places), to Mr. Arthur Bottomley, clerk, Union Offices, Museum Street, Warrington.

COUNTY OF LANARK MIDDLE WARD DISTRICT COMMITTEE, September 23rd.—Electric lighting work in connection with erection of new bathroom, etc., at County Convalescent Home, Calderbank House, near Baillieston. Intending offerers are asked to communicate with Mr. P. C. Smith, District Offices, Hamilton, on or before September 23rd.

SALFORD CORPORATION, September 23rd.—Supply of 10 000 kVA, 33 kV/6·6 kV transformers for outdoor service. Specification from the City Electrical Engineer.

COMMISSIONERS OF H.M. WORKS, ETC., September 24th.—Steam generating set, control panel and modification of existing electric generator, at the State Institution, Rampton, Retford. Specifications, etc., from the Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1; deposit £1 1s.

GRIMSBY CORPORATION, September 24th.—Electrical installation in new school at Nunsthorp. Specification from Mr. S. R. Windle, borough electrical engineer, Grimsby.

MERSEY RAILWAY CO., September 24th.—Electrical sundries, lamps and fittings. Forms of tender from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead.

DEVIZES RURAL DISTRICT COUNCIL, September 25th.—Electric light installation in houses at Easterton, Great Cheverell, Market Lavington, West Lavington, and Worton. Particulars from the clerk, Mr. P. R. Trapp, Maryport Chambers, Devizes.

STAFFORD COUNTY EDUCATION AUTHORITY, September 26th.—Electric light and power installation in new wing of Wolverhampton Grammar School. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £3 3s.

EAST LOTHIAN EDUCATION AUTHORITY, September 27th.—Electrical work in connection with erection of public schools at Longniddry and Aberlady. Forms of tender, etc., from Messrs. Morham and Brotchie, 29, Hanover Street, Edinburgh.

HORSHAM URBAN DISTRICT COUNCIL, September 27th.—Supply and erection of (*a*) rotary convertor, 125 kW step-up transformer, two draw-out truck type e.h.t. switch units; (*b*) sub-station equipment: two 100 kVA transformers, e.h.t. switchgear, l.t. switchboard and cable works; (*c*) one e.h.t. feeder cable, laid complete. Specification, with form of tender, drawings, etc., from the electrical engineer, Mr. F. Ffrench, Electricity Works, Horsham, deposit £3 3s. (or £1 1s. for any one section).

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, September 27th.—Supply and erection of a double circuit, 33 000 V, three-phase, 50 cycle, overhead (steel towers) transmission line. Specification (No. 33/T/1), from Mr. E. F. Hetherington, chief engineer and manager, at the offices of the Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

EDINBURGH CORPORATION, September 28th.—Electric light installations in 48 houses at Quarryholes and 24 at Sunnybank. Specification, etc., from the Engineer, Electricity Works, Dewar Place, Edinburgh.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, September 28th.—Six months' supply of electrical fittings, etc. Forms of tender from the clerk and treasurer, Mr. C. L. Addison Smith, 19, Heriot Row, Edinburgh.

WARRINGTON CORPORATION, September 28th.—Electrical gear in connection with pumping plant for river filtration works. Specification from Mr. J. Gray, Water Engineer's Offices, Warrington; deposit £1 1s.

METROPOLITAN ASYLUMS BOARD, October 2nd.—Installation of electric bells at Paddington Casual Ward (Contract No. 6): new storage battery for t.s. "Exmouth" (No. 7); and alterations to electric lighting in "X" block at Eastern Fever Hospital (No. 8). Specifications from the Board's Office, Victoria Embankment, E.C.4; deposit £1 for each.

HASTINGS CORPORATION, October 3rd.—Supply of (*a*) 11 kV metal clad switchgear; and (*b*) one 5 000 kVA outdoor type transformer. Specifications from Mr. A. J. Ryan, borough electrical engineer, 12, York Buildings, Hastings; deposit £1 1s. for each contract.

GRIMSBY CORPORATION, October 4th.—One year's supply (about 25 000 yds.) of paper insulated, lead covered, low pressure cables. Specification (No. 269) from Mr. S. R. Windle, borough electrical engineer, Electricity Works, Grimsby.

HALIFAX CORPORATION, October 7th.—Electricians' work in connection with erection of filter house, etc., for the waterworks department. Specifications, etc., from the Borough Engineer; deposit £2 2s.

GREAT WESTERN RAILWAY CO., October 8th—October 25th.—Supply of telegraph instruments (list 18); electrical apparatus (insulators, etc.) (19); electric wires and cables (20); electric lamps (24), etc. Samples and patterns may be seen from September 23rd to 27th at the office of the Stores Superintendent, Swindon, where specifications and forms of tender can be obtained. Form of tender for list 20 will be issued on October 17th. Tenders for list 20 by October 25th and for other above-mentioned lists by October 8th.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc. Specifications from the Borough Electrical Engineer, 18–24, Lower Clapton Road, E.5; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links, one 30 000 kVA busbar coupler equipment, with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18–24, Lower Clapton Road, E.5; deposit £3.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 22nd.—Twelve months' supply of electric cables. Further particulars from the Electrical Engineer, Penrose Street, Walworth Road, London, S.E.17.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, September 20th.—Two electric lifts at the Stationery Office (Beggar's Bush Barracks), Dublin. Specification from the Office of Public Works, Dublin; deposit £1.

SOUTH INDIAN RAILWAY CO., LTD., September 20th.—Supply of electric goods, locomotives and battery tenders, in connection with electrification of Madras suburban services. Specifications, etc. (£1), from the Company's offices, 91, Petty France, Westminster, S.W.1.

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South Indian Railway Co., Ltd., September 20th.—Electrical control and traction equipment for suburban services. Specifications, etc. (£1, not returnable), from the Company's Offices, 91, Petty France, Westminster, S.W.1.

Auckland Electric Power Board, September 23rd.—Supply of pilot cable and joint boxes. (Reference B. X. 5 643.)

Dublin Borough Commissioners, September 23rd.—Wiring 421 houses in Donnycarney housing area, for electric lighting and heating. Specifications, etc., from City Treasurer, Exchange Buildings, Lord Edward Street, Dublin; deposit £1 1s.

Egyptian Ministry of the Interior, September 23rd.—Electric light installation and distribution system for the town of Kafr-el-Cheikh (Gharbieh Province). Reference B.X. 5 502.)

Invercargill (N.Z.) Corporation, September 23rd.—Supply and delivery of switchboard to be directly operated and suitable for controlling 11 000 V, three-phase, 50-cycle current. It may be either of the draw-out truck type or totally armour clad, and will at first consist of seven units. (Reference B.X. 5 507.)

South African Railways and Harbours, September 23rd.—Crude oil engine-driven 150 kW electric generating plant. (Tender No. 1 528.) (Reference B.X. 5 566.)

India Store Department, September 24th.—Supply of 31 000 yards of dry core electric cable. Schedule (No. 4) (5s.) from the Director-General, Belvedere Road, London, S.E.1.

Postmaster-General's Department, Melbourne, September 24th.—Supply of condensers (schedule C. 461) (Reference B.X. 5 488.)

India Store Department, September 25th.—Supply of 200 000 porcelain and composition telegraph insulators. Schedule (No. 3) and form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

Melbourne and Metropolitan Tramways Board, September 25th.—Insulated and bare copper cable (contract 723). (Reference B.X. 5 654.)

South African Railways and Harbours, September 26th.—Two 100 kVA motor alternators (tender No. 1 521). (Reference B.X. 5 564.)

Victorian Electricity Commission, September 30th.—Supply of 48 busbar-supporting insulators, for use on three-phase, 50 cycle transmission system, 66 000 V between phases (specification 29/120). (Reference B.X. 5 686.)

New Zealand Posts and Telegraphs, October 7th.—Supply of 70 000 small galvanised steel insulator bolts (tender No. 151/1 806). (Reference B.X. 5 681.)

Egyptian Ministry of the Interior, October 15th (extension of time).—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B. 5 674.)

South African Railways and Harbours, October 17th.—One 10-ton electric overhead travelling crane (tender No. 1 533). (Reference A.X. 8 463.)

Wellington Corporation, October 21st.—High and low tension switchgear (contract No. 449). Reference B.X. 5 649.)

Postmaster-General's Department, Melbourne, October 22nd.—Supply of insulated wire (schedule C. 475). (Reference B.X. 5 580.)

Postmaster-General's Department, Melbourne, October 22nd.—Telephone transformers (schedule C. 474). (Reference B.X. 5 581.)

Telephone Cable.

Victorian Railway Commission, October 23rd.—Dry-core telephone cable (contract No. 43 384). (Reference B.X. 5 638.)

Melbourne City Council, October 30th.—Two 2 500 kW motor-converters and accessories, or two 2 500 kW rotary converters, with transformers and accessories. (Reference B.X. 5 570.)

New Zealand Posts and Telegraphs, October 30th.—Head receivers (P. and T. 151/1 725). (Reference B.X. 5 603.)

Johannesburg Municipality, October 31st.—Steel tramway rails, fishplates, manganese points, etc. (contract No. 257). (Reference A.X. 8 523.)

South African Posts and Telegraphs, November 14th.—Supply of 400 000 lb. of hard drawn copper wire, 2 000 lb. of soft drawn copper wire and 2 000 lb. of soft drawn, tinned copper wire (tender No. 173). (Reference A.X. 8 510.)

Postmaster-General's Department, Melbourne, November 19th.—Supply of telephone generators and motor generators (schedule No. C. 479). (Reference B.X. 5 662.)

Western Australia Government, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General, Savoy House, Strand, London, W.C.2.

Victorian Electricity Commission, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

Victorian Electricity Commission, November 25th.—Watt-hour meters, recording instruments and remote, metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92.) (Reference B.X. 5 614.)

Indian Stores Department, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

Argentine National Sanitation Works Department, December 9th.—Supply of 8 electrically driven centrifugal pumping sets, 3 air compressor sets and 20 centrifugal exhausters. (Reference A.X. 8 509.)

New Zealand Public Works Department, December 10th.—Three single-phase, oil insulated, water-cooled transformers, with accessories (section 295). (Reference B.X. 5 600.)

Tenders Accepted.

Dunoon Council.—Johnson and Phillips, Ltd., complete electric lighting scheme.

Sandbach Grammar School.—Carrington and Button, electric light installation.

Glasgow Corporation.—Malcolm and Allan, electric lighting at Kinning Park Hall.

Farnworth Urban District Council.—E. E. Garrard and A.C.E.C., supply of l.t. cables.

Southern Railway.—Twelve months' supply of Osram gasfilled and vacuum lamps and Osram train lighting lamps.

Luton Corporation.—Brush Electrical Engineering Co., Ltd., construction of covered tops for three tramcars, £355 each.

Southern Railway Co.—Johnson and Phillips, Ltd., high tension cables for Dartford, Gravesend and Twickenham-Windsor sections.

Auckland Power Board.—Johnson and Phillips, Ltd., about 13 miles of 22 000 V, 0·25 three-core cable, for underground transmission line.

Guildford Corporation.—Wilmot and Son, wireless installation at the infirmary, with 48 pairs of headphones and plugs in 12 wards, £69 1s.

Metropolitan Water Board.—Barlow Bros. and Co., provision of Parsons-Sloper secret interphones, etc., at head offices, £270. (Recommended.)

Sittingbourne U.D.C.—Kent Electric Power Co., Ltd., installing electric light in houses, providing seven points, globes and pendants, at £4 per house.

Ammanford Urban District Council.—D. O. Williams and Co., erection of supply line from Ammanford boundary to Mountain Colliery, Bettws, £195.

Ripley Urban District Council.—Derbyshire and Nottinghamshire Electric Power Co., public lighting, £3 15s. each for 19 lamps, and £4 each for 26 lamps.

Maidstone Education Committee.—Oswald Jones and Co., electric light installation at Union Street Schools, £137. Corporation Electricity Department withdrew its original tender, £121 14s. 5d., and submitted a revised one, £90.

Reigate Corporation.—Manlove, Alliott and Co., Ltd., refuse destructor, including electrical plant, etc., £11 526. Other tenderers: John Crewdson, £9 770 3s. 11d.; Mr. A. E. Farr, £10 538 7s.; Heenan and Froude, Ltd., £13 164.

India Stores Department.—General Electric Co. (India) Ltd., equipment for rotary convertor, etc., Rs. 1 900, switchboard, etc., Rs. 1 950, cable work, etc., Rs. 2 010, spare parts, Rs. 495; Stewarts and Lloyds, Ltd., Victaulic fittings, Rs. 16 194.

Southend Corporation.—W. T. Henley's Telegraph Works Co., Ltd., 12 section fuse pillars in connection with change over, £448 16s; Fraser and Chalmers, Ltd., 1 700 B.H.P. Diesel engine, coupled to 1 200 kW d.c. generator, and switchgear, £21 000.

Cape Town Corporation.—Albert Vaux, Ltd., installation of electric cooking apparatus and water heating plant at Mizenberg Pavilion restaurants, £520. Ironclad service cut-

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outs, British Insulated Cables, Ltd., £510 10s., and Siemens Bros. and Co., Ltd., £69; copper wire, Associated Engineers Co., Ltd., £2 049, and Albert Vaux, Ltd., £115; 97 electric light poles, British Insulated Cables (S.A.), Ltd., £570 4s. 3d.

BRIGHTON GUARDIANS.—Adams Bros. and Broadbridge, Ltd., supply and fitting of electric light equipment in Nurses' Home, Poor Law Infirmary, Pankhurst Avenue, Brighton, £123. Also tendered: General Installation Co., Ltd., £130; Gooding and Sons, £130; W. A. Rood, Ltd., £132; J. G. Marchant and Martin, £150; C. Lewery, £135; Page and Miles, Ltd., £140; H. J. Galliers, £161; E. E. Fellingham, £177; G. Mitchell, £147.

LEEK URBAN DISTRICT COUNCIL.—Overhead, Ltd., overhead electric mains to supply premises at Longsdon, £1 858).

LONDON COUNTY COUNCIL.—Coleby and Co., wiring and fittings for electric lighting, power and bells in the extension of the L.C.C. Trade School for Girls, Bloomsbury, £337. Also tendered: A. Dean and Co., Ltd., £341; Malcolm and Allan (London), Ltd., £344; Electric Installations, Ltd., £382; H. J. Cash and Co., Ltd., £398; Pinching and Walton, £443.

GLASGOW CORPORATION.—T. B. and J. A. Mathieson, Ltd., electrical work at new baths at Plantation; John Deas and Co., electric crane at Shettleston baths, £99 10s.; Fraser and Borthwick, Ltd., battery charging plant, £19 443 5s. 9d., and overhead charging feeder system for garage at Govan, £349 3s. 8d.; electrical installations at housing estates: Shettleston and Tollcross, £396 8s. 4d., Saracen Street, £809 4s., and Quarrybrae Street, £1 355 8s. 8d., R. J. M'Intyre; Altyre Street, £651 19s. 2d., David Henderson (all recommended).

CENTRAL ELECTRICITY BOARD.—Contracts, amounting, approximately, to £808 000, for work in connection with the undermentioned schemes: South-East England, British Insulated Cables, Ltd., 33 kV and other cables; A. Reyrolle and Co., Ltd., 33 kV and lower voltage switchgear; Mid-East England, General Electric Co., Ltd., 132 kV overhead transmission lines. The erection work under the last-mentioned contract will be carried out by the Pirelli-General Cable Works, Ltd. The contract, which amounts to £494 836, covers the supply and erection of 320 miles of 132 kV lines, identical in construction with the overhead lines which the General Electric Co., Ltd., and the Pirelli-General Co. are now erecting for the Board in South-East England.

CONTRACTORS' YEAR BOOK.

Interesting Details of the Scottish Association's Work and Progress

THE Year Book and Diary of the Electrical Contractors' Association of Scotland for 1929-1930 is to hand. It contains portraits of Mr. J. Johnston Foggo, president, Mr. D. H. Morris, vice-president, Mr. Walter Finlay, secretary, Messrs. Thos. Rigg, Alex. Pratt, John Smith and J. L. Anderson, chairmen of the Glasgow, Edinburgh, Dundee and Aberdeen branches, respectively, and Mr. James M. Davies, auditor and formerly secretary of the Association; lists of members and of firms represented; particulars of the development of the Association and its objects and scope; an illustrated report of the annual meeting at Barrhead, Glasgow, in June last; model conditions of tender; a form of apprentices' indenture and discharge certificate, a list of Scottish electricity supply undertakings, giving names of owners, chief or resident engineers, voltage, etc., of supply, and prices charged; the Central Scotland Electricity Scheme and maps of the area covered by the scheme and of the areas of existing undertakings in and around Edinburgh and Glasgow; regulations for entering into and carrying out building contracts; preliminary rules applicable to all trades; mode of measurement of electrical work; special rates for workmen's compensation and third party insurance; a list of Scottish contractors on the National Register; a geographical directory of architects; officials and fellows of the Faculty of Surveyors of Scotland; members of the Cable Makers' Association, the Accumulator Makers' Association and the Electric Lamp Manufacturers' Association; a list of British Standard Specifications; information regarding power required to drive machinery and oncost charges. The book, which is published by the Association at 55, Frederick Street, Edinburgh, at 3s. (3s. 6d. post free), is well printed on good paper and well bound, and it contains, in addition to the above-mentioned features, a large diary with only two days on a page, giving ample space for entries. Those engaged in the electrical industry will find the book very good value for money.

BUSINESS ITEMS.

MESSRS. A. W. BEUTELL, LTD., 96, Victoria Street, London, S.W.1, have made an all-round reduction in the prices of "Linolite" strip reflectors.

The GENERAL ELECTRIC CO., LTD., ask us to state that the Henry Tattersall who was convicted at the Hull Police Court on August 26th for selling spurious Osram lamps, was in no way connected with the firm of Henry Tattersall, Ltd., of Spotland Bridge, Rochdale.

With reference to our review last week of the exhibits of WILD BARFIELD ELECTRIC FURNACES, LTD., at the Shipping, Engineering and Machinery Exhibition, the address of this firm is Elecfurn Works, North Road, London, N.7, and not Harrow Road, as mentioned.

With reference to the advertisement of W. T. Henley's Telegraph Works Co., Ltd., which appeared on page xxx of our last issue, it should be noted that the bottom line of the letterpress should read: "reasons why Henley Unit Pillars are worth more," this line being a repetition of the substance forming the basis of the advertisement.

Mr. A. J. Cunningham has commenced business on his own account, trading as Cunningham Beard and Co., of 146, Kensington High Street, W.8. as electrical and radio engineers, and manufacturers of decorative fittings for cinemas. He would like to receive catalogues from manufacturers. Recent orders received include two from Blackpool Corporation for over 1 000 lamp shades, decorative fittings for the "Astoria" cinema, Dundee, and also special fittings for the Trust Houses.

The telephone number of the RELIANCE TELEPHONE CO., LTD., Goschen Buildings, Henrietta Street, London, W.C.2, has been changed to Temple Bar 1010. Other changes in the London telephone area are THE RELAY AUTOMATIC TELEPHONE CO., LTD., Marconi House, Strand, W.C., Temple Bar 1117; the ELECTRICAL EQUIPMENT AND CARBON CO., LTD., 107-111, New Oxford Street, W.C., Temple Bar 7058/9; A-S REFRIGERATING MACHINES, LTD., Magnet House, Kingsway, W.C., Temple Bar 8000.

The FALKIRK, GRANGEMOUTH AND EAST STIRLINGSHIRE PUBLICITY AND DEVELOPMENT ASSOCIATION has been formed, with Mr. James Taylor as organising secretary, and with offices at Cow Wynd, Falkirk. A strong working committee of iron founders and representatives from Grangemouth has been appointed, and a publicity campaign is being organised to make known the attractions of Falkirk and district (which, it is claimed, is the centre of the light castings trade of the country) as a suitable district in which to manufacture.

Mr. A. E. Pollard, H.M. Trade Commissioner at Vancouver, is now in this country on an official visit, and will be in attendance at the offices of the Department of Overseas Trade until September 27th, when he will be prepared to interview representatives of firms interested in the export of British goods to Canada. He will subsequently visit a number of commercial centres in the Provinces. Applications for interviews with Mr. Pollard in London should be made at once to the Comptroller-General, Department of Overseas Trade. (Reference No. 13812/1/29.)

GEO. H. SCHOLES AND CO., LTD., of Manchester, are to be congratulated on the electrical installation which they have just completed at the new synagogue in Bury Old Road, Manchester. The work has been carried out to the specification of Messrs. Pendleton and Dickinson, architects, of Manchester. One of the features of the work is the coloured lighting, red, blue and yellow, which has been arranged by means of concealed lights in the dome above the Ark. By this means appropriate lighting effects may be obtained over the Ark and the reading desk. In the centre of the building where the congregation sits there are lights both in the ceiling and hanging, arranged in the form of a Cross of David and further adding to the effect obtained.

MICA STEALING IN INDIA.

The Legislative Council of Bihar has referred the Mica Bill to a select Committee. In Bihar and Orissa the problem in regard to mica is similar to that which arose in South Africa in connection with illicit diamond buying. The exports of mica are double the quantity accounted for by regular mining, and the surplus is due to the fact that large quantities are stolen and sold cheaply to dealers. All the large mining companies have lost money, although the deposits in Bihar of this material, which is so largely used in electrical work, are the biggest in the world. The Bill will compel dealers to declare the source of their purchases.

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ELECTRICITY SUPPLY.

Shoreditch Free Wiring—Porthcawl Supply Scheme—Birkenhead Assisted Wiring—Denmark's Imported Electrical Energy—The Central Board and the Lake District—Low Temperature Heating in the City of London.

PLYMOUTH Electricity Committee recommends an expenditure of £20 000 on mains and conduits.

South Shields Electricity Committee has obtained sanction for a loan of £5 000 for the assisted wiring scheme.

Stokesley and Great Ayton are shortly to be supplied with electricity by the Newcastle-upon-Tyne Electric Supply Co.

Dartford electricity department is to extend the cable in York Road, at a cost of £240, for giving a supply to the "Ivy Leaf" public-house, Brent.

Work in connection with the erection of cable for supplying the portion of the village of Fairlie in the parish of Largs has been commenced by the Ayrshire Electricity Board.

Application is being made to the Electricity Commissioners by the Nelson T.C. for approval to the terms of a draft agreement with Burnley Corporation for the provision and laying of an inter-connecting main.

Shoreditch (London) Electricity Committee reports that applications for supplies are being received at the rate of over 60 per week, and it has been decided to seek sanction for a further loan of £20 000 for the free wiring system.

It is stated that Barnoldswick will have its supply of electricity in a week or so. Mr. R. Blackmore, the Council's consulting engineer, states that the undertaking will be a paying proposition when it has between 300 and 400 consumers.

Porthcawl Council last week further discussed the electricity scheme and, on the advice of Mr. Arthur Ellis, decided to request a representative of the two approved tenderers to attend separately and discuss their tenders in detail with the Council.

The Central Electricity Board has quoted terms for the supply of electricity to the Skelmorlie Co. for use at Inverkip and Wemyss Bay, and the company has accepted the terms subject to the authority to supply at those places being transferred from Greenock Corporation to the company.

Torquay Corporation has decided to retain Mr. W. M. Selvey to act as consulting engineer in connection with the development of electricity supply in the area to the south and west.—Application is to be made for an Order to supply in Ivybridge urban and parts of Kingsbridge and Totnes rural districts.

Birkenhead Electricity Committee is making good progress with its assisted wiring scheme, and it is intended to introduce this in all parts of the town. The number of lights which will be installed under this scheme is limited to a maximum of five per house. An electric iron with plug and socket will also be provided.

The demand for electricity in Denmark, especially in the big towns of Zealand, is so great that Denmark is going to draw still further supplies from Sweden. A new cable is being laid under the narrow Oeresund between the two countries. In Denmark windmills are generally largely used for generating electricity, but these cannot so well be used in the towns. Practically every hamlet and every cottage in that country uses electricity for domestic purposes as well as for general lighting.

It is stated that the first big section of the new electricity generating station at Red Cote, Kirkstall, for Leeds Corporation will be completed within the next few months. The ultimate cost of the scheme is estimated at about £2 000 000. The works should be in operation early in 1930. The Central Electricity Board is expected to be in a position to adopt the scheme for the North-East section by the second week in October, and the contracts for the overhead lines of the Mid-East England scheme were placed this week.

Eastbourne Corporation is to lodge an objection to the proposed application by Messrs. Johnson and Phillips, Ltd., for powers to supply Ringmer and the district comprised in the Eastbourne Electricity (Extension) Order. The T.C. is applying for an Order to authorise supply of electricity to specific premises in the parishes of Eastdean and Friston in Eastbourne rural district. The consulting engineer, Mr. W. C. C. Hawtayne, is to prepare an estimate of the additional cost which would be incurred by placing part of the line underground and the Electricity Committee has decided that, provided the additional cost will not affect the charges for supply already approved, it is prepared to agree to the placing underground the section of line in question.

Sir Andrew Duncan, chairman of the Central Electricity Board, with Mr. Archibald Page and Mr. Blackmore, conferred with the chairman and secretary of the National Trust and Sir John Randles, chairman of the Keswick Committee, on September 12th on the question of the erection of overhead electric lines in Northern Lakeland. They visited the Lorton-Bassenthwaite and Keswick Valleys from Lorton to Troutbeck, in which area the Keswick Committee asked that about 18 miles of cables should be placed underground. At a meeting of Keswick Council on September 13th Sir John Randles announced that the Central Electricity Board had agreed to put the essential parts underground.

Carlisle Electricity Committee has obtained sanction to borrow £2 400 for mains and £240 for purchase and adaptation of property. The Committee is to seek sanction for area extensions to villages in the rural districts of Brampton and Longtown.—In connection with the North-East England electricity scheme, the Electricity Committee has decided that having regard to the large expenditure involved in the proposed standardisation of frequency, representation be made to the Board protesting against the outlay for the purpose mentioned on the grounds that the benefit obtained from such standardisation is more local than national in its application.—The Committee has instructed the City Electrical Engineer to accept, in conjunction with the Central Electricity Board, a tender for the supply of switchgear at the new electricity works.

Sheffield electricity department has been unable to get into direct contact with colliery companies in the district, in regard to purchase of coal, as practically the whole of the output is sold through agents. When the Corporation invited tenders for 12 months' supply of coal to the department, not one colliery company replied, the whole of the inquiries being received from agents. A sub-committee recommends that the Corporation should submit to the Government Committee which is considering the conditions relating to the sale of coal, the desirability of ascertaining whether the absence of agents would enable colliery companies to supply their product more cheaply and the desirability and practicability of empowering municipalities to become agents for supplies of coal for their own requirements.

The City of London Electric Lighting Co., Ltd., has issued a pamphlet giving brief particulars of electric low-temperature heating for which electrical energy is supplied at ½d. per kWh between 7 p.m. and 10 a.m., and ¾d. per kWh between 10 a.m. and 7 p.m. Consumers are invited to avail themselves of the company's offer to inspect their premises, and submit free of charge details of a suitable installation together with an estimate of costs. It is claimed that the loading of the company's low temperature electric convectors to maintain an internal temperature of 60 deg. F. is less than half that required when luminous radiators are employed. The heating elements are enclosed, and as the convectors work at a temperature not exceeding 200 deg. F., they can be left in operation all night without risk. It is stated that the temperature of a room of 1 500 cub. ft. capacity can be maintained overnight by a 500 W convector, costing ½d. per hour.

According to Dominion Bureau statistics, the average daily output of central electric stations in Canada in June was almost 11% higher than the corresponding average last year. The average daily output in June, 1929, was 45 906 000 kWh, compared with 41 411 000 in June, 1928. The aggregate production of central electric stations in Canada during the first six months of 1929 was 8 567 141 000 kWh or 10·6 % more than the figure for the first half of 1928. In the Maritime Provinces during the six months, electricity developed by water power reached a total of 90 199 000 kWh, against 60 947 000 during the same period in 1928. In Quebec the output of 4 161 511 000 kWh compares with 3 638 584; in Ontario, 3 004 771 000 compares with 2 875 128 000 000; in the Prairie Provinces, 612 722 000 against 551 030 000; and in British Columbia, 535 189 000 against 517 217 000. The quantity of electricity generated by water power in central electric stations during the first half of the current year was 8 404 424 000 kWh, or over 98 % of the aggregate output.

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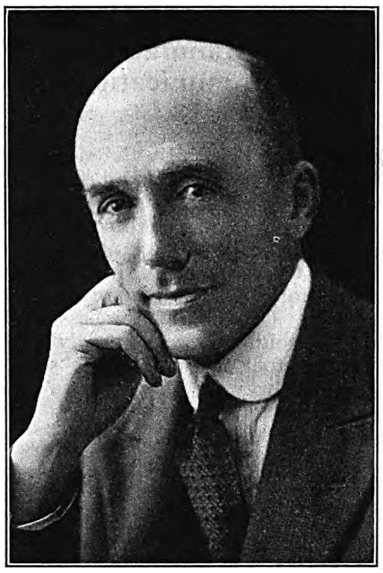
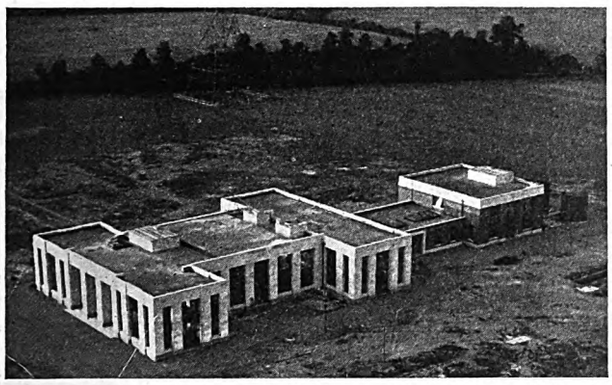
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

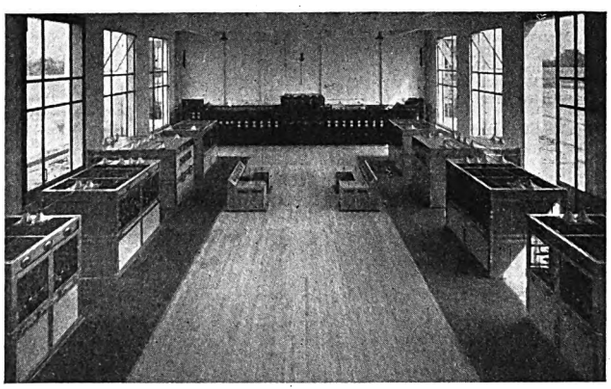
Mr. F. Winstanley, manager of the illuminating and domestic appliance departments, now appointed a director of the G.E.C. See page 337.

Sir J. M. Gatti, managing director of the Charing Cross Electricity Supply Co., whose death is referred to on page 337.

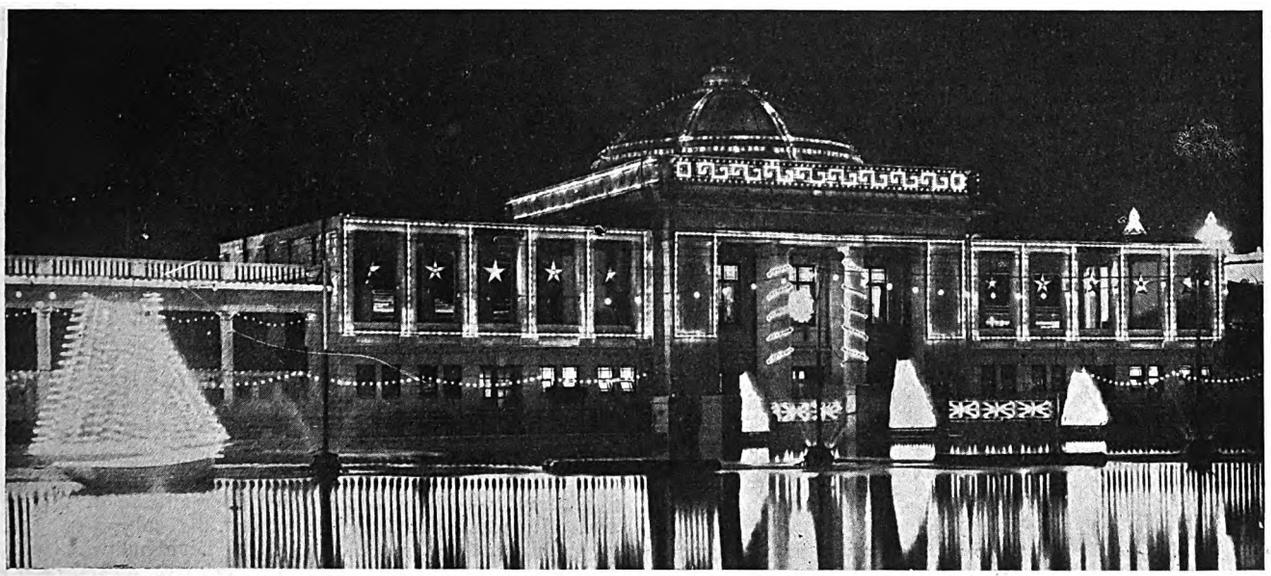


Mr. H. W. Roberts, sales manager of the General Electric Co., Ltd., who, as announced on page 337, has also been elected to the Board of the company.





These views of the Brookman's Park station of the B.B.C. show, left, an aerial view of the station, and right, the main transmitting hall with the controls for the two transmitters in the centre. This station started its experimental transmissions on Monday, and, according to reports, the results are, in the main, satisfactory. A description of the station and an explanation of the arrangement of the aerial-earth system are given on page 329.



The first section of the Blackpool autumn illuminations was inaugurated on August 6th, when 12 000 electric lamps were switched on at the open air baths. The scheme has been executed under the superintendence of Mr. C. Furness, borough electrical engineer, and Mr. F. W. Field, resident engineer. The illuminations will be continued every night, and to-morrow, Saturday, when effect will be given to the full scheme, about 100 000 lamps will be in use. At the open air baths there are eight flashing kaleidoscopes, the dome above the entrance hall and all the main buildings are outlined in light, and an illuminated yacht seen in the above picture rides at anchor in the lake.

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COMPANY NEWS.

Electrical Manufacturing Descriptions Mainly Firm—Metropolitan Supply Shares Improve —Communication Holdings Higher—Traction Stocks Decline—Company Reports, Dividends and Meetings.

BUYING of British Insulated and Callender's Cable ordinary shares has raised the quotations from last week's figure of 75s. in each case, to 77s. 6d. and 78s. 9d. respectively at the time of writing. Brush Electrical ordinary stock is a point up, and Ever Ready shares have risen 3d. General Electrics have lost their advance of last week, and are back at 57s. 6d. Metropolitan Electric Supply ordinary shares have risen nearly 2s. Cables and Wireless "A" ordinary stock is a couple of points higher at nearly 85. London United Trams debenture stock has fallen from 55 to 51½, and Underground Electric Railways ordinary shares are 6d. easier.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
(d)	Brompton & Kensington Ord. ..	26/–	26/–	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/–	51/–	24/3
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	*25/–	25/6	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	*31/10½	33/1½	52/10½	26/–
6	" " " " " 6% C.P.	*23/–	23/–	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	*57/6	57/6	68/6	25/9
6	" " " " 6% C.P.	*23/–	23/–	24/–	21/3
(c)	Kensington & K'bridge Ord. (£1)	26/–	26/–	27/6	23/9
1/9½	Lon. Elec. Sup. Ord. (£1).. ..	27/6	27/6	37/6	23/–
1/9½	Metro. Elec. Sup. Ord. ..	47/6	45/7½	53/–	24/9
4½	" " " 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup.Ord.	26/10½	26/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P.	23/–	23/–	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(c)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops.Worcs.& Staffs.Power Pref.	22/6	22/6	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/–
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/6	36/6	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	127½	127½	152	117
7·67	" " " " 6% Pf. Stk.	127½	127½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4	" " " 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	78½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	76½	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	55	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	60½	61	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	67	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	72½	72½	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
7	Underground Electric Rlys. Ord.	23/–	23/6	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	75/–	86/3	56/–
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	22/6	22/6	24/9	19/7
7	" " " 7% Deb.	103½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	129½	153½	120
15	Callender's Cable Ord.	78/9	75/–	91/3	66/–
6½	" " 6½% C.P. ..	25/–	25/–	25/9	22/–
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	" " 6% Cum. 2nd Pf.	17/6	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/–	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/–	15/–	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/–
—	English Elec. Ord.	8/1½	8/1½	15/9	5/–
—	" " 6% C.P.	8/1½	8/1½	18/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	21/9	21/6	92/3	18/1
6	Ferranti 6% Pref.	18/–	18/–	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord...	57/6	61/3	46/6	26/6
25	W. T. Henley's Ord.	127/6	127/6	120/–	69/3
10	Johnson & Phillips Ord.	40/–	40/–	67/11	34/–
7½	Lon. Elec. Wire. & Smith's Pref.	23/9	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	28/9	28/9	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23 .	30½	20
	Telegraph				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	84½	82½	—	—
	"B" Ord Stk.	70½	70½	—	—
	5½% Cum. Pref. Stk. ..	95½	95	—	—
3½	Eastern 3½% Pref. Stk.	61½	60½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Gt. Northern Telegraph (£10) ..	31	31	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	60/–	60/–	90/–	16/6
4	Western Tel. 4% Deb. Stk. ..	77½	77½	82	76

(a) 19 2/12d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share.
(d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. * Ex dividend.

GENERAL ELECTRIC CO. OF NEW YORK.—Qrtrly. div. of $1 is announced.

WESTERN UNION TELEGRAPH CO.—The regular qrtrly. div. of $2 has been declared.

MONTREAL LIGHT HEAT AND POWER CONSOLIDATED.—Div. of $0·06 p. sh. is announced.

BRITISH INSULATED CABLES, LTD.—Intm. div. of 1s. p. sh. (5%), less tax, on ord. cap. is announced.

AMERICAN TELEPHONE AND TELEGRAPH CO.—Regular qrtrly. div. of $2.25 p. sh. payable Oct. 15.

HENDON ELECTRIC SUPPLY CO., LTD.—Intm. div. of 5% tax free, on ord. shs. (same rate as last year) is announced.

EASTERN TELEGRAPH CO., LTD.—Div. at rate of 3½% p.a., less tax, on pref. stk. for qrtr. endg. Sept. 30, 1929, will be paid on Oct. 15.

ANDHRA VALLEY POWER SUPPLY CO., LTD.—Transfer books of 7½% 10-year secured sterling notes are closed until Sept. 30, inclusive.

WEST LONDON AND PROVINCIAL ELECTRIC AND GENERAL TRUST, LTD.—Pref. and ord. transfer registers are closed until Sept. 30, inclusive.

BRITISH COLUMBIA POWER CORPORATION.—Div. of 50 cents p sh. on class "A" shs. for qrtr. endg. Sept. 30, less tax, payable Oct. 15.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.—Intm. div. of 2½% on ord. shs. (same rate as last year) has been declared.

HYDRO-ELECTRIC CO. OF TUCUMAN.—Half-yearly coupon due Oct. 1 may be left for examinatn. at Bank of London and South America, Ltd., 6, 7 and 8, Tokenhouse Yard, London, E.C.

AUTOMATIC TELEPHONE MANUFACTURING CO., LTD.—Intm. div. of 3¾% on ord. shs., less tax, is announced. Ord. sh. registers are closed until Sept. 21, inclusive, for preparatn. of div. warrants.

INTERNATIONAL AUTOMATIC TELEPHONE CO., LTD.—Intm. div. of 3¾%, less tax, on ord. shs. is announced. Pref. and ord. sh. registers are closed until Sept. 21, inclusive, for preparatn. of div. warrants.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—The transfer books and register of hldrs. of 7% red. deb. stk. are closed from Sept. 17 to 30, inclusive, preparatory to paymt. of int. on Oct. 1.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—The transfer books and register of hldrs. of 4½% 1st deb. stk. are closed from Sept. 17 to 30, inclusive, preparatory to paymt. of int. due Oct. 1.

PACHUCA LIGHT AND POWER CO.—Coupon No. 38, due Oct. 1, on 5% 50-year 1st mtge. bonds will be paid on and after that date at the Canadian Bank of Commerce, 2, Lombard Street, London, E.C., and in Toronto, New York, Brussels and Basle.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—Net income of Corporation and associates for six months ended June 30, 1929, $7 808 000, or $1.56 p. sh. Qrtrly. div. of 50 cents p. sh. will be payable on Oct. 15.

NIAGARA HUDSON POWER CORPORATION.—This $450 000 000 concern, recently formed by Morgan and Co., has, through purchase of the Frontier Corporation, acquired sites on the St. Lawrence river wh. will enable plants to be established to produce 28 400 000 H.P.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—Qrtrly. div. of 1¾% ($1.75 p. sh.) in respect of fixed div. of 7% p.a. on the non-cum. participatg. pref. shs. will be paid on Oct. 1. London agents: Canadian and General Finance Co., Ltd., 3, London Wall Bdgs., London, E.C.2.

SIDRO CO.—Board has decided to maintain div. for year ended June last at 20% on pfd. and ord. shs., subject to approval of shhldrs. at gen. mtg. on Oct. 1. Dividend will therefore be 50 francs gross, or 47 francs net, tax free, on pfd. and ord. shs., while 182.80 francs gross or 171.80 francs net will be paid on founders' parts.

CENTRAL STATES ELECTRIC CORPORATION.—An issue of $25 000 000 25-year optional 5½% debs. of this corporation was made last week by Messrs. Dillon Read and Co. in New York. The corporation is the largest shhldr. in the North American Co., and has a controlling int. in the Class "B" shs.

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of the American Cities Power and Light Corporation, and substantial holdgs. in other leading American public utility concerns.

RADIOVISOR FOREIGN AND COLONIAL.—Shhldrs. of Radiovisor Foreign and Colonial have been informed that the directors have concluded an agreement with Siemens and Halske A.G. of Berlin for exclusive rights of mfre. and sale throughout Europe of all apparatus involving use of selenium cells. Siemens and Halske undertake to buy Radiovisor cells from Radiovisor Foreign and Colonial at a fixed price, and to pay a royalty on all apparatus in which the cells are embodied. The agreemt. is for ten years.

INTERNATIONAL PAPER AND POWER CO.—For half-year ended June 30, 1929, rev. was $13 894 554; to depreciatn. $4 22 157; int. on funded debt, $5 273 579; amortisatn., of disct. on funded debt, $302 968; res. for income taxes, $426368; minority int. in earngs. of New England Power Associatn. and subsidiaries, $310 915; net rev. available for divs., $3 357 566; divs. on stks. of subsidiaries, $1 949 501; net rev. added to surplus, $1 408 064; surplus brt. in., $18 180331; surplus adjustmts., $£1 643 985; divs. on co's. stocks, $4 407 617; surplus June 30, 1929, $16 824 764.

SPHINX ELECTRIC, LTD.—In their 2nd qrtrly. report, directors draw attentn. to the fact that in the electrical world the months June-August represent the low water mark of the year, and it is therefore with no small amt. of pride that they are able to announce not only steady increases in sales week by week, but 96% increase over the June qrtr. and 184% over the corresponding qrtr. of 1928. The sales force have opened 1 301 new accts. during the past six months, including the General Post Office, Royal Court of Justice, Scotland Yard, etc. The company's purchase of the controlling interest in Setalite, Ltd., and Thornton Norris Products, Ltd., is proving to be a satisfactory transactn. Already negotiatns. are on hand with most of the principal car mfrs. in the British Isles for the incorporatn. of a Setalite as standard equipmt. while one contract now being negotiated with a foreign combine of car mfrs. will, if brought to a successful issue, show the company a minimum net profit of £65 000, apart from a further £20 000 that will accrue to Thornton Norris Products. As only £7 500 is required to meet preferential div. the prospects for both pref. and ord. shs. are of the brightest.

Company Meetings.

COLUMBIA GRAMOPHONE CO., LTD.—Lord Marks, presiding at the meeting on September 12th, said the profits for the past year were £505 120, or more than 25% increase over the preceding 12 months. They were now manufacturing a combined gramophone and radio instrument which they hoped to have on the market this year. Careful investigations and watchful observations of the radio industry had satisfied them it had reached stabilisation, and, that being so, they were convineed that now was the opportune moment for their company to commercially enter it. They had manufactured Columbia radio sets that they unhesitatingly said were equal to any competitive sets now known, and the three models they had just announced to the trade as coming on the market during this month had made them absolutely confident that they could look to a great expansion in this section of their business. The report was adopted. the payment of the preference dividend was confirmed, and the final dividend of 30%, making 45% for the year, on the ordinary shares, was approved.

ELECTRAMONIC CO., LTD.—An extraordinary general meeting of the Electramonic Co., Ltd., was held on September 12th, to consider a resolution for the voluntary liquidation of the company and the appointment of Mr. James Bell as liquidator. Sir Philip Dawson, M.P., occupied the chair. Mr. W. H. Sayers said that since the previous day he had had the opportunity of discussion with the chairman and directors of the company, and they had arrived at the conclusion that some arrangement might be arrived at. He had not altered his view as to the undesirability of liquidation of the company. He urged that bygones might be bygones, and the question of who was wrong and who was right be left alone and an endeavour made by all concerned to get the ship off the rocks. The Chairman said that certain statements had been made regarding himself and others, and he was anxious to answer all allegations which had been put forward, because there had been nothing done, in any shape or form, which would not bear the full light of day. The view of the directors was that the best possible thing in the interests of the shareholders was voluntary liquidation, with, if possible, a reconstruction of the company afterwards. The proposal for voluntary liquidation was lost by a large majority. A further resolution to appoint a committee of six shareholders with power to elect directors, and, if necessary, new solicitors, auditors, secretary, and any other officers of the company, was ruled out of order by the Chairman. He announced the resignation of himself and his fellow directors, and left the chair. Mr. A. G. Nathan, who was then voted to the chair, put the resolution which the chairman had ruled out of order, and it was carried on a show of hands and six members present elected.

New Companies.

FLAMWELL AND APPLEY, LTD.—Cap., £1 500. Manufacturers of and dealers in electrical apparatus, etc. A director: T. H. Flam well, 24, Watson Road, Worksop.

CHARLES MESSENGER AND CO., LTD.—Cap., £100. Electrical and general engineers, etc. A director: J. A. C. Messenger (chairman), 243, Brixton Road, London, S.W.9.

A. H. WHITEHEAD AND CO., LTD.—Cap., £300. Electrical, mechanical and radio engineers, etc. Reg. Office: 92, Upper Brook Street, Chorlton-on-Medlock, Manchester.

T. BAXTER, LTD.—Cap., £6 000. To acquire business of factors, agents and general dealers in electrical and wireless goods, etc., at 36, Great Eastern Street, Shoreditch, London, E.

GLOUCESTER IGNITION SERVICE, LTD.—Cap., £1 200. To acquire business of electricians, now carried on at 145, Barton Street, Gloucester. Reg. Office: 23, London Road, Gloucester.

RAYZONE, LTD.—Cap., £5 000. To acquire any invention relating to electric and other lamps, to adopt an agreement with John Lister and Co. and J. R. Quain, and to carry on the business of electricians, etc. Secretary: R. H. Watkin, Marlpit Farm, Coulsdon.

NATURETONE, LTD.—Cap., £10 000. To adopt agreement with M. A. Cowan, Ltd., M. A. Cowan, G. V. Palmer, G. Hope and R. Wilson, to acquire the benefit of inventions connected with improvements in volume and tone control systems in electrical sound reproduction, etc. Reg. Office: Imperial House, 80, Regent Street, London, W.1.

ELLISON MANUFACTURING CO., LTD.—Cap., £3 000. Manufacturers of and dealers in wires, lamps, fittings, accumulators, batteries, dynamos, motors, switches, controls, valves, telephonic and telegraphic instruments, wireless goods and accessories, electrical, mechanical, wireless and general engineers, etc. Solicitors: Titley and Paver-Crow, 6, Princes Square, Harrogate.

ASSOCIATED ELECTRICITY AND MONOXIDE GAS CORPORATION, LTD.—Cap., £200 000. To carry on business of light and power company and that of electrical engineers and manufacturers and maintainers of plant for generation, accumulation, transmission and supply of electrical energy, etc. Solicitors: Satchell, Chapple and Son, Rimmel House, 167, Regent Street, London, W.1. (Public Co.)

METAL AND CHEMICAL PRICES.

TUESDAY, September 17th.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£79 10 0	—	10s. 0d.
Electro Wirebars .. .. .. ,,	£85 5 0	—	5s. 0d.
H.C. Wires, basis .. .. per lb.	11 11/16d.	—	1/16d.
Sheet .. .. ,,	11 11/16d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2 11/16d.	—	1/16d.
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet ,, ... ,,	10 1/4d.	—	—
Wire ,, ... ,,	11 1/4d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. ,,	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£25 0 0	—	—
Foreign or Colonial .. .. ,,	£23 7 6	—	2s. 6d.
Tin—			
Ingot .. .. per ton	£205 15 0	10s. 0d.	—
Wire, basis .. .. .. per lb.	2s. 8 1/4d.	—	—
Aluminium Ingots .. .. per ton	£95 0 0	—	—
Spelter .. .. ,,	£24 5 0	—	5s. 0d.
Mercury .. .. per bottle	£22 10 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¼d.
Sodium Bichromate—Per lb. 3¼d.

Rubber—Para fine, 10⅝d.; plantation, 1st latex, 11¼d.

***. The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

According to James Forster and Co., the lead market displayed a steady tone last week, although the best prices were not maintained at the close. The declaration early in the week of considerable quantities of lead against September contracts established a contango on prices of 3s. 9d. a ton.

Closing prices on September 13th were £23 8s. 9d. for September, £23 10s. for October, £23 11s. 3d. for November, and £23 12s. 6d. for December, 3s. 9d. down to unchanged on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ABBOTT, A. P., AND CO., Lee Mill Bridge, Ivybridge, electrical engineer. £17 8s. 6d. July 26th.

BARKER, P., AND CO., 3A, Whitcher Place, Rochester Road, Camden Town, electrical engineers. £22 7s. 2d. July 31st.

BIGGS, G., AND SON, 5, Clayponds Lane, Brentford, electrical engineers. £70 11s. 9d. July 19th.

CLARKE, W. E., 149, Seabank Road, Wallasey, wireless dealer. £22 3s. July 17th.

EASTAWAY, William A., 62, Dale Street, Liverpool, electric adaptor manufacturer. £26 6s. 11d. August 7th.

EMERY, H., Halesowen Motor Works, Halesowen, wireless dealer. £27 6s. 2d. July 12th.

KEYWOOD, G., 584, Main Street, and 1, Greenhill Road, Carlton, electrical engineer. £17 4s. 7d. July 25th.

MATTHEWMAN, A. E., Holderness Garage, Landress, Lane, Beverley, wireless dealer. £36 9s. 6d. July 25th.

ORMSKIRK WIRELESS SUPPLY CO., 44A, Burscough Street, Ormskirk, wireless dealers. £29 13s. 11d. July 31.

RIPON ELECTRIC CO., 39, Kirkgate, Ripon, electrical engineers. £22 13s. 10d. August 7th.

ROBBINS, G. L., AND SONS, 323, High Road, Wood Green, builders and electricians. £18 11s. 8d. July 26th.

SOUTH ESSEX ELECTRICAL CO., 30, London Road, Romford, wireless engineers. £15 13s. 10d. July 16.

TROWER, James, 178 Mount Road, Leicester (trading as L. C. CHURCH), electrician. £19 11s. 7d. July 2nd.

VINCER, Mr. E., 94, Marlowes, Hemel Hempstead, electrical contractor. £15 7s. 2d. July 12th.

WESTON WIRELESS STORES, 32, Cinema Market Extensions, Uxbridge Road, W., wireless dealers. £18 11s. 5d. July 22nd.

Receivership.

BRITISH ELECTRICAL REPRODUCTION CO., LTD. R. L. Latimer, C.A., 4B, Fredericks Place, E.C., was appointed receiver and manager on September 6th, 1929, under powers contained in debenture dated November 29th, 1928.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

INCANDESCENT SYNDICATE AND ALLIED STORES, LTD.—This company, now in voluntary liquidation, was formed at the end of 1927, and acquired the Cardiff business carried on by James Wilfrid Fisk, who remained as chairman of the company. The stock was disposed of by auction last week. The company has no debentures.

PARCELL, E., wireless and electrical fittings dealer, Eastcheap, Letchworth. A meeting of the creditors of the above was held on September 11th at the offices of Corfield and Cripwell, accountants and auditors, Balfour House, Finsbury Pavement, E.C., when Mr. W. A. J. Osborne submitted a statement of affairs which showed ranking liabilities of £563, net assets estimated to realise £490, and a deficiency of £91. The assets comprised stock, £408, estimated to realise £230; book debts, £100, expected to produce £75; hire-purchase book debts, £78, valued at £50; cash register, £80, estimated to realise £50; office furniture, etc., £50, expected to produce £25; tools, benches, etc., £50, valued at £30; and household furniture, £100, estimated to realise £30. Mr. Osborne stated that the debtor had been carrying on business for a number of years. About two years ago the creditors were consulted, and they agreed to accept 10s. in the £ by four equal instalments, and that composition had been paid. In 1927, there was a surplus as a going concern of £79, but it was then estimated that if a realisation took place, there would be a deficiency of £241. It would appear that the position had improved since 1927, but that improvement was due to the fact that the old liabilities had been discharged by the payment of 10s. in the £. During recent months every effort had been made to do something with the business, and attempts had been made to sell it as a going concern. It was understood that there was a syndicate which was prepared to buy a large number of small retailers' shops in the wireless and electrical trade in different parts of the country. Efforts had been made to get in touch with that syndicate, but nothing definite had been done. The premises were held on a lease for 21 years from 1925, at a rental of only £45 per annum. The lease should be of some value. There were a number of pressing creditors. The drawings had been at the rate of £3 a week. The debtor thought he could carry on the business profitably, but Mr. Osborne said that unless the turnover could be increased, he did not see how the concern could be made a success. A substantial turnover was done during the winter months, but during the summer the sales fell off considerably. It was decided that a deed of assignment should be executed, with Mr. W. A. J. Osborne as trustee.

London Gazette, etc.

Company Winding-up Voluntarily.

RHAYADER ELECTRIC LIGHT AND POWER CO., LTD. By Special Resolution, August 8th, confirmed September 3rd. J. Stephenson, Victoria Hall, Llandrindod Wells, Incorporated Accountant, appointed as liquidator. Meeting of creditors at Victoria Hall, Llandrindod Wells, on Friday, September 20th, at 11 a.m. (This notice is purely formal. All creditors will be paid in full.)

Bankruptcy Information.

GREEN, William, 3, York Street, Stourport, Worcester, wireless dealer. Receiving order September 6th. Debtor's petition. First meeting, September 20th, 12 noon. Lion Hotel, Kidderminster. Public examination, October 1st 12.30 p.m., Town Hall, Kidderminster.

PAGE, Edgar George Matthews, Bohemia Road, St. Leonards-on-Sea, dealer in wireless sets and accessories. Receiving order, September 11th. Debtor's petition.

SHAPLAND, Albert Edwin, 13A, High Street, Budleigh Salterton, electrical engineer. First meeting, September 20th, 11.30 a.m., Official Receiver's Offices, Exeter Bank Chambers, Broadgate, Exeter. Public examination, October 17th, 11 a.m., The Castle, Exeter.

STONE, George Frederick Amos, trading as STONE MANUFACTURING CO., 108, Great Saffron Hill, London, electrical accessories manufacturer. Receiving order, September 12th, creditor's petition. First meeting, September 25th, 11.30 a.m., and public examination, October 29th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Notice of Dividend.

HOLMES, Harold, 60, Ward's End, Loughborough, Leicester, electrical contractor. First and final dividend, 4s. per £, payable September 19th, Federation Chambers, Wheeler Gate, Nottingham.

Notices of Intended Dividends.

BLOOD, Ralph, 44 and 46, Station Road, Padiham, Lancashire, wireless dealer and electrician. Last day for receiving proofs, October 2nd. Trustee, J. W. Carter, District Bank Chambers, Blackburn, Official Receiver.

HORSFALL, Robinson, trading as HARRISON AND HORSFALL, Midland Street, Barnsley, electrical engineer. Last day for receiving proofs, October 1st. Trustee, C. H. Baker, Standard Buildings, City Square, Leeds.

Partnership Dissolved.

M'LAREN AND HAY (David M'LAREN and George HAY), electro platers and bronzers, 11, Maitland Street, Glasgow, as at July 31st, 1929, by mutual consent, by the retiral of G. Hay. The business will be carried on by D. M'Laren on his own account, under the old name.

Application for Discharge.

SANDGROUND, Arthur, 32A, Allerton Road, Lordship Park, London, wireless factor. Hearing, October 16th, 10.30 a.m., Court House, Upper Edmonton.

Bankruptcy Proceedings.

STEVENS AND COLE, LTD., wireless, etc., dealers, 46, Barking Road, Canning Town, E. The statutory first meeting of the creditors and shareholders of this company (in liquidation) were held on September 10th at the Board of Trade Offices, Carey Street, W.C., before Mr. H. P. Naunton, Official Receiver. A statement was submitted showing liabilities £2 497 against assets £904, or a deficiency of £1 743 with regard to contributories, the issued capital being £150. The chairman reported that the company was formed in June, 1928, to carry on the business of dealers in wireless equipment, gramophones, records and accessories, the managing director being Mr. Leonard Cole. It originally had two shops at 251D and E, East India Dock Road, and 46, Barking Road, where Cole had been trading under the style of Stevens and Cole, but the East India Dock Road branch was given up in September, 1928. Early in March last the company opened another branch at 284, Barking Road, but the premises were burgled shortly afterwards, stock to the value of £100 being taken, and as it was not insured the amount was a total loss. The business of the company did not flourish, and through lack of cash to meet the demands of pressing creditors, Mr. Cole, in April, advanced £150 to the company on the security of a debenture for that amount. Mr. Harris Rainsbury was appointed receiver on June 25th; he carried on the business for a time, and then sold the balance of the stock and effects at 46, Barking Road for £220. The only other asset of importance was the lease of 284, Barking Road; an offer of £450 was made for it last May, but owing to illness on the part of the purchaser, it was not proceeded with, and it was doubtful whether the lease would now fetch anything like that sum. The failure of the company was attributed to severe trade competition, depreciation in the value of stock and lack of experience by the directors. The liquidation was left in the hands of the Official Receiver.

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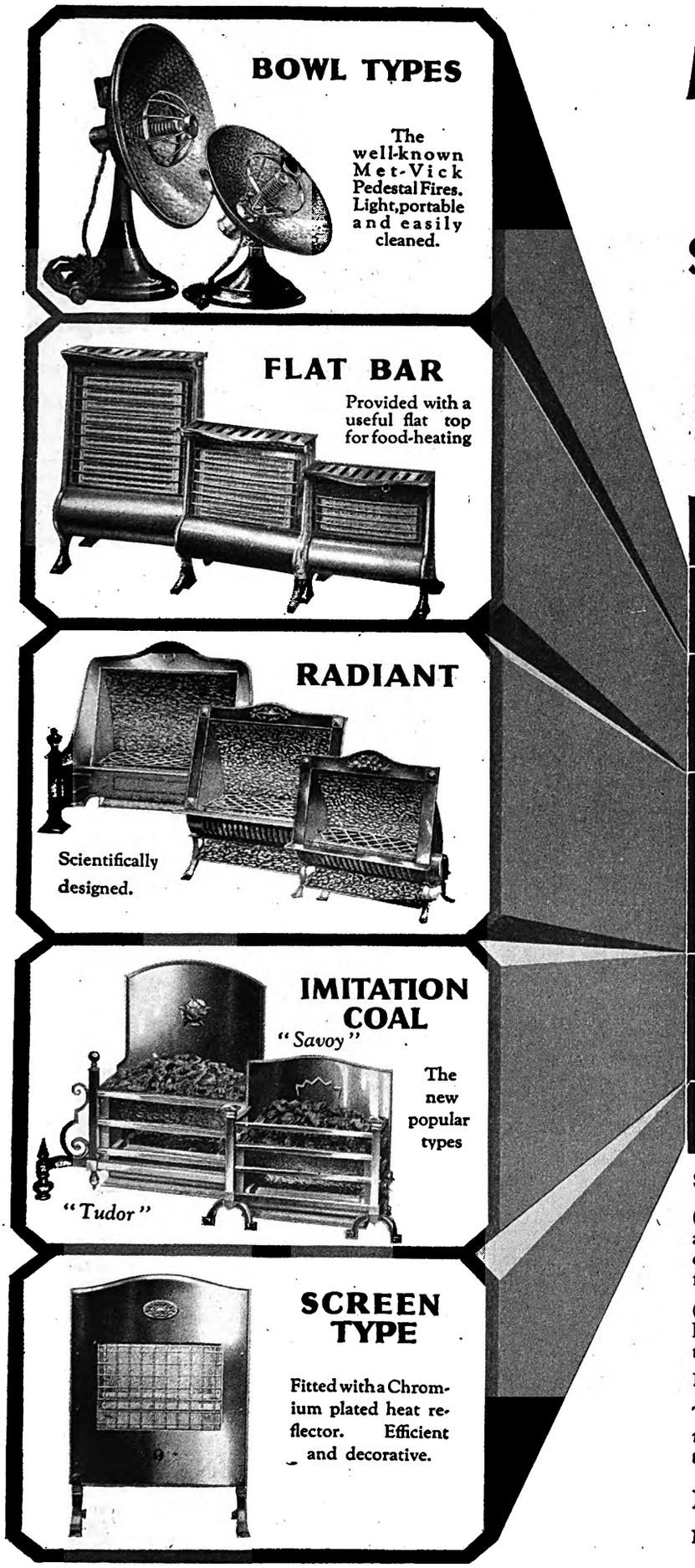

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Large - Oxy-Copper	27 : 6			
FLAT BAR:				
Black Enamelled		33 : 6	45 : 0	67 : 6
Oxydised Copper		37 : 6	50 : 0	72 : 6
White Enamelled		—	70 : 0	—
RADIANT:				
Standard Oxy-Copper		42 : 0	65 : 0	80 : 0
" Oxy-Silver		47 : 6	—	—
Jacobean Oxy-Copper			77 : 6	100 : 0
" Oxy-Silver			82 : 6	110 : 0
Empire - Oxy-Copper				110 : 0
" Oxy-Silver				120 : 0
Adam - Oxy-Silver				195 : 0
IMITATION COAL:				
Savoy - Oxy-Copper			145 : 0	170 : 0
" Oxy-Silver			152 : 6	177 : 6
Tudor - Oxy-Copper			175 : 0	200 : 0
" Oxy-Silver			182 : 6	207 : 6
" Chromium			190 : 0	215 : 0
SCREEN:				
Oxy-Copper			85 : 0	
Oxy-Silver			92 : 6	

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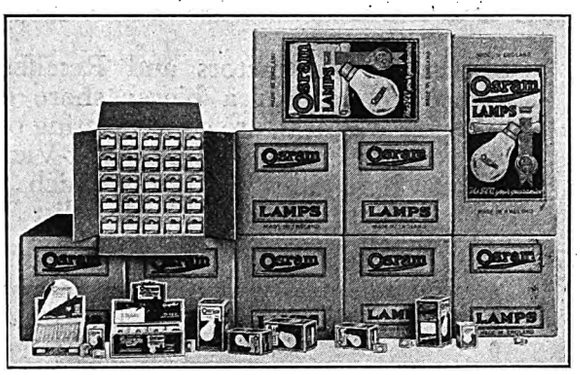
PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents, by permission of the Controller of H.M. Stationery Office.) Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

315 441 W. Rea. Automatic electric switch mechanism. (13/2/28.)
315 443 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Multiphase alternating-current rectifiers. (13/2/28.)
287 138 International General Electric Co., Inc. Electric discharge tubes. (16/3/27.)
315 447 English Electric Co., Ltd., and G. Tilstone. Electromagnetic indicating devices, relays, and the like. (13/3/28.)
294 196 Siemens and Halske Akt.-Ges. Circuit arrangement for transmitting signal messages over telephone lines. (20/7/27.)



A COLLECTION of G.E.C. publicity material which has been prepared in connection with the company's lamp-selling campaign.

315 234 S. G. Double and B. J. Hall and Co., Ltd. Distribution of electric current. (31/3/28.)
288 208 Compagnie des Mines D'Ostricourt. Electrical precipitation of suspended particles. (4/4/27.)
288 300 Fabrique D'Appareils Electricque Favarger Soc. Anon. Electric signalling systems. (5/4/27.)
315 284 S. A. Stevens and Westinghouse Brake and Saxby Signal Co., Ltd. Apparatus for rectifying alternating-currents. (4/4/28.)
315 204 Chamberlain and Hookham, Ltd., and S. James. Electricity meters. (5/4/28.)
315 244 Creed and Co., Ltd., and R. D. Salmon. Electric transmitters suitable for use in telegraphy. (10/4/28.)
315 246 Wild-Barfield Electric Furnaces, Ltd., and L. W. Wild. Electric furnaces. (10/4/28.)
315 286 E. Spielmann. Electric music instrument. (10/4/28.)
315 247 W. Luxford. Devices for application to pipes for repairing bursts, earthing electrical apparatus, and for other purposes. (10/4/28.)
315 291 Siemens Bros. and Co., Ltd., and D. P. Long. Automatic and semi-automatic telephone systems. (11/4/28.)
315 292 Electrolux, Ltd. (Platen-Munters Refrigerating System Aktiebolac.) Absorption refrigerating apparatus. (11/4/28.)
315 452 General Electric Co., Ltd., and E. H. Croft. Control of electrical apparatus. (12/4/28.)
315 337 Dr. F. B. Dehn (Burroughs Adding Machine Co.). Speed controlling mechanism for electric motors (12/4/28.)
315 457 A. Reyrolle and Co., Ltd., and G. R. Wilson. Electric couplings. (13/4/28.)
293 685 Central Electric Tool Co. Electromagnetic reciprocating motors. (9/7/27.)
315 481 F. Collingridge. Apparatus for the recovery of metals by electrolysis. (18/4/28.)
315 482 Standard Telephones and Cables, Ltd., E. P. Goodwin, J. H. E. Baker, and A. H. Cameron. Automatic and semi-automatic telephone systems. (18/4/28.)
315 487 T. A. Biddington and R. Field. Wireless receiving apparatus. (19/4/28.)
315 488 P. D. Tyers. Method of electrically reproducing gramophone and like sound records. (19/4/28.)
315 496 R. E. H. Carpenter. Relays and other electromagnetic instruments and machines. (25/4/28.)
315 499 Simplex Conduits, Ltd., and H. F. McLoughlin. Electric fuses. (27/4/28.)
295 677 J. W. Hofmann (trading as J. W. Hofmann (firm of)). Clamping devices for electric conductors. (17/8/27.)
289 778 Associated Electrical Industries, Ltd. Electric circuit breakers. (30/4/27.)
289 782 Telefonaktiebolaget L. M. Ericsson. Telephone systems comprising automatic telephone exchanges of different systems. (30/4/27.)
315 511 Igranic Electric Co., Ltd., and J. H. Abbink-Spaink. Electrical supply systems. (7/5/28.)
290 576 British Thomson-Houston Co., Ltd. Systems of electric distribution. (23/5/27.)
290 642 E. H. Armstrong. Radio telephone signalling. (18/5/27.)
315 515 British Thomson-Houston Co., Ltd., and L. J. Davies. Flicker-producing devices applicable to imitation solid fuel fires. (18/5/28.)
315 521 G. L. Porter and Ferranti, Ltd. Electic cable protection. (23/5/28.)
306 109 Siemens-Schuckertwerke Akt.-Ges. Fuse bases. (17/2/28.)
315 532 J. M. Ortega. Aerial conductors for use in radio communication. (1/6/28.)
294 873 S. C. L. V. Larsen. Concentric wall-plugs for electric wiring. (30/7/27.)
315 551 K. Wolinski. Diaphragms for electrolytic cells. (20/6/28.)
315 556 Chloride Electrical Storage Co., Ltd., and B. Heap. Electric accumulators. (22/6/28.)
293 318 E. Pohl. Röntgen-tube having its anticathode movable relatively to th e cathode. (2/7/27.)

Applications for Patents.

June 21st.

19 109 Siemens and Halske A.G. Carrier frequency transmission system. (30/6/28 Germany.)
19 116 Siemens and Halske A.G. Circuit arrangements for conference telephones. (10/10/28, Germany.)
19 111 Soc. Anon. Brevetti Elettrici. Electric heating plate. (21/6/28, Italy.)
19 112 Soc. Anon. Brevetti Elettrici. Electric flat-iron. (21/6/28, Italy.)
19 089 Standard Telephones and Cables, Ltd. (M. den Hertog and C. E. Stevens). Telephone systems.
19 128 Telefunken Ges. fur Drahtlose Telegraphie. Arrangements for heating cathodes of valves, etc. (23/6/28, Germany.)
19 129 Telefunken Ges fur. Drahtlose Telegraphie. Arrangements for timing high frequency circ uits. (23/6/28, Germany.)
19 130 Telefunken Ges. fur Drahtlose Telegraphie. Wireless signalling apparatus. (25/6/28, Germany.)
19 153 Telehor Akt.-Ges. Television apparatus. (21/7/28, Germany.)
19 154 Telehor Akt.-Ges. Glowlamps for television apparatus. (21/8/28, Germany.)
19 155 Telehor Akt.-Ges. Television projecting apparatus. (2/10/28, Germany.)
19 158 R. J. Tugwood (G.M.S. Products, Inc.). Electric switches.

June 22nd.

19 235 J. Anderson. Electric circuit breakers.
19 201 Arcturus Radio Tube Co. Radio receiving systems. (23/6/28, U.S.)
19 250 Associated Electrical Industries, Ltd., G. A. Cheetham and H. Lister, Prepayment devices.
19 251 Associated Electrical Industries, Ltd. Regulating systems for dynamos. (29/6/28, U.S.)
19 248 C. B. Backer. Electric heating elements.
19 246 C. L. Baudry de Saunier. Attaching electric wires to electrodes. (3/7/28, France.)
19 227 British Thomson-Houston Co., Ltd. Light sensitive apparatus. (22/6/28, U.S.)
19 212 R. Bruni. Radio truphonic systems. (23/6/28, Italy.)
19 253, 19 254 English Electric Co., Ltd., and F. Morris. Current collectors for electric railway vehicles.
19 188 T. Gray. Remote control switches.
19 243 H. J. Garnett, W. F. Randall, and W. S. Smith. Manufacture of magnetic alloys.
19 232 D. A. Oliver. Alternate current phase-splitting systems.
19 230 G. H. Schiefirstein. Influencing oscillatory systems and non-cohesive masses. (22/6/28, Germany.)
19 184 G. A. Stravrokov. Magnetic compasses.
19 183 A. M. Taylor. Electric power transmission.
19 186 J. Wilson. Sound reproducing kinematograph projectors.

June 24th.

19 355 M. Bandle and Howards and Sons, Ltd. Variable resistances. (23/6/28, Germany.)
19 274 C. F. S. Bilbrough. Method of charging Daniell cells.
19 336, 19 337 British Thomson-Houston Co., Ltd., F. H. Clough, C. G. Mayo and J. G. Wellings. Transformers.
19 513 British Thomson-Houston Co., Ltd. High voltage cable testing systems. (25/6/28, U.S.)
19 514 British Thomson-Houston Co., Ltd. Vacuum switches. (25/6/28, U.S.)
19 515 British Thomson-Houston Co., Ltd. Mounting filaments. (25/6/28, U.S.)
19 347 F. R. Butterus. Relays.
19 364, 19 365 P. H. Chase. Electric cables. (25/7/28, U.S.)
19 367, 19 368 A. S. Cachemaille (Westinghouse Lamp Co.). Thermionic cathodes of vacuum electric tube devices.
19 300 A. R. Clarke and A. E. Hall. Device for earthing electricity.
19 401 R. J. Frost. Electrolytic production of white lead. (6/7/28, U.S.)
19 416 General Electric Co., Ltd., and W. Wilson. Electric power plants for running in fluid pressure engines.
19 330 J. G. Hall and A. J. E. Osbourn. Electric magnets. (6/6/29.)
19 321 S. B. Hamilton. Electric torch lamps.
19 344 L. G. Hawkins and L. G. Hawkins and Co., Ltd. Electric inspection lamps, etc.
19 403 W. Hribar. Transformer.
19 409 E. Kleinmann, Kleinmann Geb. and A. Mendel. Pins for thermionic valves, etc.
19 393, 19 394 Kolster-Brandes, Ltd., and T. D. Ward-Miller. Electric connections.
19 395 Kolster-Brandes, Ltd. Radio signalling. (23/6/28, U.S.)
19 396 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Electric rectifying systems.
19 357 J. E. Lilienfeld. Electric vacuum tubes. (3/10/28, U.S.)
19 295 M. Seliger. Electric drive of trains.
19 381 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. Apparatus for operating Röntgen tubes. (23/7/28, Germany.)
19 377, 19 378, 19 379 S. Thompson. Electric heating devices.
19 418 M. Tranton and Wireless Music, Ltd.—Electromagnetic loud speakers, etc.
19 267 W. G. Turner. Electric liquid heaters.

June 25th.

19 559 American Travelling Sign Co. Circuit control apparatus. (19/7/28, U.S.)
19 545 Automatic Telephone Manufacturing Co., Ltd., C. E. Beale and H. S. Deyes. Telephone systems.
19 449 H. S. Benson. U-shaped thermometers adapted to close electric circuits.
19 532, 19 533 H. H. Berry and C. A. Painton. Electric water heaters.
19 534 H. H. Berry. Electric fires.
19 480 B. Crentsil. Galvanic cells.
19 415 F. G. G. Davey. Electromagnetic loud speakers.
19 518 Electrical Research Products, Inc. Signalling systems. (15/9/28, U.S.)
19 485 Electro-Medical Supplies and C. H. Greenham. Electro-medical apparatus, etc.
19 430 General Engineering Co. (Radcliffe), Ltd., and S. Taylor. Impregnation of dielectric materials.
19 438 Handelsvenootschap onder de firma J. Schleper and Zonen. Electric testing device. (26/6/28, Holland).
19 467 A. Lederer. Electrical discharge tubes. (3/7/28, Austria.)
19 459 H. C. Mahoney. Turntable for portable wireless sets.
19 511 A. M. Newman and J. Suchomski. Electrical sound box for talking machines.
19 522 Siemens-Reiniger Veifa Ges. fur Medizinische Technik. Metal vapour lamp. (26/6/28, Germany.)
19 529 Siemens and Halske A.-G. Electroplating with chromium. (26/6/28, U.S.)
19 435 F. L. Smith. Receiving wireless signals.
19 539 Soc. des Magnetos R.B. Electric equipments for motor vehicles. (20/10/28, France.)
19 493 Telefunken Ges. fur Drahtlose Telegraphie. Radio, etc., valve transmitters. (30/6/28, Germany.)
19 494 Telefunken Ges. fur Drahtlose Telegraphie. Keying systems for radio, etc., valve transmitters. (30/6/28, Germany.)

COMING EVENTS.

Monday, September 23rd.

Electrical Contractors' Association (Ealing Sub-branch).—Ordinary meeting.

Monday, September 23rd—Thursday, October 3rd.

National Radio Exhibition.—Olympia, London.

Wednesday, September 25th.

Electrical Contractors' Association (Croydon Sub-branch).—Ordinary meeting.

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THE ELECTRICIAN, September 27, 1929.

ELEVENTH ANNUAL AUTUMN TRADE NUMBER.

THE ELECTRICIAN

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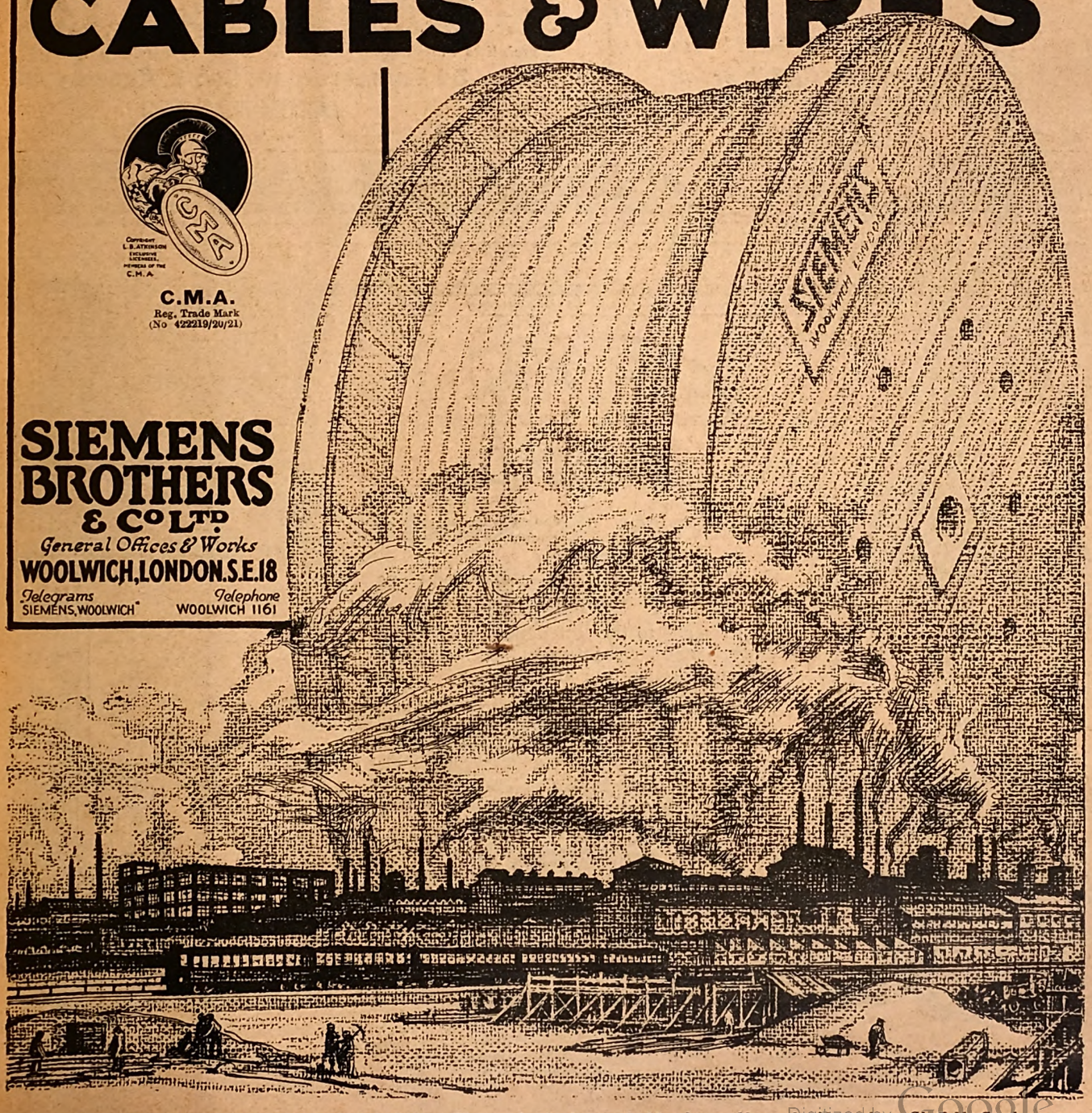

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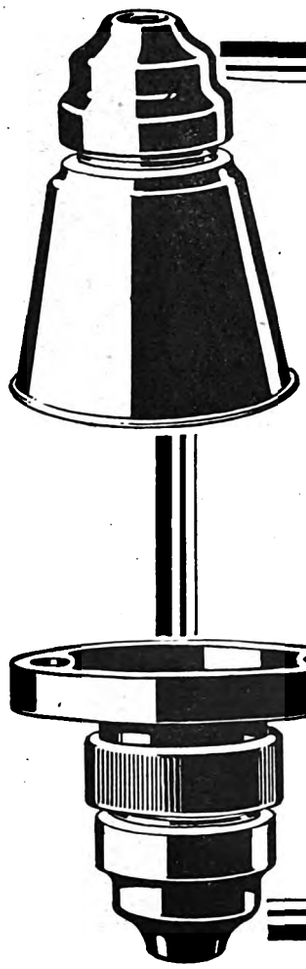

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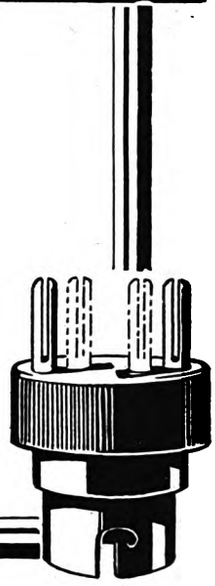

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THE ELECTRICIAN

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Current Topics.

Autumn Trade Promotion.

THE sudden change in the weather and the consequent drop in temperature are causing the public to give serious consideration to winter preparations, and the time is now appropriate for electrical contractors to give to their windows that atmosphere of warmth which the electric fire is able to create. We publish elsewhere in this issue a number of suggestions received from manufacturers with a view to promoting autumn trade, and from these descriptions it will be gathered that a number of new lines have found their way to the market. Besides fires there are cookers, and at a time like the present, when the September quarter sees many changes in domestic addresses, the purchasing of new houses, etc., the careful display of electric cookers should do much to augment the usual brisk demand. The cold spell of last February did more to convert the public to electric heating than any campaign, and, bearing in mind the fact that every householder still remembers the "big freeze," the trade should prepare for greatly increased sales in all heating apparatus, portable and otherwise. That manufacturers are ready for such demand is evident from the number of designs available, and if the winter is to be as seasonable as was the summer, stocks will need to be large and varied. Another point worthy of attention is the effect of the summer sunshine. Lighting fittings and shades, purchased in the spring in order to withstand inspection during the long daylight hours, have in some cases lost their colour under the unusual glare, with the result that many housewives would not be averse to replacing faded shades for the winter months. Retail readers hardly need to be reminded of the valuable aids to autumn campaigning that are ready to hand in the E.D.A. Electric Homes Campaign and in the E.L.M.A. Glareless Light Campaign. Every preparation has been made for a really busy lighting and heating season, and, if individuals make full use of their opportunities, turnover will be large.

The National Radio Exhibition.

OF late years one has always associated the National Radio Exhibition with some new component which has tended to awaken flagging interest in radio, but this year the exhibition heralds the coming of some dozens of new sets, components, loud speakers, etc. The exhibition is further assisted by the rekindled interest in radio brought about by the testing of the Brookman's Park station and the promise of television at the end of the month. All things considered, therefore, the number of people attending is likely to be far in excess of any previous year, and electrical contractors interested in radio sales are advised to make an early visit. Preparations for autumn trade might well include radio, for with the publicity of the exhibition and the general enthusiasm of the public in the new developments, valuable sales can easily be brought about. Reverting to the exhibition itself, set designers are apparently concentrating on mains-operated equipment, and sets of all sizes, at prices to suit all pockets, are now available. One of the most noticeable features of the show is the number of different makes of portable sets on the market, which, judging from reports, are finding a ready sale. Another point of interest is the comparative absence of loud speakers in various disguises, the finish of this year's designs being such as to justify their exhibition without that unspoken, though none the less inferred, apology of previous shows. On the whole the exhibition is a good one and likely to reward the electrical contractor who is enterprising enough to inspect its stands.

Radio Trade Overseas.

IT is interesting to observe that, according to a recently published American "Commerce Report," the United States is the exclusive supplier of mains-operated radio receivers in New Zealand. Another point is that American valves "are very much in demand, the only competitive tube of any importance being of Dutch manufacture." British valves, we are informed, are mainly used in connection with set kits. The same report also states that the United States supplies the largest part of the trade in imported storage batteries, followed by Great Britain, the respective valuations last year being £409 539 and £266 238. These facts are all the more interesting in view of the fact that one of the chief visitors to the National Radio Exhibition will be Mr. J. LEVENSON, of Sydney, who is, according to report, out to buy equipment most suited to Australian radio conditions. After leaving this country Mr. LEVENSON will visit the United States with the same object in view, and it behoves every radio manufacturer to see that whatever impression he takes away from Olympia is not forgotten when America is reached. That Australia and New Zealand have been neglected so far as British radio goods

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are concerned is well-known, but, whatever may have been our shortcomings in the past, it is imperative that future policy includes these potentially big Empire markets. Our loud speaker trade with those two countries is a long way ahead of the American, and there is no reason why we should not lead in all other branches of the industry. Technically, British radio is well in advance of American practice, but whereas the Americans sell their goods in the form that is wanted by listeners in the southern hemisphere, we, apparently, hope to convert their views by offering sets which home conditions demand. Obviously, our Antipodean friends, flattered by the American attention, resent such treatment at the hands of their own kin.

Illumination Design Courses.

THE value of the Illumination Design Courses which are provided by the E.L.M.A. Lighting Service Bureau is so widely appreciated that it is hardly necessary for us to emphasise it here. It is sufficient, in fact, to announce that the twentieth of these courses opens at Savoy Street, London, on October 21st, that the programme will cover the more important fields of lighting in accordance with the very latest practice, and that all members of the electrical trade are cordially invited to attend. As on this occasion the course will occupy seven successive Monday evenings—the last lecture being on December 2nd—many of those who were unable to devote several whole days to attendance at these courses will now be able to do so without sacrificing working time.

Backs to the Wall.

THAT the gas industry takes a serious view of the work of the Lighting Service Bureaux is obvious from recent remarks in the gas journals, one of which is now strongly advocating the establishment of a Gas Lighting Service Bureau. The pathetic efforts of the gas industry to follow and approximate as closely as possible to electrical methods, as instanced in their remote-control switches and plug points, have for some time indicated that all was not well in the gas camp, but the position now seems to be sufficiently serious for those best qualified to judge its gravity to admit quite openly, not only that "gas is not making the progress that it should in the lighting world," but that "retrogression would be a more accurate description of its present motion." The only ray of hope discernible by the physicians of the gas industry is seen in the proposed Gas Lighting Service Bureau, but our friends in Savoy Street may be pardoned if they view it as a very feeble ray.

The Electric Iron.

REFERRING to our recent remarks on the use of electric irons in the U.S.A., and in particular to the statement that there are still 50% of American homes without an electric iron, the "Hardware Trade Journal" pertinently asks how many British homes are deficient in this respect. The question is one that would be difficult to answer with any degree of accuracy. It is, at any rate, safe to say that the percentage is certainly not less than the American figure, and probably considerably higher. Knowledge of the exact number of people in this country who have not yet discovered the many advantages of the electric iron would no doubt be interesting, and a series of individual investigations of this kind, made by electrical contractors in their own localities, would be both practicable and profitable.

Working Temperatures.

ATTENTION nowadays is rightly directed to the various factors which influence efficiency, but observations during the hot spell of the last few weeks suggest that one factor—working temperatures in such places as technical and clerical offices—is apt to be overlooked altogether. If indoor staffs are to work without undue fatigue, it is essential that the temperature should be maintained at a suitable level. Anything between say 62 deg. and 65 deg. F. is a reasonable proposition. In many cases, unfortunately, it is either too hot or too cold. Of the two extremes, the latter is least objectionable, but neither is desirable, and neither tends towards increase in efficiency. There is nothing more fatiguing or exasperating than the attempt to carry on intelligently with the thermometer registering 85 deg. F. Where freshness of thought, care in calculation, the creative work of responsible design, the close application of overlooking and checking the work of others, are concerned, the result cannot be felicitous while the main effort is perforce to keep oneself awake. The drowsiness and consequent sluggishness which such conditions engender has without question a most retarding influence upon the quantity and the quality of the output. If statistics—quantitative and qualitative—were kept of technical progress over a period, under different temperature conditions, they would give any discerning management most serious food for digestion. As a result, careful control of temperature and ventilation in the interests of the human material would be insisted upon. What is here urged may seem a very trifling matter. Actually, it may be very important. As an industry providing the best possible means for both heating and cooling we should make a point of using the remedial equipment which we supply, and experience of the benefits so received would be helpful in indicating the best ways of passing them on to others.

The "Talkie" Dispute.

IT is unfortunate that the Klangfilm group and the Western Electric Co. have so far failed to reach agreement as to the development and exploitation of the sound film producing and reproducing apparatus in which both groups are interested. The German interests are seeking to restrain the Western Electric Co., by injunction, from working their system in Germany on the ground of infringement of patent rights, and the Americans have demanded, and have been refused, a complete monopoly for their apparatus in the English speaking world. Unless some compromise can be reached a costly legal conflict seems inevitable.

Electricity and the Bodleian.

FEAR of the consequences of an outbreak of fire has for many years deterred the curators of the famous Bodleian Library at Oxford from using artificial lighting of any sort in the library. The recent decision to light this priceless storehouse of information by electrical means is therefore of more than passing interest, and we hope that supply authorities and contractors will not fail to use this example in their propaganda to show that electricity, if properly installed, is the safest illuminant in existence. What is good enough for the Bodleian is certainly good enough for Mrs. Brown.

Clever Psychology.

MENTION of Mrs. Brown naturally leads to recognition of the clever psychology to be seen in the latest newspaper advertisement of the Telephone Development Association, the main feature of which is the passage: "Mrs. Brown's on the phone! Mrs. Smith's on the 'phone!! Mrs. Jones is on the 'phone!!! Are you on the 'phone?" The average housewife's desire to emulate her neighbours in dress, furnishings and conveniences is well recognised, especially by those who are fortunate enough to foot the bills, but this trait seems to have been insufficiently appreciated or exploited by the purveyors of electrical service in the home.

A Belated Decision.

WE must congratulate the London, Midland and Scottish Railway on its somewhat belated recognition of the desirability—so frequently stressed in these columns—of converting its gas-lighted rolling stock to the convenience and safety of electric lighting. In a large scheme of modernisation, involving an expenditure of £2 250 000, the company proposes to allot £200 000 for electric lighting plant in trains at present lit by gas. We hope that other companies concerned will follow the lead of the L.M.S. Perhaps it is expecting too much to ask that they should all contemplate a similar conversion in the lighting of railway stations.

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A NEW THREE-PHASE SYSTEM.

A Proposed "A" System for Transmission and Distribution and its Suitability for Single or Three-phase Units and Secondary or High-Tension Practice.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.; Fel.A.I.E.E.

ELECTRICAL systems either with earthed neutral or earthed return conductor have long been in general use. The former is commonly derived from the star system, the latter from the delta system. In their arrangement they must, for best service conditions, have equal voltages between the different phase conductors and the earthed neutral or the earthed return-conductor, respectively. The star system provides for equal maximum voltages to earth, but not so the delta. For the delta system the universal practice is to earth the middle point of one phase winding, which practice provides a maximum voltage to earth approximately 29 per cent. higher than the star system of equal line phase-voltage.

Up to the present time there have been in operation five distinct three-phase systems; these systems are commonly designated as the "Y," "Z," "V," "T," and delta. The writer proposes another system, which, for descriptive purposes, he calls the "A" system.

At the present time many distribution systems, in particular, have reached a stage of expansion where a change in line voltage is necessary to reduce excessive voltage drop or power losses, or to allow of further extensions. The only available and commonly recommended system so far in use for conversion from delta is the star system. This gives an increased line voltage of 73%, which voltage increase reduces the current flow over the line for the same kVA delivered.

However, it does not provide increased kVA capacity of the existing transformers; further transformer kVA capacity must be installed to satisfy the increased kVA carrying capacity of the line. It is, therefore, evident that any of the *six* systems above mentioned must increase the transformer kVA capacity to satisfy the increase in line voltage, and consequent additional kVA carrying capacity, but the number of transformer units and sizes and types will not be in the same proportion for all the systems. Of the above-mentioned systems, the "V" and "T" systems are objectionable because of the loss of nearly 15% transformer kVA capacity, and the delta system is objectionable because it does not provide a true neutral point or symmetrical voltages to earth (see Fig. 1B).

Not unlike the delta, the "V" and "T" systems, the "A" system (proposed herein for both transmission and distribution) is well suited to single-phase unit and secondary distribution practice; the "A" system is also suited to the three-phase unit and high-tension practice. On the other hand, the star system is best suited to the three-phase unit and high-tension practice. The "A" system not only forms a bridge between the delta, the "V" and the "Y" systems, but it is a combination of these systems for the primary or/and the secondary.

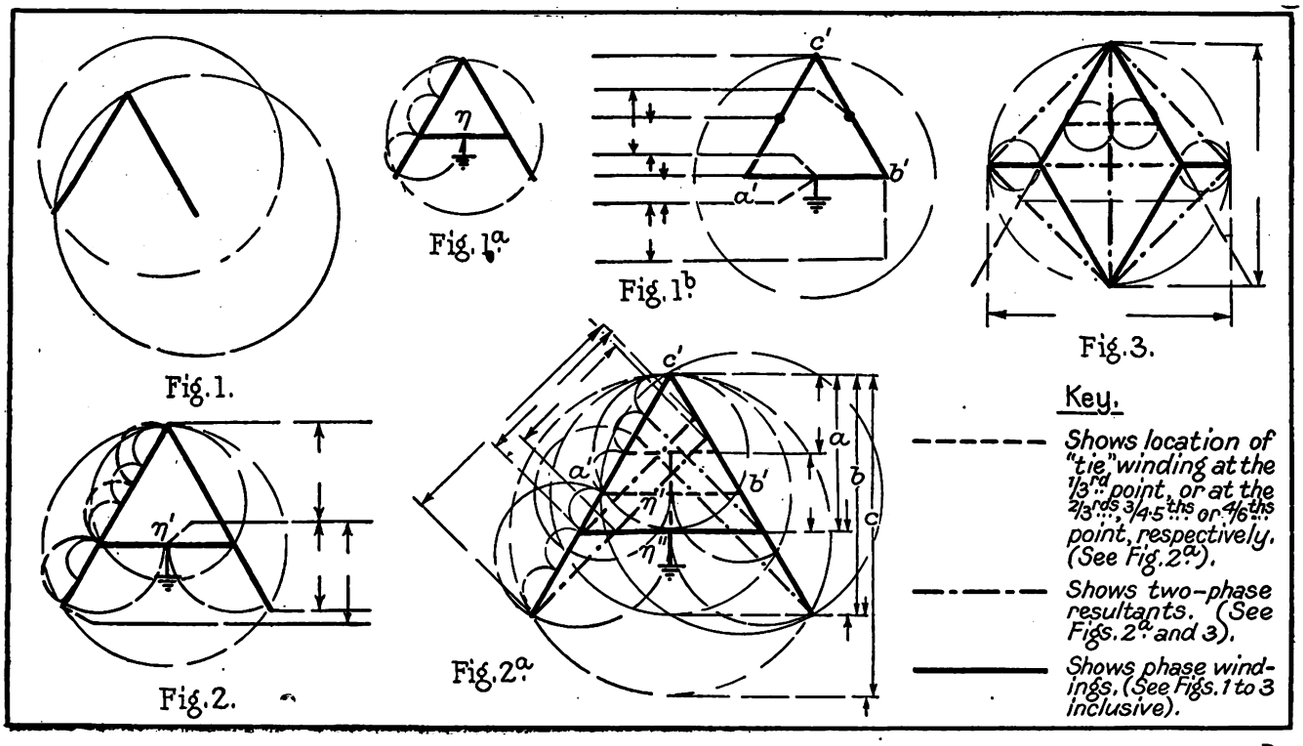
According to recent statistics, the majority of transformer installations operating with the "V" and the delta connections are on the American continent. Not only is the "V" connection inefficient in kVA capacity, but the system does not provide a true neutral point, and the voltage stress to earth is 29% higher than the equivalent star or "A" line-voltage (see Fig. 1A), and a three-limbed polyphase unit cannot be used. The relative maximum voltages to earth for the "V" and the "A" systems, for equal line voltage, are shown in Fig. 1 and Fig. 1A by means of the three different sized circles.

Advantages of "A" System.

The field of usefulness of the "A" system is given herein in its most condensed form. Several good reasons exist for its introduction into practice at this juncture of electrical progress. It provides means for improving both the "V" and the delta systems, for changing the line voltage from one standard to the next standard without disturbing the existing phase relations or the transformers or the system, and to permit of a gradual system change-over or/and local change-over, and allow of the same facilities for system (or installation) parallel operation of units of the same circuit voltage.

At one time or another the question of voltage increase of circuit or system arises. It is simple to change from delta to star, but not so where only a star system remains. On the other hand, when changing from delta to star there is the odd line voltage to contend with, which future transformer installations are called upon to meet.

The "A" system of Fig. 2 offers simplicity itself, and provides a standard phase-voltage, and will, as a general rule, meet the requirements of line losses, voltage regulation, increased carrying capacity of line, and other requirements, such as use of the same line insulators, etc. Moreover, as will be seen, there is no necessity to touch or go into or change connections of existing transformers; half of one phase-



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winding is connected to the two legs shown, *i.e.*, to the respective line terminals *a'* and *b'* of Fig. 1B, which converts the delta system into the "A" system, so that a 2 200 V line becomes a 3 300 V line, a 6 600 V line becomes a 10 000 V line, a 44 000 V line becomes a 66 000 V line, an 88 000 V line becomes a 132 000 V line, etc. The voltage to earth is not increased, the parallel operation of units may continue as before, a true neutral point is obtained, a symmetrical earthed system is secured, etc., all in the simplest possible manner, to be done at leisure, in the cheapest way, and without fear of phase displacement and future complications.

The "A" system of Fig. 2 permits of the same maximum voltage to earth as the delta system of Fig. 1B, but, in this case, a symmetrical voltage to earth is provided with a 50% increase in line voltage above that of the delta phase voltage. Or, as desired (depending on whether we are considering a change in the high-tension transmission line, the primary or the secondary distribution voltages), we may increase the line voltage by 100% (see Fig. 2A) which gives a 29% increase in voltage above earth compared with the delta of Fig. 1B.

We thus see that the delta system has the same maximum percentage voltage above earth compared with Fig. 1A as the "A" system of Fig. 2A has above the delta system. This is shown in Fig. 2A by the values *a*, *b* and *c*. As a rule, we can safely assume that the maximum of 29% increase in voltage above earth, compared with the delta of Fig. 1B, for, say, a 3 300 V delta system, need not necessarily mean a change of the line insulators for the "A" system of Fig. 2A when operating at 6 600 V across phases with *n''* winding earthed. In each figure (Figs. 1 to 2A) the relative maximum voltages above earth are shown by circles; for the purpose of comparison, relative circle values *a*, *b*, and *c* are given in Fig. 2A.

Comparative Advantages.

To best meet present *standards*, when converting from the delta system, the advantages of systems and voltages are shown in the following :—

Delta System.		*Star* System.		"*A*" System.		
Line to line voltage. (see Fig. 1B)	Maximum voltage from line to earth. (see Fig. 1B)	Line to line voltage*	Symmetrical voltages from line to neutral.	Line to line voltage.	Same voltage as the original system.	Symmetrical voltages from line to neutral.†
(1)	(2)	(3)	(4)	(5)	(6)	(7)
132 000	114 000	228 000	132 000	200 000	132 000	114 000
88 000	76 000	152 000	88 000	132 000	88 000	76 000
66 000	57 000	114 000	66 000	100 000	66 000	57 000
44 000	38 000	76 000	44 000	66 000	44 000	38 000
33 000	28 500	57 000	33 000	44 000	33 000	28 500
22 000	19 000	38 000	22 000	33 000	22 000	19 000
13 200	11 400	22 800	13 200	20 000	13 200	11 400
6 600	5 700	11 400	6 600	10 000	6 600	5 700
4 400	3 800	7 600	4 400	6 600	4 400	3 800
2 200	1 900	3 800	2 200	3 300	2 200	1 900
(*For the above*, (6) *and* (7) *refer to conversion from Fig.* 1B *to* 2.)						
11 000	9 500	19 000	11 000	22 000	11 000	12 700
5 500	4 750	9 500	5 500	11 000	5 500	6 300
3 300	2 860	5 700	3 300	6 600	3 300	3 800
2 300	2 000	4 000	2 300	4 600	2 300	2 600
2 200	1 900	3 800	2 200	4 400	2 200	2 500
2 000	1 732	3 460	2 000	4 000	2 000	2 300
250	216	430	250	500	250	289
240	208	415	240	480	240	275
230	200	400	230	460	230	260
220	190	380	220	440	220	250
200	173	346	200	400	200	230
115	100	200	115	230	115	130
110	95	190	110	220	110	127
105	91	182	105	210	105	120
100	87	173	100	200	100	115
(*For the above*, (6) *and* (7) *refer to conversion from Fig.* 1B *to* 2A.)						
200	173	346	200	200	200	115
220	190	380	220	220	220	125
380	330	660	380	380	380	220
400	346	690	400	400	400	230
440	380	760	440	440	440	250
3 300	2 860	5 700	3 300	3 300	3 300	1 900
4 400	3 800	7 600	4 400	4 400	4 400	2 500
6 600	5 700	11,400	6 600	6 600	6 600	3 800
22 000	19 000	38 000	22 000	22 000	22 000	12 500
33 000	28 600	57 000	33 000	33 000	33 000	19 000
44 000	38 000	76 000	44 000	44 000	44 000	25 000
66 000	57 200	114 000	66 000	66 000	66 000	38 000
88 000	76 000	152 000	88 000	88 000	88 000	50 000
(*For the above*, (6) *and* (7) *refer to conversions from Fig.* 1 *or* 1B *to* 1A.)						

* Standard phase (or line) voltages are always required to meet standard transformer practice; very few of these voltages conform to standard practice. It will therefore be noted that the "A" system better meets all the requirements of line and neutral voltages for increase to the 50% or 100% line voltage or for a decrease in voltage.

† It is only for primary and secondary *distribution* that these voltages are sometimes required to meet standard transformer practice—the more usual line to neutral voltages for distribution being 115, 230, 2 300 and 3 800 V, respectively.

A primary object of the increase in line voltage is to increase the circuit or system kVA-carrying capacity. A conversion to the "Y," the "A," or any other system, will thus mean an increase in transformer kVA capacity to warrant the desired expansion and/or extension, and/or serve the best purposes o the change-over.

For a single-phase unit or for one bank installation, which form the majority of transformer installations, the "A" system should prove specially useful. The "A" system kVA capacity is automatically increased by the manner of increasing the line voltage, whereas a mere change from delta to star does not provide for any additional kVA capacity being carried by those transformers or installations already loaded to their rated capacity.

Other Phase Transformations.

A further object of the "A" system is to provide other phase transformations. For instance, according to the dot-dash lines of Fig. 2A, there are shown three distinct two-phase systems; also, Fig. 3 shows the "A" system converted to give one two-phase and one quarter-phase (at times called four-phase) system, respectively. In all, *five* distinct two-phase systems are derived from the "A" system and its modification. Moreover, by the reversal of one leg (from the point of the closed polygon connection) a two-phase system is obtained from two or from three of the phase-windings; one leg forms one of the two phases, and the other phase is the resultant of the *n* winding and one leg extension—the same two-phase relation can be obtained when the *n* winding is disconnected.

The "A" system can be divided into three distinct phases of application, namely :

(1) . . . A conversion of the "V" or open-delta system of Fig. 1 into the "A" system shown in Fig. 1A. By this conversion, simultaneous delta and star supply may be taken from the primary and/or the secondary sides.

(2) . . . A conversion of the closed delta system of Fig. 1B to the "A" system of Fig. 1A. Also a conversion to Fig. 2 or Fig. 2A for the purpose of increasing the line voltage on any one or both sides of the system without changing existing phase relations, etc., etc.

(3) . . . Direct use of the "A" system for two-phase and three-phase service or for conversion to a quarter-phase system (see Fig 3) by having the two legs form a double open-delta or star with $\frac{1}{2}n$ winding (or $\frac{1}{2}n''$ winding connected in multiple).

Comparing the "A" system of Fig. 1A with Figs. 1 and 1B, the following remarks will serve to point out a few of the outstanding points in favour of the "A" system :

A symmetrical three-phase 4-wire system is obtained.

It provides a true neutral point.

Compared with Fig. 1B, less total winding is required.

It permits of a safer system from third harmonics as compared with the "V," and a three-limbed polyphase unit may be used.

Maximum voltage to earth is brought to a minimum on all phases —i.e., to 29% less than the delta or "V."

It requires four wires only, as compared with six or seven wires for Fig. 1B, which latter has a less balanced lighting service.

Better protection is offered and means for maintaining same.

It combines three distinct systems into one—namely, the delta, the star, and the "A" system, all of which (or combinations) can be operated in parallel.

A satisfactory, simple and cheap means is provided for changing to a higher standard voltage without phase displacement from the original system.

Judging from the above remarks, it is apparent that the "A" system has certain advantages over both the delta and the "V" systems. It is also apparent that, where the delta or "V" system is employed and a higher line voltage is desired, it may be more advantageous to change to the "A" system than to the "Y" system. Apart from a better standard voltage derived as compared with conversion from delta to star, the same delta connections are retained and left undisturbed, so that operation may continue without interruption of service or rush or extra cost of the change over, etc.

Comparing the delta of Fig. 1B with the "A" system of Fig. 2 we have the following outstanding points showing where the "A" system is likely to be preferred :—

Existing star and delta-connected single-phase units can be used to increase the line voltage in steps of 50%, or in steps of 100%, as shown in Fig. 2A.

Using Existing Transformers.

Full use can be made of existing transformers, whereas all existing star-connected transformers (connected to the delta lines) cannot be used when the delta system is converted into a higher-voltage star system.

A minimum additional transformer kVA capacity (one-third more winding) is required to convert the delta to the "A"

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system and increase the line voltage by 50%. For high-voltage systems where first cost, interruptions, etc., are censurable, the "A" system conversion from delta will be found advantageous in many ways.

There need be no change in line insulators, etc., for a 50% increase in high-tension line voltage because the maximum voltage to earth has not been increased above that of the delta shown in Fig. 1B; the voltage increase of 50% is usually all that is necessary, and it is safer than converting to the star connection.

The phase relations are not changed, hence parallel operations of existing delta and star connections are not disturbed.

As the "V" connection permits of only 86% kVA capacity of each two-unit bank, the difference in kVA capacity from normal can be credited to the "tie" unit *n*, required for the "A" system.

Where the "V" connection is in common use, and where the primary or secondary is one of the lower distribution voltages, the "A" system should prove of special usefulness when it is required to change to a higher standard voltage on the primary and/or secondary.

As the standard and more commonly used single-phase voltages are either 110, 115 or 230 V, it is seen that the lower voltage can be changed to the higher standard of 220 V for a minimum of changes and system interruption, etc., and such a conversion offers a system of greater adaptability and flexibility than the star system.

As the standard and more commonly used three-phase voltages are either 220, 230 or 460 V, it is seen that the low standard voltage can be changed to the higher standard of 440 V with a minimum of changes, etc.

For combined light and power service the "A" system will supply power from the lines or from the closed delta, and lighting from the star.

No Idle Spares.

If there is a spare unit, there is no necessity to leave it standing idle; it may be connected across the two open ends of the "A" legs to help pay for itself, and still act as a spare unit which can be moved and used when and where it may be required.

By changing, say, a 2 200 or 6 600 or 44 000 V delta to a 3 300 or 10 000 or 66 000 V "A" system, not only provides for standard line voltages but for a change with a minimum of service interruptions and with automatic provision for increased transformer kVA capacity; the star system must use three additional phase-windings to provide for an increased transformer kVA capacity as compared with two half additional phase-windings for a 50% voltage increase for the "A" system. For a large group of transformers there is a disadvantage, but this is more than offset by the odd line-to-line voltage when converting from delta to star. See column (3) of tabulation of system voltages.

Increasing the voltage from delta to "A" system permits of either a gradual or a complete change-over, because the original system phase-relations and voltages remain (see column (6) of tabulation); for the star system a sudden and complete change-over must be made because of the total change in voltages and phase displacement—cases will arise where these do not occur, but general conditions must be taken for proper comparison.

An increase in transformer kVA capacity for the star system requires three phase-windings, whereas an increase of 100% phase voltage from delta to the "A" system (see Fig. 2A) requires two existing delta phase-windings, and one existing star winding to make *n* equal $2n=n$"; thus, an increase from a delta secondary of 100 or 200 V to the "A" system gives 200 or 400 V between phases and 115 or 230 V between any phase and neutral, and requires two single-phase units of the former, and one single-phase unit of the latter, which, latter are made obsolete when converting from delta to star.

Differing from the star system change-over from the delta system, the "A" system is capable of expansion and/or conversion to suit the primary or/and the secondary, and for the two ratios of voltage increase to conform directly with the inherent "A" system changes.

Where the delta-star or star-delta system is used and it is desired to raise the line voltage on the delta side, certain advantages and flexibility, etc., are sacrificed by converting to the star-star system unless a tertiary delta winding is also used. Converting the delta to the "A" system retains advantages of both the delta and of the star systems.

On the American continent, in particular, the "A" system should find its widest field of usefulness.

POLE TRANSFORMERS.

Units with a Novel Form of Tapping Unit.

THE arduous conditions under which pole-mounting transformers are employed are amply provided for by British makers of this increasingly necessary equipment. The accompanying illustrations show Peebles transformers,

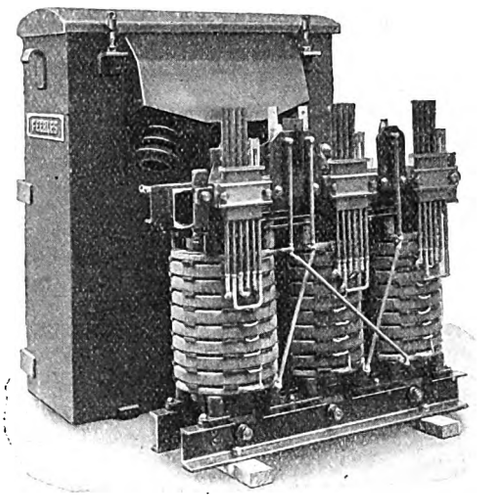

Fig. 1.—A 15 kVA three-phase 50 cycle 11 000/415-240 V transformer, showing h.t. side fitted with Peebles patent tapping units. Tank fitted with improved design of h.t. terminal insulator.

made by Bruce, Peebles and Co., Ltd., of Edinburgh. These units have detachable hangers and fixing shafts arranged to stiffen and act as guards for the base and sides. The terminal arrangement entirely dispenses with the use of compound, either for locating the porcelains or ensuring water-tightness. Connections can be made to h.t. or l.t. cables or base conductors without removing the tank cover. The ingenious design of the h.t. cable socket permits of the cable being held in position with one hand, whilst the fixing screws, which cannot fall out, are tightened with the other.

Petticoated insulators dispense with the use of insulated tails, and the setting of the insulators in a special terminal pocket gives freedom from flashover or bird trouble when bare conductors are used.

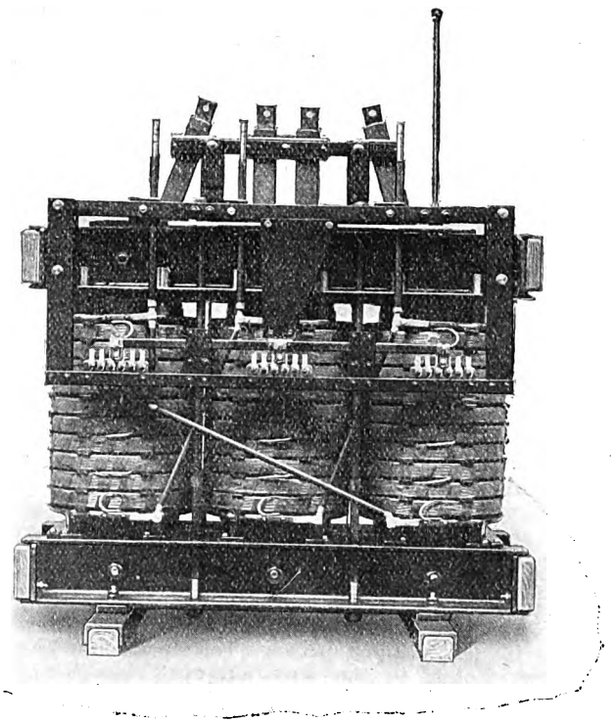

Fig. 2.— A 200 kVA three-phase 50 cycle 6 600/415-240 V transformer showing h.t. side fitted with Peebles three-phase "off-load" tapping switch.

In order to preserve the symmetry in ampere turn distribution between h.t. and l.t. windings, all tappings are brought out at the centre of the windings. A patented form of h.t. tapping unit provides a neat and compact fitting.

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ARTIFICIAL DAYLIGHT.

Its Increasing Use for General Lighting—Some Fallacies Exposed—Some of the Applications of "Modified Daylight"—Eliminating Colour Glare.

By "LIGHTING CONSULTANT."

AN important development in the modern science of illumination is the increasing use of artificial daylight, both for general lighting as well as for special work where accurate colour recognition is an essential at all seasons of the year.

Until a few years ago the general conception of artificial daylight, amongst electrical engineers, architects and laymen, was that its only utility lay in the matching of colours. Even this use was considered doubtful, owing to the number of inaccurate so-called "daylight lamps" in use, and greater reliance was placed on natural daylight, in ignorance of its constantly changing qualities and intensities. Even where one of the only three types of lamps that might be described as accurate was in use the high absorption was always referred to as militating against their general application, as also the factor of "coldness" due to comparisons with the bright yellow of uncorrected light, which gave rise to a peculiar semi-psychological objection.

Current Misconceptions.

These objections were generally based on an entire misconception of the facts involved, and were in large degree given rise to by the wrong use to which the first artificial daylight lamps were put. It was also not generally realised, even amongst firms who specialised in this type of lighting apparatus, that two distinct degress or types of correction were necessary, one for accurate colour work, which reproduced the reflected light of a natural "north sky" and another for general illumination where the degree of correction was not so high, approximating to diffused sunlight, and the absorption, in consequence not so great, thus giving the greatest possible amount of luminosity consistent with the reduction of the red-orange excess in the spectrum of uncorrected electric light.

These errors are, in fact, perpetuated to the present day, as various artificial daylight lamps are still marketed that claim to produce an accurate light for colour work with sufficient luminosity for general illumination. The fallacy involved is obvious, as it is practically axiomatic to state that the more efficient an artificial daylight unit may be from the point of view of luminosity, the less its utility for accurate colour recognition, and *vice versa*.

The importance to colour and textile industries of an artificial daylight lamp which reproduced with absolute fidelity the spectrum of the reflected light of a north sky was conceded both by physicists and colour workers many years ago, and the general adoption in these vocations in life of the most scientific unit of this kind, the invention of the well-known Birmingham scientist, Mr. F. E. Lamplough, has sufficiently proved the inherent necessity for such a lamp, which remains a constant source of reference throughout the year, and renders a colour firm independent of climatic and seasonal changes.

The necessity for the application of a more modified form of artificial daylight to general illumination purposes was, however, not so obvious, and even now is grudgingly conceded, owing to the little research that has been carried out on the momentous questions of glare and visual acuity, except from the standpoint of uncorrected light.

The subject is too complicated and involved to be dealt with even cursorily in this article, and to-day, after years of debate amongst the most competent authorities, no generally acceptable definition of "glare" exists. At the risk of rushing in where angels fear to tread, the writer would suggest that this is because "glare" is purely an individual sensation, partly physiological and partly psychological in character, which is largely influenced by a person's colour vision. There are, however, factors in the sensation of "glare" which are common to each person's experience, and the principal of these, taken in their order of importance, are (1) colour; (2) intrinsic brilliance of the light source; and (3) contrast.

Should this assumption be correct, and the experience of the last few years suggests that there is little reason to doubt it, a modified form of artificial daylight, which corrects the colour of the light and gives sufficient diffusion of the light source together with an adequate polar curve of light distribution, must obviously be the only means of successfully defeating the evil of glare which takes such enormous annual toll of industry in inefficiency, reduced output and absentee lists due to visual fatigue and the nervous ailments it engenders.

There is strong evidence available that business circles at large are coming to this conclusion, and experience shows that the *correct* installation of an artificial daylight system, giving a reproduction of natural diffused sunlight—*not* "northlight"—with a graduated ratio of luminosity commensurate with the type of work being performed in order to produce the highest visual acuity, *does* eliminate glare and increase efficiency.

The difficulty involved in this statement of fact, borne out by the use of modified artificial daylight in thousands of business houses embracing every type of profession or industry, lies in the words "*correct installation.*" The procedure so usual in these days, as in the past, amongst architects and consulting engineers, of making a wattage allocation and spacing out light points on conventional lines to harmonise with supposed architectural requirements, without any conception of the polar curve or light distribution of the unit ultimately chosen, often has disastrous results. Gaps or drops in intensity on the working plane, owing to faulty spacing and inadequate candle-power for the processes involved, are not so immediately noticeable with uncorrected electric light as they are with artificial daylight, owing partly to custom and usage, and partly to the effect on colour vision of the comparatively novel conditions introduced.

Failures such as this, which have occasionally attended the use of artificial daylight, even when the type of unit employed was not itself to blame, as often happens, can always be attributed to the almost complete absence of knowledge of the physics of light and laws of colour vision amongst any but physicists and specialists. The time has, in fact, now arrived when an electrical engineer must be a physicist as well as an expert in electricity, if he is to keep pace with the march of scientific progress, and the necessity for a course in illumination to be included in the curriculum of the Institution of Electrical Engineers is becoming increasingly obvious.

Unsuitable Applications.

One can hardly blame the layman for ignorance of the laws of light, but one can most certainly blame the lighting engineer when a "daylight" lamp, which gives a faithful reproduction of natural "north" light is used in a room with yellow walls and green doors, or on a silk or hosiery counter under the glare of hundreds of uncorrected lights. It can hardly be wondered at if the results of matching under such conditions are inaccurate, but it is *not* the fault of the lamp.

Or again, if the colour values given by the daylight lamp do not correspond with the "daylight" of the sunlit street outside, in which every conceivable colour element from brick walls and other materials may be present, is it fair to attribute discrepancies to the inaccuracy of the lamp rather than to the lack of knowledge of the varying spectral intensities of daylight itself, complicated by colour reflections from every possible source? These constitute some of the difficulties that the most accurate of daylight lamps labour under, and can be laid at the door of the lighting engineer who does not acquaint his clients with the correct use and application of the units he supplies, owing generally to his own ignorance of the subject.

In regard to the general utility type of artificial daylight lamp the only satisfactory kind is one, as has been said before, that produces the spectrum of natural sunlight, which has more red or "warmth" than "northlight." Such a filter, the best known and most used of which is also associated with the name of Mr. Lamplough, will have an absorption of about 50% of luminosity, and must therefore be used in conjunction with a two-ply opal or metal reflector.

It is this feature of absorption that has led to the greatest objections being raised against the use of artificial daylight, even of the "modified" type, on account of the supposed increase in maintenance costs that must result. These objections are again based on incomplete knowledge of the facts.

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Given the necessity for diffusion of the light source in order to avoid "direct glare," some type of enclosed opal fitting must be used, and is, in fact, being used increasingly these days. Yet practically every type of enclosed opal unit used for lighting has an absorption which may vary from 20 to even 60%. Why, then, is no objection raised in regard to this form of unit? When it is further realised that the artificial daylight unit, with perhaps only slightly more absorption than the plain opal type, produces a light which is far superior in the quality of visual acuity, this objection becomes even more ridiculous and unfair.

The production of high visual acuity is, in fact, one of the greatest arguments in favour of the use of modified artificial daylight, and yet it is scarcely ever thought of or understood by the average electrical engineer. Very little blame can be laid at his doors at the moment, however, in the absence of authoritative tests, and the various conflicting opinions expressed by many presumed experts on the subject.

There has indeed been very little research in this vital matter, and where there has, the issue has been confused by the use of uncorrected light alone as the basis of the conclusions arrived at. On the other hand, it has been suggested by those who have had many years of experience of artificial daylight, and is supported by the strongest evidence, that, on the average with normal eyesight, the visual acuity produced by modified artificial daylight of the type referred to above is in the ratio of 2 : 1, when compared with uncorrected electric light of equal candle-power. Since it is on high visual acuity that the rate of production depends, especially in fine processes that demand great visual concentration, the importance of this quality of artificial daylight to industry at large can hardly be overrated.

There is, indeed, little doubt, in the light of some years of experience and practical test under working conditions, that it is this quality of high visual acuity, combined with the elimination of what may be termed "colour glare," that is leading to the increased use being made of modified artificial daylight in business houses, as is instanced by its adoption for so many new city buildings.

But industry, and efficiency in industry, depends upon the recruits to its ranks furnished each year by the schools, and more especially the secondary and technical schools under the control of local authorities. It is in institutions such as these, and in the Education Boards that control them, that serious and measured consideration should be given to a system of lighting that appears definitely to be combating and defeating the menace of eyestrain and deteriorating vision which is converting the nation into a race of myopes.

AERIAL CABLE UNIONS.

A Novel Splicing Device for Overhead Line Conductors—Saving Time in Field Work—Ease of Disconnection—Method of Assembly.

A RANGE of cable unions of novel design for splicing copper, aluminium and steel cored aluminium strands has been put on the market by British Insulated Cables Ltd., of Prescot, Lancs.

This union has been specially designed to give maximum efficiency, both electrically and mechanically, with due regard to simplicity in assembly under field conditions, and without the necessity to use special tools.

The design for steel cored aluminium, as illustrated on this page, is an adaptation of the well-known principle of cone-type wedges so constructed and applied as correctly to proportion the stresses in both the steel and the aluminium wires, thus giving, according to the makers' claim, 100% conductivity and 100% mechanical strength of the complete stranded conductor. It is claimed that with this device joints can be made in the field in half the time required by earlier methods, two ordinary spanners being sufficient to tighten up.

The design, which is patented, has the further advantage that the line may be disconnected, if required, by releasing one nut, without disturbing the wires of the strand or the clamping devices. In fact, it may be uncoupled and coupled up again as simply as an ordinary pipe union.

The unions for use with plain copper and aluminium strands are very similar in design. They are claimed to give 100% conductivity, and not less than 95% of the mechanical strength of the stranded cable.

Examination of the sectional drawing in Fig. 2 shows that each half of the joint is made by means of four cones, the two parts of the joint being held together by a screwed nut.

To assemble a joint it is necessary to bind and saw the end of the cable, and, having slipped the largest cone through the nut, put both over the cable end. The binding wire is cut and the nut and cone slipped along the cable. The cable is then bound approximately $3\frac{7}{8}$ in. from the end, and $1\frac{7}{8}$ in. is cut off the outer layer of the aluminium strands and $\frac{1}{4}$ in. off the inner layer. The steel core is bound and a second, smaller, cone pushed on the end. The steel core binder is removed and the inner layer of aluminium strands is cut off level with the outer layer. The second cone is pushed along

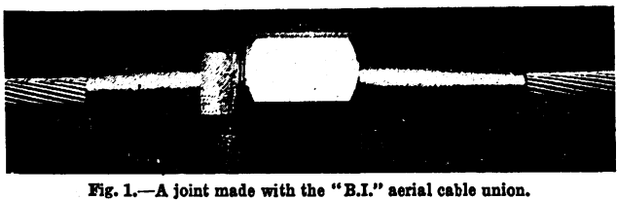

Fig. 1.—A joint made with the "B.I." aerial cable union.

the steel core, over which a further cone is pushed. Then the binder is pushed back another $\frac{3}{4}$ in., the aluminium strands are carefully lifted, and the second cone pushed along the steel core until its large end is flush with the ends of the aluminium strands. The third cone is then pushed up to the second cone.

The two halves of a fourth cone are next inserted over the centre strand of the steel core, and pushed into the third cone as far as possible, care being taken that none of the six outer strands of the steel core get into the grooves between the two

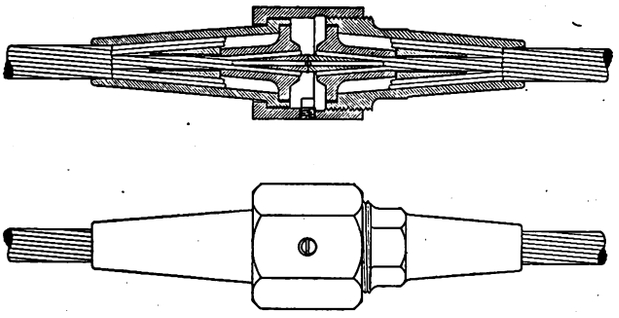

Fig. 2.—Showing the method of joint assembly with the "B.I." union.

halves of the fourth cone, which is finally driven up into the third cone with light hammer blows. The binder is then cut, and the outer cone slid as far as possible up to the end of the cable before releasing hold of the aluminium strands, and the nut and cones are pulled up to their final position.

Assembly of the other half of the joint is proceeded with in exactly the same manner. The two halves are firmly screwed together with the nut, the joint is filled with compound through the hole seen in the lower part of Fig. 2, and finally sealed with a plug provided for the purpose.

OFFICIAL STATISTICS.

THE complexity of modern civilisation demands an increasing knowledge of the organised activities of the community and the social phenomena to which they are related. Recognition of the importance of statistics, as the most convenient means of acquiring this knowledge, has proceeded apace, but it often happens that the inquirer has to discover for himself where the desired information can be obtained.

So far as official statistics are concerned, this requirement is met by the "Guide to Current Official Statistics." This compact publication not only gives a list of volumes containing statistical information, but also provides a detailed index of subjects, in which are indicated the exact characteristics of the statistics to which reference is made. Special devices are employed to facilitate the use of this index by the most casual inquirer, and to enable the appropriate reference to published statistics on any subject to be traced. Volume VII of the Guide (price 1s. 4d., post free) has just been issued, and may be obtained from H.M. Stationery Office or any bookseller.

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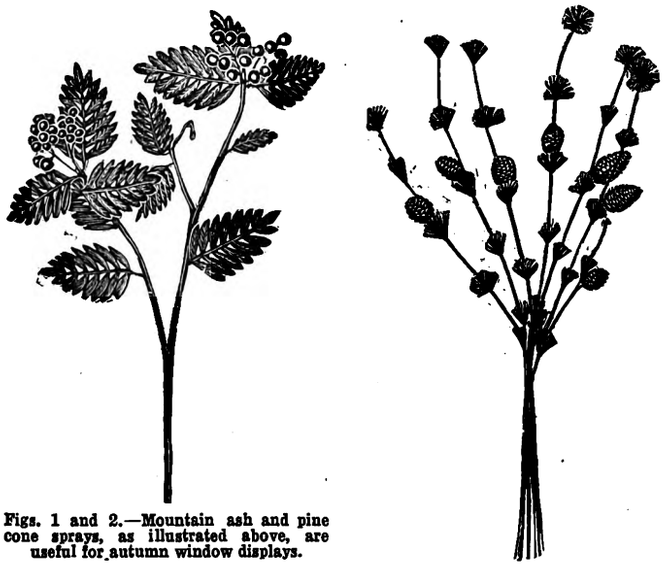
AUTUMN WINDOW DISPLAYS.

Seasonable Effects for the Contractor's Window—Armistice Day Displays—Preparing for Winter—Natural Colouring.

By A. EDWARD HAMMOND (Author of "Shopfittings and Display" and "Practical Aids to Retail Selling").

IN THE ELECTRICIAN of September 28th, 1928, I said, "It is surprising how few electrical contractors take advantage of the excellent opportunities afforded by the autumn months for seasonable window displays. With the holiday season over, and the winter approaching, there should surely be every incentive to attract the interests of the public to new lighting and heating equipment, not to mention wireless."



Figs. 1 and 2.—Mountain ash and pine cone sprays, as illustrated above, are useful for autumn window displays.

Whether or not my article had any influence I do not know, but I was interested to notice that both in London and some half-dozen large provincial towns there was an increase in the number of contractors' windows and supply authorities premises in which special autumn displays were arranged. But I do not feel justified in taking any of the credit, for there has been a tremendous advance in electrical window displays of recent years. The British Electrical Development Association is doubtless largely responsible, for the effect of its display activities has been generally to uplift the standard of electrical display, and the pioneers of this association's display service builded better than they knew when they laid the plans for assisting contractors with their window displays. It has had a repercussion in this respect, that although there are still many contractors who do not avail themselves of the help proffered, a good proportion of these traders are now employing improved display methods of their own, and are making regular window changes.

To return to autumn displays, the contractors' windows are of vital importance at this time of the year because everybody's indoor activities are necessarily more limited during the summer months; but people generally return to them with renewed zest at the onset of the longer, darker evenings, and this is the theme the contractor might well play upon in arranging his winter campaigns.

Seasonable Appeals.

In preparing his window display plans for a particular period, as I pointed out last year, the first matters for an electrical contractor or the display man in an electrical showroom to consider are seasonable appeals.

October and November are not rich in either; but there are several special days which provide him with excellent opportunities for introducing seasonable and topical features into his display. I explained last year some ideas for displays for Midsummer Day; October 1st, beginning of shooting season; and October 21st, Trafalgar Day; but there are three other important days that should not be overlooked.

November 5th is Guy Fawkes Day. Some contractors might make this a good opportunity for introducing special displays appealing to children, with a view to attracting the attention of their grown-up companions. Such a display might have a painted background suggesting fireworks, and/or illuminated effects by means of coloured spotlights and floodlights; a "firework display" worked by "flashers" is also an attractive possibility.

November 9th is Lord Mayor's Day in London, and the day on which new mayoral appointments are made in most of the provincial towns. For such an occasion, displays in which reproductions of historical pictures of local interest were featured, or wording introduced with a bearing on the civic events, would probably have the effect of arousing considerably increased local interest, and would set passers-by talking, and thus bring the contractor's or supply authority's name into prominence in connection with local activities.

An Armistice Day Plan.

November 11th, Armistice Day, suggests itself for a restrained display, with Flanders Poppies forming a prominent feature. A few selected items could be arranged against a black setting or on a black covered window base, relieved here and there by a few scarlet artificial poppies and a card bearing the appeal "Wear a Flanders Poppy" placed on an easel in the centre or at one side of the window.

For the window of an electrical supply authority's showroom something on rather more pretentious lines might be arranged. One display theme which suggests itself is an adaptation of the "pictures in the fire" idea, with the window setting arranged as the hearth end of a drawing room or simple parlour. An electric fire in one corner, with a suitable surround and wall carried out in window dressing paper (this can be obtained in rolls representing numerous varieties of interior decorative treatment). A seated woman's figure (in *papier maché* or composition) holding a photograph, and on a small table near by a row of medals. Across the back, or on the window base, scarlet poppies could be pinned to spell the word "Memories," and a neat card placed unobstrusively on the opposite side bearing the words "Buy a Flanders Poppy."

An electric reading lamp might be placed on the small table, and this, with the glow of the electric fire, should provide all the lighting. No top illumination should be used, except perhaps one floodlight throwing a ray on the tableau.

Autumn leaf sprays can be obtained in dozen lots in two sizes 20 in. and 27 in. high respectively, and seasonable artificial flowers, such as chrysanthemums, gladioli, jasmine, lavender, heather, mountain ash (with berries), pine (with cones), and cape gooseberry, in sprays in single or dozen lots, are also procurable from the firms specialising in display accessories.

The mountain ash spray shown in Fig. 1 is naturally pro-

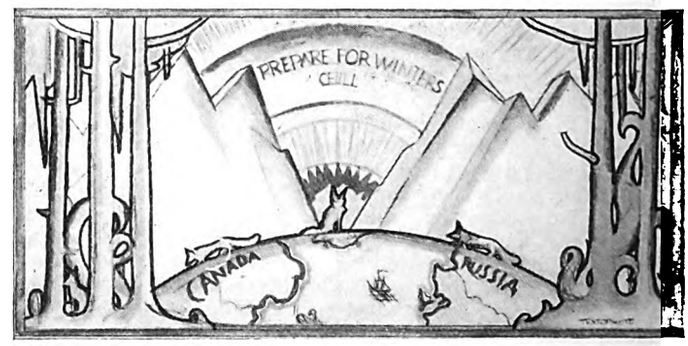


Fig. 3.—A scenic background in which colour and light could be effectively combined in a window display of electrical heating appliances.

duced in cambric, and is 24 in. high. The real pine cone spray in Fig. 2 is 22 in. high. (Both of these are reproduced by courtesy of Messrs. Dudley and Co., Ltd.) Then, strips of artificial variegated autumn leaves, 36 in. long, may also be obtained in dozen lots. These can be used with attractive effect in various parts of the window. Window dressing papers representing various autumn settings can be obtained in rolls measuring 12 yd. long by 22 in. wide.

A topical element can be brought into the window by warning people of the rapid approach of winter, and of the need for being prepared in advance for sudden cold spells even before winter commences, by installing electric heating

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equipment which enables them to heat a room quickly on the cold evenings which so frequently follow a fairly warm day, and to avoid the labour and dirt caused by lighting a fire.

Electrical contractors anxious to improve their window displays will find it possible to seek inspiration from many sources. The range of subjects which they can adopt and adapt for use as special window features is inexhaustible. Much of the modernist display work seen at the moment is inspired by the present day trends in architecture, and there have been several developments recently which seem to suggest the builders' merchant's yard as a happy hunting ground for ideas.

One material which has been used by many well known stores is an "art" metal similar to silver plating in appearance. An advantage about this is that it can be adapted to individual requirements of shading and design after erection. Display stands are now produced in this material with an oxidised silver finish. The metal is treated by a patented chemical process which allows for the incorporation of any design or symbolic motif. The flat surfaces can be shaded, blended, or graded to any tone desired, and may be given an oxidised, silver plated, matt, burnished, or crystalline finish.

Another popular new display material takes the form of a specially treated flexible wood supplied in strips. This can be bent to any desired design by the aid of a block supplied for the purpose. It stays in this position until straightened out again, and can be used repeatedly in different ways. Screens and panels can be produced in these flexible strips as well as display stands, and it might also be employed as applied ornamentation for the window enclosure.

Corrugated iron has been used, both in this country and America, for display settings. The corrugations lend themselves well to modernist effect, and can be painted to blend with other display features. In this connection, it is interesting to note that corrugated strawboard is now being used for showcards. The two in conjunction seem to suggest possibilities.

More recently still, iron piping has also been employed for display purposes. One trader had a series of windows with iron piping forming part of the setting. The design consisted of a central arch with two half-arches on either side. Small corner unions and "I." and "T" shaped and fourway unions were employed with universal threads, so that varied shapes and designs were made possible. Piping may be finished in any colour, or given a bronze, aluminium, gold or silver finish.

These materials are all very inexpensive, and with a little ingenuity easily adapted to the contractor's requirements. If he has a cellar or small back room available for experiments, so much the better.

The Sculptor's Aid.

Now, an even wider departure has been made from the conventional idea of display sources, for recently one firm of retailers decided to go outside the display and shop-fitting world for new ideas in window fittings, and accordingly sought the advice of a well-known sculptor who designed the Great Seal of England and was responsible for the design of the Irish Free State coinage.

The idea of employing a sculptor to design window fittings seems very much in keeping with the modernist spirit. Many of the modern commercial buildings have their façade enriched by sculpture. One example very much in the public eye at the moment is the new building for the headquarters of the London Underground, where two eminent sculptors have been employed in carving *in situ* symbolic figures representing "The Four Winds" and "Night" and "Day." One of these sculptors—Mr. Eric Gill—has also been consulted by a retail organisation, for he designed the lettering used on the fascia of the shop-fronts of a well-known multiple concern.

Cubes and blocks are becoming more popular for display purposes. An American firm of display specialists has recently designed complete window sets of these blocks, made of heavy fibre board in three finishes: dark walnut veneer sides, natural veneer tops, and black bottoms; pebble finish silver sides and tops, black bottoms; pebble finish gold sides and tops, black bottoms. One set consists of two units 9 by 9 by 24 in., two units 9 by 9 by 18 in., two units 9 by 9 by 15 in., two units 9 by 9 by 6 in., two plateaux 18 by 18 by 9 in., and one plateau 21 by 21 by 6 in. An infinite variety of arrangements is possible with this set.

Another set of blocks for smaller windows, or where only a small unit is wanted for the centre of a display, is made in the same materials and finishes. This set comprises one unit 9 by 9 by 24 in., two units 9 by 9 by 18 in., two units 9 by 9 by 9 in., one unit 9 by 9 by 15 in., and two units triangular in shape, one-half of a 9 by 9 by 9 in. cube.

Several traders have found the luminous blocks now available wonderfully adaptable for display purposes, for they provide a means of incorporating light into the display as a decorative feature as well as an illuminant, and for this reason they seem particularly suitable for use in conjunction with displays of electrical fittings.

Another new material which has been brought to the front recently in connection with display is aluminium. Display fittings are now made in this, and also in a light alloy of aluminium known as "Duralumin" in which magnesium and copper are important components. Aluminium is the lightest of the common metals and as such suggests itself for the dainty fittings associated with modern display.

I have made reference in previous articles to the value of scenic backgrounds as a means to effective display. Fig. 3 shows a suggestion for a seasonable setting of this description, in which colour and light could be effectively combined. Backgrounds of this description are produced in specially prepared linen, and can be illuminated in sections. The illustration is reproduced by courtesy of The Textophote Display and Advertising Co., Ltd., 11, Berkeley Street, London, W.1.

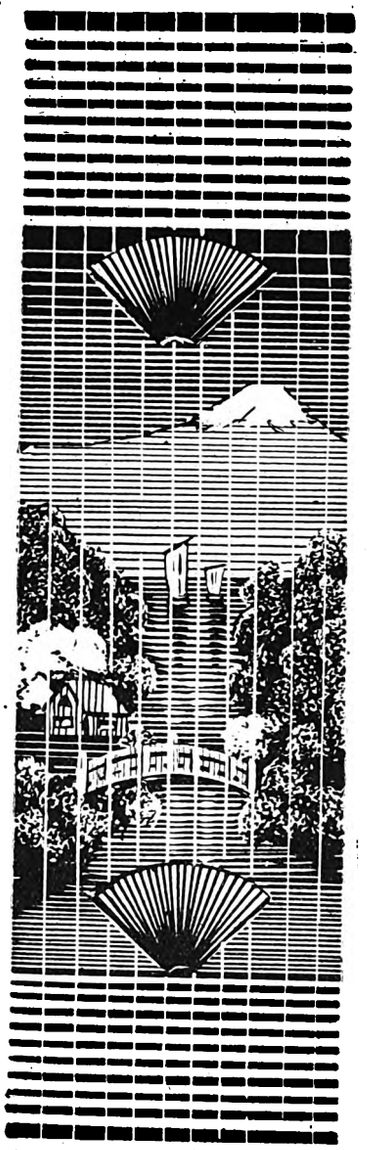

Fig. 4.—A suspensible setting suitable for use in open-backed windows.

One form of window setting recently introduced is suitable for use in open-backed windows or as a temporary covering for a fixed window enclosure, for it can be suspended on cord from the top of the window or lightly tacked to the wood framing of a glass or wood panelled enclosure. This takes the form of panels of split cane, finished in a variety of designs and colours. The standard measurements are 48 in. long and 14 in. wide. An example of this form of window background panelling is shown in Fig. 4, by courtesy of Messrs. J. C. King, Ltd.

There is a matter to which the electrical contractor should give particular attention at this time of the year, and that is the prevention of condensation on his window glass. "Steamy windows" are the bugbear of many retail traders during the winter months; but there are now quite a number of devices for preventing the results of condensation.

Among these devices are special electric tubular heaters. The contractor who has to face condensation difficulties should make a point of using one of these appliances. It would provide him with an effective demonstration.

The tubes are light and compact, and are made in lengths of from 2 to 8 ft., finished in a copper bronze, which renders them unobtrusive. The heating element is entirely enclosed within a heat-resisting insulator, which, in turn, is protected by the outer tube.

Another useful device performs three functions: it serves as an electric sign, it illuminates the window, and it provides a warm current of air which ascends the inner surface of the plate glass and thus nullifies the effect of the cold air outside and the hot air inside coming into contact.

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SHOWROOM EXTENSIONS AT CARDIFF.

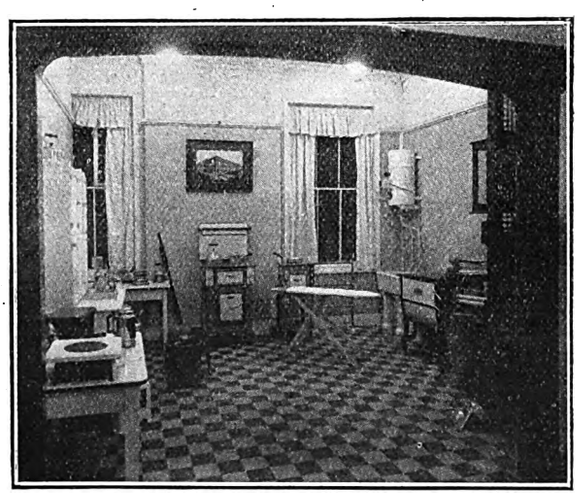
Formal Opening of Enlarged Premises by the Lord Mayor—New Demonstration Facilities for Domestic Appliances and Radio Goods.

CONSIDERABLE extensions have recently been made at Magnet House, the headquarters of the Cardiff branch of the General Electric Co., Ltd. The newly extended premises which were formally opened by the Lord Mayor of Cardiff last Thursday, are situated in the centre of the city, and have their main entrance in Castle Arcade, with trade counter entrance and goods receiving and despatch sections in Womanby Street.

One of the attractive lighting fittings showrooms at Magnet House, Cardiff.

This branch serves a very wide area and covers the whole of the Welsh coalfields, and the many industries allied to the coal trade within and without the Principality, including the whole of South Wales, Herefordshire, Gloucestershire, Somersetshire, and the greater part of Wiltshire. The growth of the business has been so rapid that the important territory of which Plymouth is the centre, which formerly was within the area served by this branch, has now been allocated to the Plymouth branch, and this is particularly pleasing in view of the depression that has existed so long in the territory served by the Cardiff branch, because it does show that while depression may exist in certain industries, improvement in others is no less rapid.

When the Cardiff branch was opened, 29 years ago, it was only of small dimensions. The staff numbered exactly two, consisting of one office boy and one warehouseman. Mr. W. G. Phelp, now managing director of the British General



A corner of the household appliances showrooms.

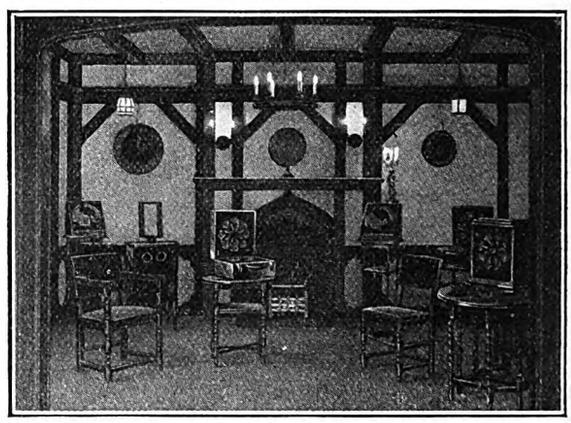
Electric Co., Ltd., of Johannesburg, was in command. From this small beginning the branch has been developed to its present flourishing condition.

In 1900 a certain amount of opposition was offered by electrical contractors in the district, due to the belief that the enterprise would take away their trade, but actual experience of the working of the G.E.C. trading policy, soon proved these suspicions to be without foundation.

The old premises were situated on the canal side, and besides being subject to flooding at certain times of the year, their position was so exposed that, on two occasions at least, the roof was blown off. Thus it became necessary to secure fresh premises, and in 1906 a new G.E.C. home was established by the side of the present premises in Womanby Street. Since 1906 these have been extended no less than six times by taking over adjoining property as the various occupiers' leases expired. Success attended these various extensions, and business and staff increased very considerably. In 1903 Mr. W. E. Hobbs, the present manager, took over command, and under his guidance the business has continued to develop ever since. The staff to-day numbers approximately 200.

So successfully did business develop that it eventually became necessary to open sub-branches to serve the important industrial centres of Bristol and Swansea; in fact, at the moment of the completion of the main Cardiff branch extensions, the sub-branch at Bristol is about to occupy vastly improved and extended premises, and at the same time the question of extending at Swansea is receiving serious consideration.

The Cardiff premises are now arranged in three separate blocks for management purposes, and general convenience. The centre block comprises the trade counter, a series of showrooms devoted to industrial and domestic heating and cooking appliances, general and industrial lighting fittings,



Part of the radio demonstration rooms at Magnet House, Cardiff.

lamps, radio demonstration showrooms, mining gear, stage lighting and other electrical equipment, wires and cables, and well equipped stores. The north block houses the administrative offices, a travellers' conference room and lecture hall and lamp stores. The south block is devoted to wireless and general stores, receiving, despatch and special express and general transport arrangements. Express goods lifts serve the upper floors.

Electrically the premises are equipped with the most up-to-date apparatus, the main distribution board on the ground floor, which is capable of carrying a load of some 70 kW, serving a number of specially designed link boxes for controlling current supply in the various departments.

The electrical fittings showrooms at this branch are designed on the latest lines to permit the inspection of a wide range of lighting fittings under the most favourable conditions. These fittings are shown in separate groups or rooms. One section is devoted to a display of multi-coloured panelled and moulded glassware pendants, brackets and floor standards fashioned in bronze metal work, oxidized silver, etc. Another section is devoted to alabaster ware, and yet another is devoted to a comprehensive selection of pendants, electroliers, and other types of fitting.

Separate showrooms are devoted to industrial and domestic heating and cooking appliances, as well as general and industrial lighting fittings and demonstrations of lighting. Here also mining, haulage and winding gear, flame-proof switchgear, stage lighting and other electrical equipment for cinemas

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and theatres, wires and cables, and various apparatus for industrial electrification is on view. Much of this is arranged so that it can be demonstrated in the showrooms, including the Magnet mine signalling system introduced by the company into the South Wales coalfields.

The two showrooms devoted to the display of electric household appliances and wireless goods are equipped on the most up-to-date lines to supply every need of the domestic and entertainment sides of the average household. In the Tudor radio demonstration room speech and music radiated from every corner of the globe may heard under comfortable conditions.

The showroom service is, of course, backed by extensive stocks and a well-equipped trade counter.

ELECTRIC HOMES CAMPAIGN.

Enthusiastic "Send-off" at Area Conference in Manchester.

THE E.D.A. Electric Homes Campaign had an excellent "send-off" at the Manchester Lighting Service Bureau on Monday, when the first area conference was held. Mr. H. C. Lamb, the chief engineer of the Manchester Corporation Electricity Department, who presided, said that the purpose of the campaign was to increase the number of all-electric houses, and to put an end to the construction of houses without adequate electrical service.

Lieut.-Col. W. A. VIGNOLES briefly outlined the objects and the programme of the campaign, and made passing reference to the success of the W.O.B. Campaign of two years ago. He said that the Electric Homes Campaign was likely to become a permanent feature of the work of the E.D.A. Houses were always being built, and the question of seeing that they had sufficient plug-points would always be necessary.

The campaign was to show how electricity could do more than it was doing at present. He mentioned the ways in which the campaign was to make its appeal. It was to appeal to the public through the daily Press, particularly through the housing advertisement columns, and also through the 20-page booklet, "The House You Want," which was largely to be distributed through contractors. They were then to run an advertising campaign through the women's papers and the home papers. Finally it was to make its appeal through trade papers to the builder and the architect. On the question of the E.D.A. wiring specification, it had taken two whole days for the Committee to come to an agreement. The Committee were not satisfied with the word "outlet" and were inclined to prefer the simple word "point." The expression "plug-point" was one which was being considered.

In the discussion which followed, Mr. L. ROMERO said he had every reason to expect that the campaign would be a thorough success. He thought that the name "plug-point" was an excellent solution of the problem, as it combined the idea of position with that of plug.

Mr. A. J. HUTCHINSON, of Farnworth, said that it was all very well appealing to the new homes, but what was to happen to the older houses. Could they not extend the campaign to embrace the older houses? In his own area they were continually extending the supply to streets of old property.

Mr. H. C. HAZEL, of Liverpool, said that he did not think there was much necessity to appeal to the builder and the architect, as they knew all about it. It was to the general public that the appeal should chiefly be made. He knew of speculative builders who were advertising their houses by the number of plugs.

More "Circles" Needed.

Mr. J. F. SIMPSON, borough electrical engineer of Preston, said that in his area there was an average consumption per house of 1 460 units a year. He suggested that instead of "outlet" the word "service-point" should be used.

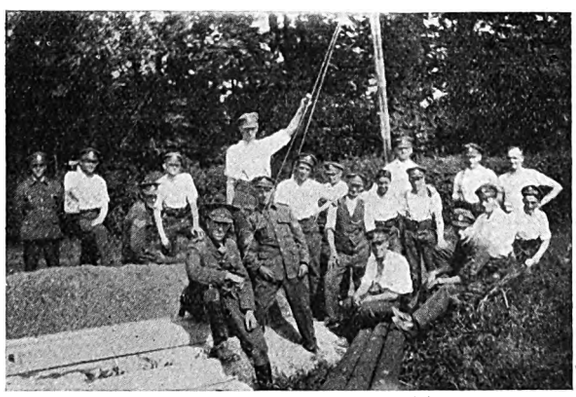
Mr. W. A. SHAW, of Stockport, said that he could heartily advocate E.D.A. as the finest means of bringing all sections of the industry together, and he knew of more than one case where the Association had been the means of the contractor meeting his supply engineer for the first time. He was glad to hear from Mr. Hazel that the builders were making a move in the direction of better electric lighting, as he knew of many cases in the past where the builder had spent more on the decoration of one room than on the wiring of the whole house.

Mr. R. C. HAWKINS, the E.D.A. district officer, said that in the North-Western Area there were five electric Circles, all doing very good work; but five circles were not enough in an area which had 92 supply undertakings. He hoped that more Circles would be formed, and, though he was very full up with lectures, he had kept a few dates open to assist with the formation of any new Circles. He also referred to the good work the area hoped to do at the forthcoming Manchester Smoke Abatement Exhibition.

Miss FOSTER JEFFERIES said that the Manchester Branch of the Electrical Association for Women would give the campaign their whole-hearted support.

Lieut.-Col. VIGNOLES, replying to the discussion, said that they were out to attract the attention of the old householder as well as the new.

ANTI-AIRCRAFT SIGNALS.



THE accompanying pictures, illustrating the work of the 26th and 27th Anti-Aircraft Signal Companies, R.E. (T.A.) in their recent camp at Manston, show (left) constructing a terminal pole by the field signal office, (centre) a detachment after completing a practice line, and (right) another view of work on a terminal pole. These units are responsible for training personnel for providing communications between the searchlights and guns of the London Air Defences. There are vacancies for a few keen recruits with technical ability who will appreciate a thorough and comprehensive training in Army telephony in all its branches. Much of the time available for training during the winter months is devoted to the very interesting problems connected with the manning of an Intelligence Centre for London's Air Defences. The headquarters are at 56, Regency Street, Westminster, and intending recruits will be welcomed any Wednesday evening between 7 p.m. and 9 p.m. Special attention is paid to the social side and recruits are assured of an enjoyable as well as a useful and instructive period of service.

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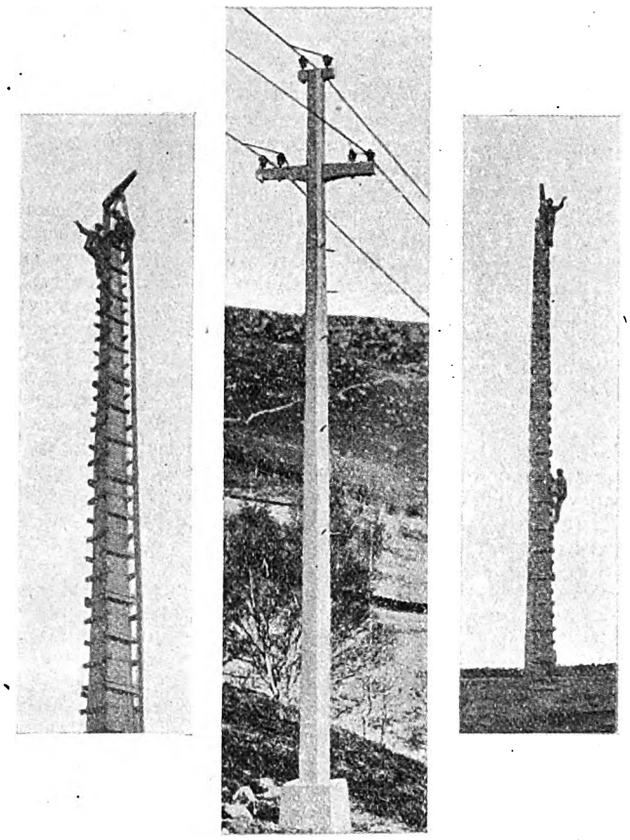
CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Concrete Pole Designs and Costs."

[To the Editor.]

Sir,—In reply to Mr. W. Fennell's letter in your issue of September 6th, p. 276, I enclose three photographs showing one of several pole lines built of reinforced-concrete construction where the poles are cast directly in their final positions, i.e., they are cast vertically and directly in their final place of location in the line.



These pictures show (left and right) the method of casting reinforced concrete poles vertically in their final positions in the line. The centre picture shows a completed pole in operation using the ordinary cross-arm construction and double insulators per conductor. Mr. Taylor states that this type of construction conform in every respect to the costs, &c., which Mr. Fennell has criticised.

False impressions or opinions based on lack of practical experience can be best satisfied by facts, but if Mr. Fennell disputes even the photographs shown here, I am prepared to request Mr. Fennell, should he still condemn my claims, dispute the costs, and cry aloud the cautions, to deposit, in a bank to be chosen by an arbitrator, the sum of £1 000, plus 6 per cent. to cover losses incurred in interest, etc., the writer to do likewise, and that, entirely at the loser's expense, Mr. Fennell, the arbitrator, and the writer or his deputy, visit and inspect the various lines, etc., *now built* (and being built) according to the above-mentioned method of construction; that the views of the arbitrator and those of the different electricity supply companies, etc., concerned (respecting the above-mentioned costs, supposed experimental stage, falsity of cautions) be accepted as final, that Mr. Fennell and the writer deposit in advance a further sum of £250 to cover these said expenses, also respectively guarantee to make up the difference if any.

It is worthless and a waste of time and paper to say anything further at the moment, other than to add that all the writer's remarks *stand unchanged*, and that Mr. Fennell's views that "it is possible to use wood for *any* span which could be dealt with by ferro concrete" (which differ from the original) are literally true, but in practice are not only vague and useless, but can be positively dangerous. The original views were answered, and the following still further substantiate them.

Speaking generally (which is the more acceptable and just viewpoint), it is unsound practice unduly to stress any (relatively) rapidly deteriorating and untested and unknown quality material such as timber, also to compare its durability, minimum maintenance costs, the relatively *durable* factor of safety, etc., with reinforced concrete for equal length of span, equal loading and climatic and atmospheric conditions, for the different locations and countries. Steel and concrete poles are inherently intended for heavy constructions, and consequently are best suited to long-span and single (especially *double*) three-phase circuit lines and long-length poles. For relatively light-weight, such as the example given on page 160, and for the most favourable soil and climatic conditions for properly-treated round red fir, the concrete pole line of the writer's proposal would be pressed in the matter of commercial competition for short-span construction, which latter would be both foolish and unnecessary practice, and quite contrary to the reasons for using concrete construction.

Going to specific cases, it may be added that the writer has built lines in several locations and countries where the untreated timber pole would have cost no less than double that of a concrete pole, and in other cases where the life of a red fir pole could safely be reckoned to average little over three years; on the other hand, we can have a specific case where the soil, conditions, location, and careful maintenance are so favourable to the best-treated sound red-fir pole that, after 30 years' continuous service, it can be almost as sound as when first installed—any specific case is of little practical value as a guide, and comparing the same number of wood and concrete poles in a line to equal the strength of the latter would be very much more specific than general to meet the best conditions of practice and economy and safety, etc. The writer scopes the whole world; not only Mid-Cheshire.—I am, etc.,

William T. Taylor.

September 16th.

"Where *Is* That Battery?"

[To the Editor.]

Sir,—My profoundest regrets to "Battery Electric" that I have "contributed nothing to that great question of the battery." I really must see what I can do about it, as it seems to cause him so much concern.

But did I misread his text and his nom-de-plume? Was it not a practical battery-driven automobile which he wanted to substitute for "stink wagons," and was not the battery improvement required solely for achieving this object? If so, surely it is not out of order to indicate that the research is now hardly worth while in this connection. Even electricity supply concerns and electrical contractors run their goods and staff round in "stink wagons," and some even proudly proclaim the virtues of the use of electricity for "everything" on the side thereof.

But this challenge of his is a serious matter. It is stated that we can lower the *average* speed by 10 m.p.h. and get there just as quickly. As the average speed of a battery electric rarely exceeds this amount, I suggest that we make the experiment and see how fast the road traffic goes by standing still!

The poor rich lazy battery makers. They have done nothing but make profits; and, worse still, very largely by equipping "stink wagons" with batteries that are good enough for the job. They have even helped to bring into existence a big and prosperous industry for making all "stink wagons" into partial electrics when they should have been diligently engaged in making batteries to prevent cars from going too fast or from being overworked when they ought to have been in the garage being recharged.

Sir, the "stink wagon" is here, and by its correct title and in its modern form it is a far better car than any battery electric can be, even with the aid of a miracle in battery evolution. But, as an auxiliary, it does want more battery per car, especially for town use, and it is possible that "Battery Electric" may, within his lifetime, see developments in this direction at present undreamed of in his philosophy; and, moreover, the best batteries of the present day will enable this to be done.—I am, etc.,

"Cynicus."

September 20th.

Electricity is effecting a tremendous social change. Families find in the country the natural advantages of unbounded space, healthful living conditions and lower living costs. And to these electricity is adding the other great advantages of light and power and the thousand and one labour, time and money saving inventions that have become a basic part of modern life.—*Mr. G. Dyer.*

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AUTUMN TRADE PROMOTION.

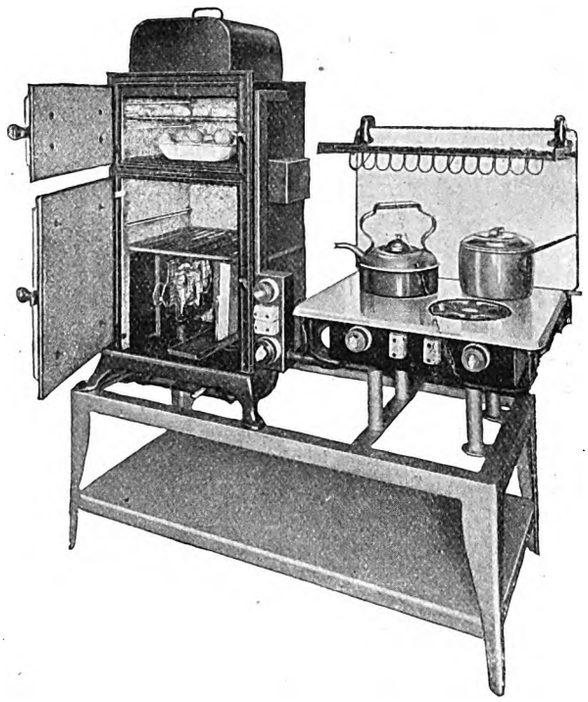
Suggestions for the Coming Season—New Fires and Cookers for the Winter Demand—What the Manufacturers are Offering.

IN order that electrical contractors may form some idea of what is offered for the coming winter trade we give below the suggestions of a number of manufacturers. In many cases the details are of new apparatus, while in other cases the models have been extensively improved.

Three new fires have, for instance, been introduced by SCHLEPER AND SONS, of Amsterdam, and these are illustrated on page 363. In all cases the elements are protected, and a connector with 3½ yards of flexible is supplied with each fire. The elements are 500 or 700 W, according to requirements. The finishes include crystallised black, oxidised silver, Florentine bronze and black spotted brass. The reflectors are made from brass or chromium, according to type.

The "Quead" patented electric cooker manufactured by WILLIAM GEIPEL, LTD., of Vulcan Works, 156–170, Bermondsey Street, London, S.E.1, incorporates the feature of roasting by radiant heat more or less on the old spit system. The joint or bird is hung on a hook and kept slowly revolving between red-hot elements by means of a roasting jack. An automatic baster is provided so that once roasting is started no attention is required; in fact, it is claimed that the door of the oven need never be opened until cooking is completed. The size of the roasting oven is 21 in. by 16 in. by 14 in.; it will accommodate joints up to 20 lb., a large turkey or several fowls or ducks. Baking is done in the top oven, partly by superfluous heat from the roasting oven, and partly by means of a top element which is specially useful for browning. The internal dimensions of the top oven are 9 in. by 16 in. by 14 in.. The boiling efficiency of the Quead boiling-plate is claimed to be higher than that either of other similar boiling-plates or of the modern gas boiling-ring. The element is of the plug-in type. With the 1 100 W plate 3 pints can be boiled in 11 minutes, and two heating spirals are fitted—one rated at 1 100 W and the other at 300 W. The small type boiling-plate has a capacity of 600 W and boils 3 pints in 18 minutes.

Some new types of cooker have been produced this year by the GENERAL ELECTRIC CO., LTD., of Magnet House, Kingsway, London, W.C.2. In their principal points of construction they are identical, the only important variations (except in the case of one) concern their dimensions and capacity. The one exception is the "Magnet Minor" cooker. This is of a type which will appeal by reason of its compactness to occupiers of small flats, bungalows, etc. Each of these new cookers is built up with a sheet-metal body double cased and lagged, and with a close-fitting cast-iron door and door frame. The ovens have enamelled interiors which are rounded at all corners, and detachable shelf-runners are fitted. The ovens can be entirely withdrawn for cleaning purposes. The heating elements are so disposed that side heating or combined side and bottom heating is available. An oven pan, grid shelves and a browning sheet are standard fitments. Between the oven and the top hob-plate provision is made for a hot cupboard and a grilling chamber, the enamelled pan and adjustable grid being removable. Two circular totally enclosed hot-plates 8 in. and 7 in. diameter are fitted, and one of the larger models has a third hot-plate 6¼ in. diameter, which is particularly economical when a small utensil is used or simmering is required. These hot-plates, as well as the oven and grill, are separately fused and controlled by reciprocating



The "Empress" cooker of William Geipel, Ltd.

switches giving "full," "medium" and "quarter" heat, and are guaranteed for two years. They are fitted behind flush insulated cover plates, and fuses of approved H.O. pattern are assembled beneath the hob, being protected when the hob is closed. The standard finish of these models gives mottled grey porcelain enamel for the hob and black stoved enamel for the exterior; the removable oven interior is porcelain enamelled and the door and switch panels enamelled white.

The "Minor" cooker already referred to embodies in the main the foregoing constructive details and finish, but it is intended only for small families, and its dimensions are the result of careful estimation of probable requirements. It seeks to represent the maximum efficiency in the minimum of space, together with an economical rate of maintenance. A distinctive feature of this cooker is that it is provided with separate self-contained units for boiling and grilling, while the grill element, although part of the oven heater, is separately regulated, an additional switch being fitted to control the

A few of the hand-painted shades offered by the Regent Lampshade Co., of Brixton, London, S.W. The material is painted on both sides.

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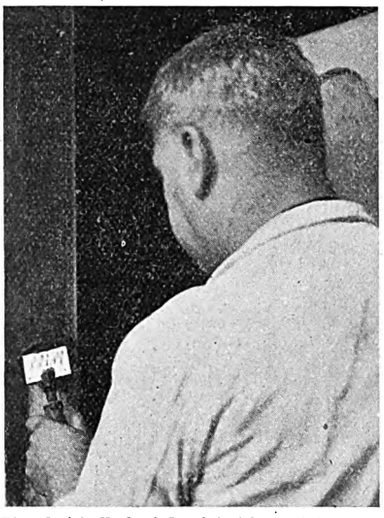
bottom heat when required. The hob is fitted with an 8 in. circular hot-plate, with separate three-heat control. A white enamel drip-tray is provided immediately below the hob. Optional fitments to this cooker are a floor stand with a shelf, and a splashguard.

The G.E.C. is also introducing a number of new types of fires. One of these is a handsome sheet-metal fire available in either antique brass or oxidised silver finish, with a load of 3 kW. It is designed for standing in an existing fireplace, the back being of smaller dimensions than the front, so that it will conveniently recess into the grate opening. The control switch of this fire allows for three grades of heat.



The electrically-heated paint stripper, introduced by the Electric Heating Co., is particularly appropriate while the present "house painting season" is in progress.

Two series of these new fires are of the reflector type, with concealed elements mounted in a focal position. The loading of these designs ranges from 1½ kW to 2 or 3 kW. Arranged for half or full heat and being fitted with heat-insulated handles, these models can be moved from room to room and placed in any convenient position. They are finished in bronze colour and one of the series is decorated with oxidised silver facings and ornaments which look particularly attractive against the matt black of the background. Two switches are fitted at one side, each of which controls an element mounted at the base of the hammered copper reflector, while the front panel element is connected directly to the main terminals.

Among the numerous "Magnet" household appliances are one or two specialities which merit special attention by reason of recent improvement in their design or construction. For instance, the "Magnet" iron has been given a superior nickel-plated finish, and the back-rest is now so fitted that the user's hand will not be impeded during work and an auxiliary stand can be dispensed with. At the same time the price has been reduced in the case of both the 4 and 5½ lb. weight types. The "Magnet" kettle, in 2, 3 and 6 pint sizes, is now standardised with an automatic cut-out, which consists of a fusible link which causes the electrical circuit to be broken before any damage can be done through overheating. The "Magnet" shaving-pot is now fitted with an ebonite handle, which enables it to be picked up and carried about without any appreciable degree of heat to the hand. The bowl of the shaving-pot is of seamless copper heavily nickel plated. The new "Magnet" electric wash-boiler, claimed to be simple to operate, cleanly and reliable, is another interesting line. The standard type is of 10-gallon capacity, and has a consumption of 3/4 kW. It is constructed of heavily galvanised iron and is supplied complete with the 3-heat switch mounted in a metal box with a vitreous enamel cover, and five feet of waterproof C.T.S. flexible. In the de-luxe model the outer casing is finished in cellulose enamel.

A wide range of heating and cooking apparatus is being marketed by THE BASTIAN METER CO., LTD., of Farnham Road, Trading Estate, Slough. Included are the "Imperial" fires, "Imperator" heaters, canteen boilers, grilling ovens, and hot water systems. Bastian water heaters can be fitted with wall brackets if desired, and the type 800 is fitted with a thermostat, of which two kinds are offered—the mercury break adjustable and the single-temperature non-adjustable a.c. thermostat. One of the special features of the 1929 models is the lagging with 2 in. granulated cork surrounded by a casing of sheet steel, which is sprayed with enamel. The firm's well-known immersion-type elements can now be supplied fitted in copper tubes, which can be withdrawn from the tank for de-furring purposes. This construction, together with the loose lid, should make cleaning and maintenance quite simple. Bastian storage geysers are available in various sizes for bathroom and kitchen.

As winter and bad weather approach, the Sadia drying stand, which we have previously described, will doubtless become increasingly popular. It is marketed by SADIA, LTD., of 22, Newman Street, Oxford Street, London, W.1, who also sell many useful heating and cooking devices. Another useful line is the series of "Electro Special" aluminium pans and kettles which have been especially designed for working with totally enclosed fast-boiling plates. These pans are made by a special process, the aluminium being compact and free from pores. The bottom is 8 mm. (⅓ in.) thick and machined flat. The handles of both pan and lid are made of hard wood. The outside is highly polished, while the inside is finished matt. There are no sharp corners. By making perfect contact with the boiling plate, this type of pan effects a saving of time and current up to 20%. For instance, a 1 600 W Sadia boiling plate will, it is stated, boil 3 pints in an 8-in. kettle in 12 minutes, as against 16 minutes in an ordinary kettle.

The "Sadia" water heater, also by SADIA, LTD., is suitable either for placing at the point where hot water is required or for supplying several draw-off taps located in different parts of the house. The heater works on the displacement principle, and once it has been in use there remains a plentiful supply of hot water unless and until the heater is emptied. The thermostat incorporates a special locking and sealing device; it can be removed without the necessity of emptying the water from the container. The container, which appears to be very thoroughly lagged, is made of heavy sheet copper, welded and tinned, for soft water, or of welded galvanised iron for hard water. The copper containers are, it is stated, tested to 120 lb. sq. in. for a maximum working pressure of 60 lb./sq. in. while the galvanised iron containers are tested to 180 lb./sq. in. for a maximum working pressure of 90 lb./sq. in. All working parts of the heater are mounted on a base plate and can be removed for cleaning by undoing eight bolts, which leaves the container bare. The smallest Sadia heater has a capacity of 1½ gallons, and is loaded to 500 W. It is recommended for fixing over wash-hand basins or sinks, and for shaving water at hairdressers. The volume of the lagging is stated to equal three times the volume of the water container. The 2½ gallon size is intended for fitting over narrow basins; it projects only 8 in. from the wall, is well finished in white enamel with nickel-plated fittings, and will provide two gallons of water at 195 deg. F. immediately, or a steady supply of one gallon per hour throughout the day.

A Stand-type Boiler.

Another Sadia item is a stand-type boiler, which consists essentially of a water container of wrought iron completely galvanised and lagged, a protecting cover, heating element, regulator and the necessary switchgear. The lagging is shown to be effective by the statement of the firm that a 44-gallon boiler heated to 185 deg. F. only falls 39·5 deg. F. in 12 hours, provided no water is drawn off. The boiler is controlled by a temperature regulator, which acts as a relay to a contactor. The sensitivity of the regulator permits a constant temperature—within one or two degrees F.—to be maintained. When working on a.c. the contactor can be combined in one unit with a time switch, and for d.c. an ordinary time switch can be used. The boilers are normally constructed to heat up in eight hours with the listed consumption, but they can be constructed for any desired consumption over a heating-up period of not less than five hours.

Several changes in their fires and cookers are announced by THE ARORA CO., of Loughborough. The most important improvement in the construction of Arora fires is the introduction of the new type "C" firebar, termed the "Honeycomb" bar, and now included as a standard fitting to a number of models. An attractive honeycomb effect and a pleasant glow are produced by this new bar, which reflects its glow and radiates its heat from practically the whole area of the bar. The original Arora winding is employed. Another improvement is the introduction of the entirely British made switches which can be operated with very light pressure by the foot. A further constructional improvement is the new porcelain insulated 3-part terminal supplied with all Arora apparatus, allowing any product to be connected to earth where this is desirable.

A further improvement has been made in the design of Arora fires, in the extension of the use of white metal in the manufacture of certain models. This metal is highly reflective and will harmonise (by reflection) with any colour scheme of furnishing or decoration in any room. It has the advantage of wearing the same colour throughout however vigorously it is polished.

(*continued on page* 364.)

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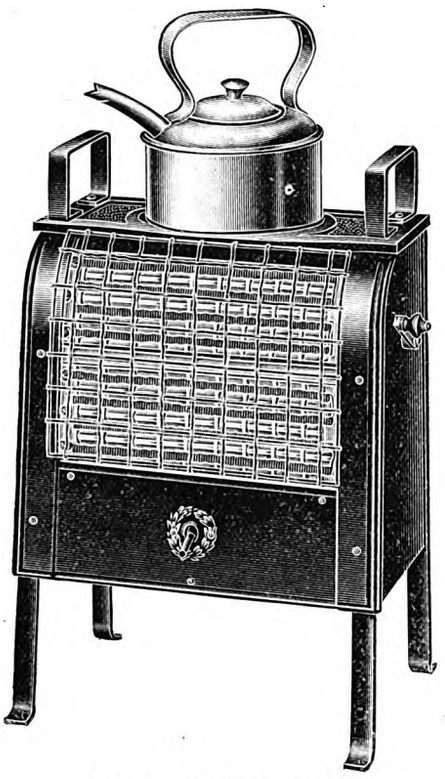
COOKERS AND FIRES FOR AUTUMN TRADE.

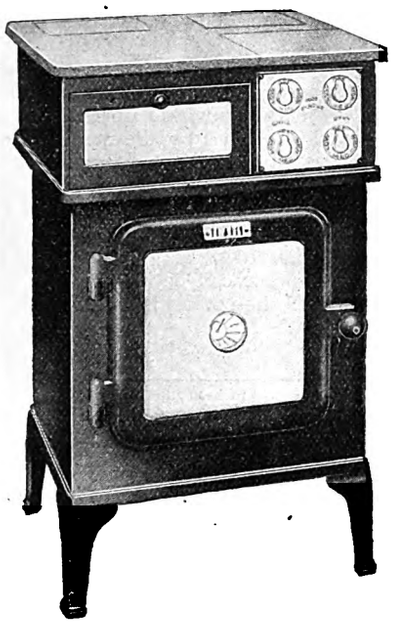
An attractive cooker by the British Electric Transformer Co., Ltd.

One of the fires of Belling & Co., Ltd.

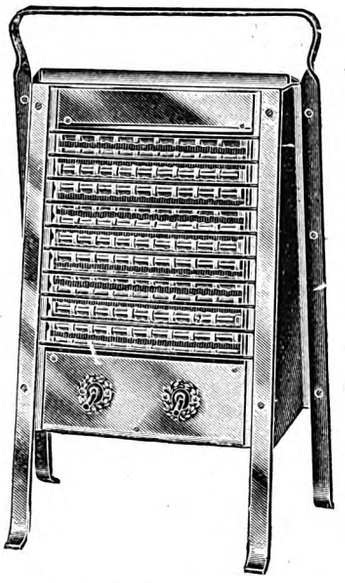


A suggestion by H. W. Sullivan Ltd.

Another "Belling" fire.

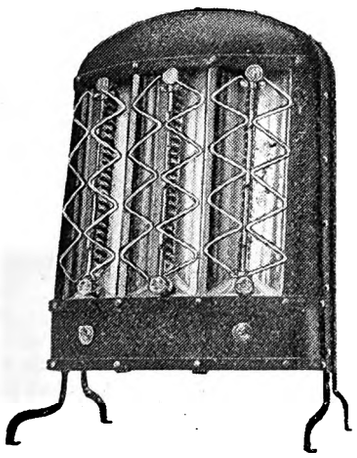


One of the cookers offered by the Hotpoint Electric Appliance Co., Ltd.

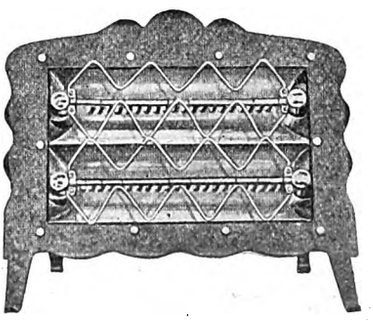


Another "Sullivan" design.

A three bar vertical model of Schleper & Sons.



One of the new fires of Schleper & Sons.



Another new design produced by Schleper & Sons.

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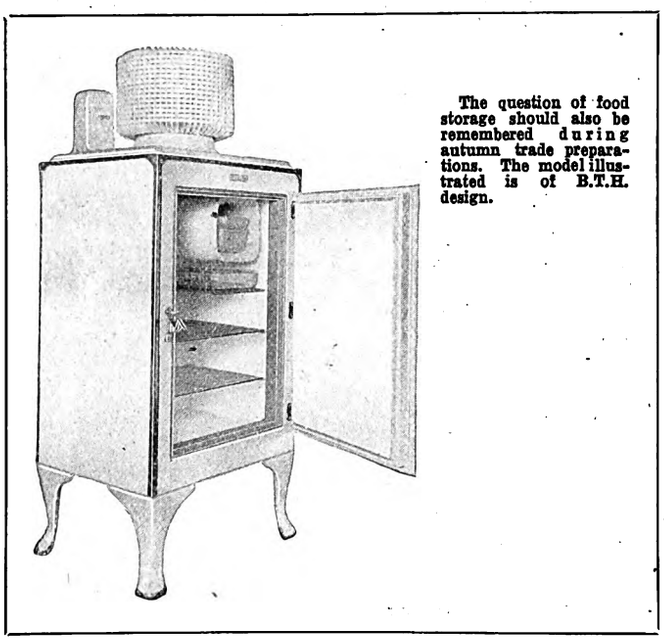
The Arora Co. is also specialising this season in a new system of tubular heating for large buildings and large rooms. The tubes can be run along the skirting where they are quite inconspicuous, and alternate or single sections can be operated on each switch. The standard loading is 66 W per ft., resulting in a heating capacity of 90 cu. ft. of room space to one foot of tube. The casing is of seamless steel tube about 1¼ in. in diameter.

Among the large number of fires offered for the winter season by THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, W.1, is a new series of "Chinese" fires, "fabric" finished in Chinese blue, red, bronze, or grey. These fires are fitted with chromium plated reflectors and are supplied in various sizes. The many virtues of the Jackson Junior cooker are again being emphasised this autumn.



The question of food storage should also be remembered during autumn trade preparations. The model illustrated is of B.T.H. design.

One of our illustrations gives a good idea of the distinctive appearance of the "Grecian" fire of ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, London, N.W.10. This is a 3 kW fire, employing two "grid" elements, each with its own switch There are two finishes: copper plate and grey or brown vitreous enamel. Various other fires as well as cookers and toasters are suggested by this firm.

H. W. SULLIVAN, LTD., 72, Leo Street, Peckham, London, S.E.15, have three new electric fires, the "Cinderella," the "Charma," and the "Challenga." The Cinderella has the special feature that the top element may be raised, by turning a handle, for heating a kettle placed on the top of the fire.

In "Sullivan" electric fires, the heating elements take three distinct forms known as the "Clip" element, the "Uniglow" element, and the "Paraglow" element. In each case, the spiral consists of a metal strip wound in a special manner, stated to be different from that employed in any other electric fire. The construction of this spiral allows the air to circulate more freely through the winding, enabling the strip to be safely run at a higher degree of incandescence than is sometimes employed; also, the appearance when glowing is far more pleasing than the usual plain coil. The spirals are of thicker section than is usual, thereby securing a robust construction and long life. In addition, there are numerous Sullivan cookers, toasters, warming plates, etc.

It is claimed that the "New Electriglow" fire, manufactured by ELECTRIC FIRES, LTD., Heatrae Works, Norwich, gives a perfect effect of combined blazing fuel and smoke. In this fire there is the appearance of glowing coals both behind and in front of the heating elements. This model is sold in three sizes, giving, 1, 2, and 3 kW. The "Crater" fire, in addition to symbolising living coals and smoke, imitates the effect of a flame. It is finished in nickel-plate and polished aluminium. Heatrae electrically heated towel rails are another accessory which should appeal to autumn traders.

The "Furniculus" luminous stoves are suggested by THE A. E. G. ELECTRIC CO., LTD., of 131, Victoria Street, London, S.W.1, who, among many other domestic appliances, also market electric teapots, towel driers, coffee percolators, and ovens. The "Carnifix" 1 kW oven, designed for small flats and bungalows, is another interesting line.

One of the most popular fires produced by SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38-39, Upper Thames Street, London, E.C.4, is the "Cosyglow," available in bronze or polished aluminium finish. A higher-priced model of the "Cosyglow" has an armour bright finish. The reflector fires by the same company should also be borne in mind. These are made in a number of types, with loadings up to 750 W. Screen fires are another Siemens line, and are obtainable with loadings up to 1 000 W. 2 kW well fires and "Excel" coal fires, together with the numerous small domestic appliances offered by the company, make a wide choice for the electrical contractor.

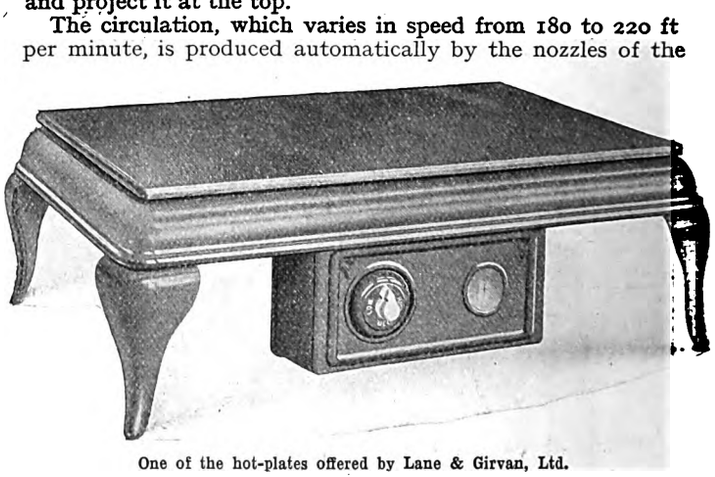
THE REVO ELECTRIC CO., LTD., (Britannia Works, Tividale, Tipton, Staffs, and 30, Great Queen Street, Kingsway, London, W.C.2), has endeavoured to make the design of the "Colonial" cooker comply exactly with every requirement. The oven is constructed in one piece, with rounded corners and welded joints, and vitreous enamel finish is used inside and out. The floor is brought forward to form a weathered joint with the front casting, thus preventing the ingress of liquids to the lagged chamber. Top and bottom heating elements, each controlled by a 3-heat switch, are fitted, and the elements are of the plug-in pattern. The plugs are arranged outside the oven to avoid overheating and the contacts are of non-corrosive metal. One 8 in. diameter (1 600 W) and one 6½ in. diameter (1 000 W) circular boiling plate are fitted to the hob. Each is of the totally-enclosed high-speed pattern which is standard in Revo cookers. The plates may be readily removed by lifting, so that the connections are at once accessible. Grilling is performed by making use of the top oven element, which for this purpose operates at red heat. The fuses can be easily reached by the removal of a vitreous enamelled inspection cover. The standard model has stoved black front, door, base and leg castings, all remaining metal parts being vitreous enamelled. The de-luxe model has all castings vitreous enamelled. Each is supplied complete with two oven racks, drip tray, grill pan and drainage tray, while a thermometer can be fitted as an extra if desired. The specification of the cooker is as follows:—

Size	Overall	Oven Cooking Space	Grill	Boiling Plates	
				1 Large	1 Small
Width	24½ inches	14 inches	8 inches		
Depth	18½ ,,	12½ ,,	10 ,,	8 in. diam.	6½ in. diam.
Height	37 ,,	12½ ,,			
Loading in Watts	4 400	1 000	800	1 600	1 000

Net Weight:—1 cwt. 3 qrs. 18 lb.

A new system of heating by electricity has been introduced by THE ARTIC FUSE AND ELECTRICAL MANUFACTURING CO., LTD., of Birtley, co. Durham. It is known as electro-velocity radiation, and comprises the use of radiators which draw in air at the bottom, heat it to a predetermined temperature, and project it at the top.

The circulation, which varies in speed from 180 to 220 ft per minute, is produced automatically by the nozzles of the radiator. There is claimed to be uncomfortable draught while the temperature is maintained at an agreeable level with the minimum of cost. The firm points out that as the electro-velocity radiator has as its means of heating a room both surface radiation and the current of warm air it has a marked advantage over steam and water heating systems—an advantage which is further increased by the fact that the temperature of the heating element is not less than twice the temperature of



One of the hot-plates offered by Lane & Girvan, Ltd.

(*continued on page 366.*)

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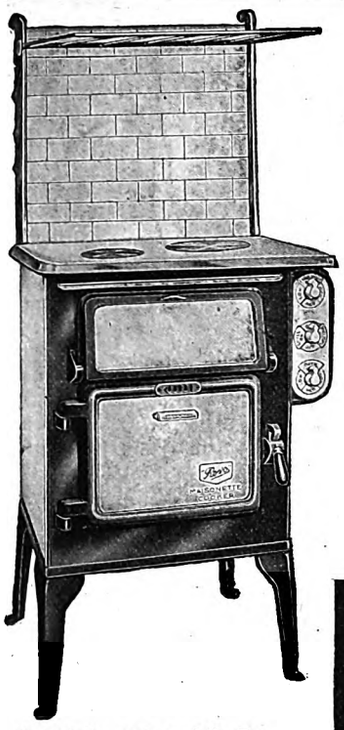
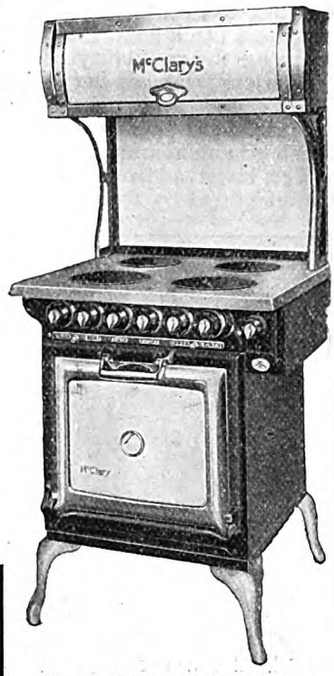
COOKERS FOR THE COMING SEASON.



One of the cookers of the Revo Electric Co., Ltd.

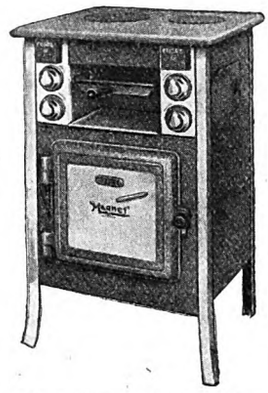
A "Revo" hot-plate.



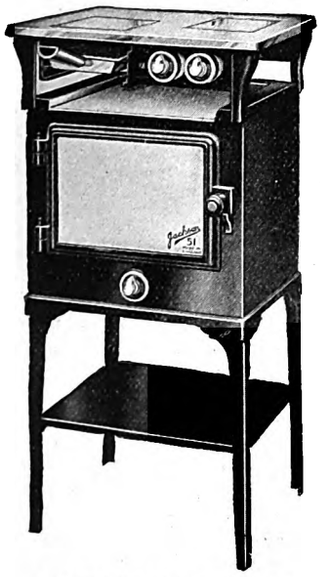
A Berry-McClary cooker is another useful line.

A G.E.C. model.

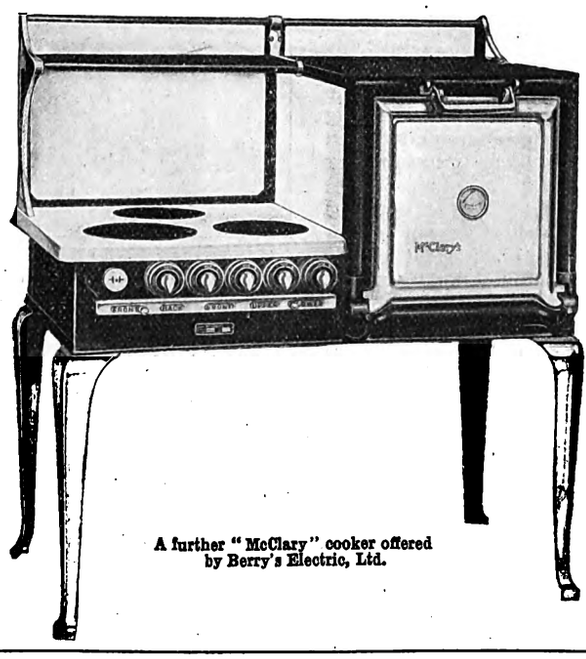
An attractive cooker in the range offered by the Jackson Electric Stove Co., Ltd



Another "Magnet" suggestion.



The "Jackson No. 51" design.



A further "McClary" cooker offered by Berry's Electric, Ltd.

One of the "Cosmos" range put on the market by Metro-Vick Supplies.

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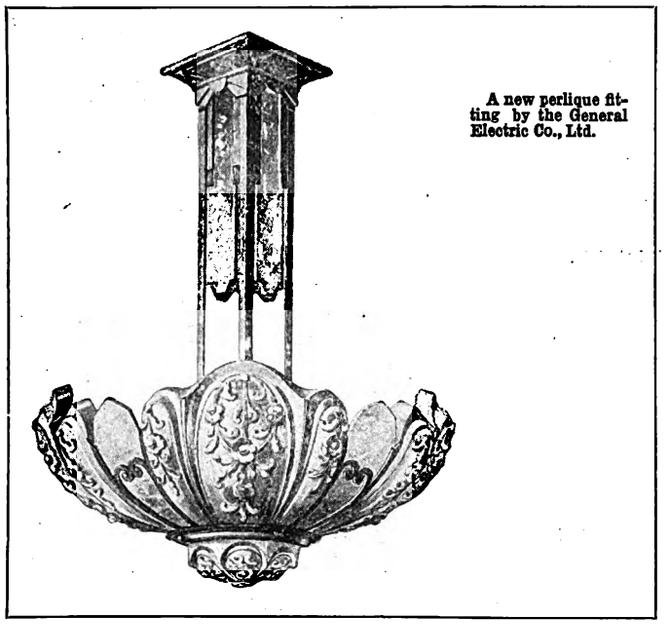
the steam radiator. The nickel-chromium element is capable of being run continuously at a red heat, but in practice it is kept at a black heat, thus providing a high safety factor and reducing the possibility of failure. The radiators are made for various wattages and for wall, bulkhead or floor mounting. They can be arranged for connections for 2 or 3 degrees of heating, depending on the size of the radiator. The standard finish is in aluminium.

The latest addition to the range of domestic appliances manufactured by FALK, STADELMANN AND CO., LTD., Veritas



A new perlique fitting by the General Electric Co., Ltd.

House, 83-93, Farringdon Road, London, E.C.1, is a low-priced electric iron designed in good quality nickel-plated finish, with thumb rest, connector, 2 yds. heavy-braided flexible cord and wire rest at back. The weight is approximately 5 lbs., the consumption 600 W. and it is stocked for 200/220 and 230/250 V.

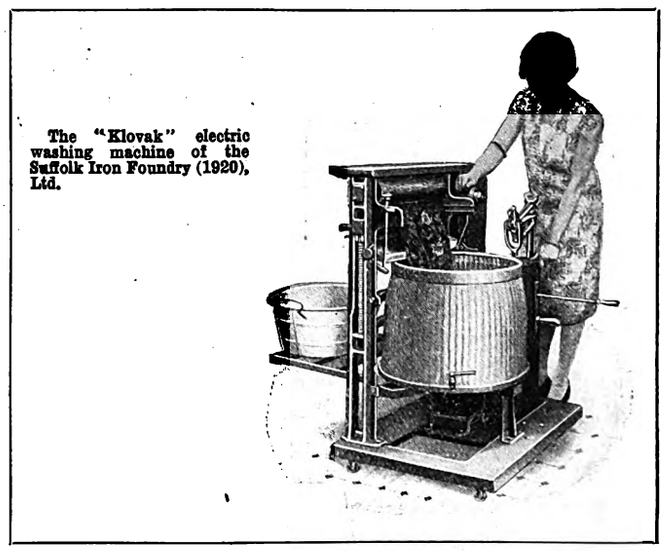
The correct lighting of windows is another aspect of trade promotion, and much of the success of shop window reflectors depends upon the correct focus of the lamp, and as lamps of different wattage have varying light centres, some means of adjustment to obtain correct focus is necessary. This problem has been met by a gallery recently patented by PHILIPS LAMPS, LTD., of Philips House, 145, Charing Cross Road, London, W.C.2. The gallery is very simply constructed. It is made in two parts, the shade-carrying part fitting inside the other, and being held in the desired position by means of three pins which engage in appropriate slots according to the wattage of the lamp in use. A coil spring in the inside of the outer portion maintains rigidity. It is thus a simple matter to ensure the correct focal position of the filament. In order to remove the reflector for cleaning purposes it is unnecessary to interfere with any screws, as the bottom half of the gallery holding the reflector is disengaged by a simple turning movement. Owing to the light centres of electric lamps having been standardised by the leading lamp manufacturers, the gallery is suitable for use with any ordinary make of lamp. Philips Lamps, Ltd., supply with each gallery particulars showing the appropriate slots for use with various types of reflectors and sizes of lamps.

The ELECTRIC HEATING CO., of Croydon, has just put on the market a very simple electric appliance for stripping paint. This consists of an electrically heated element enclosed in a casting of Admiralty brass having a bottom plate of steel. The loading is in the neighbourhood of 80 W. The bottom plate is brought to a sharp edge and should it by accident come in contact with a hidden nail, a new plate can be fixed at the cost of a few pence. From the element running up a steel tube into the handle, which, by the way, is set off from the cast element chamber to prevent the hot paint falling on to the hand when in use, are the connections which are protected by fish spine beads, the ends of the lead being connected to the terminals at the top of the handle.

The No. C. 196 cooker of CREDENDA CONDUITS CO., LTD., Oldbury, Birmingham, is one of a new series and is a very useful size for average family use. Many striking improvements and refinements have been incorporated. The standard finish is white vitreous enamelled oven door panel, hot cupboard door panel and switchplate. Granite grey vitreous enamelled hob and feet. Mottled grey vitreous enamelled removable oven interior. Vitreous enamelled oven linings. Other parts triple stoved black. A de-luxe model is also made, and this has white vitreous enamelled oven door panel, hot cupboard door panel and switch plate. White vitreous enamelled oven sides (exterior). Granite grey enamelled hob, feet, front frame, door frame and base. Mottled removable oven interior. Vitreous enamelled oven linings. Polished aluminium switchbox cover. The boiling plates are of the enclosed type, 8¾ in. diameter, of 2 kW loading and 7 in. diameter, 1.2 kW. The grill, 10 in. by 8 in., 1.5 kW loading. The oven is removable in one piece for ease of cleaning and the size is 15 in. high by 14 in. wide by 14½ in. deep, with a loading of 2.5 kW. Another cooker is No. C. 195 with a total maximum loading of 6.8 kW. A smaller unit is the No. C. 184 model fitted with two boiling plates (8¾ in. dia., 2 kW, and 6¼ in. dia., 1 kW) and a 10 in. by 8 in. grill with a 1·5 kW loading. The oven measures 12 in. by 13 in. by 12 in. and is loaded to 1.75 kW, making the maximum load of the cooker 5.25 kW. An extensive range of smaller appliances such as irons, kettles, boiling rings, hot plates, etc., is also offered.

The Credenda Co. also offers a wide selection of fires of the portable reflected heat type and also of the cast metal type. Of the latter there are three of the " Imp " series finished black stove enamel, with loadings of 1, 2 and 3 kW respectively. The " Trivet " series also consists of three fires with similar loadings finished in black and copper. Of the more elaborate models may be mentioned the " Ritz " finished in black and copper with a 2 kW loading, the " Carlton " (3 kW) with similar finish, and the " Majestic " (4 kW). The latter is fitted with three switches and heats 4 000 cub. ft. It is obtainable in black and copper finish as well as in bronze. Bathroom fires with 1 kW loading and screen fires are offered in addition to the " Sudan " (2¼ kW) and the " Sahara " (2¼ kW) portable fires.

A new electric washing machine—the " Klovak "—is being made by the SUFFOLK IRON FOUNDRY (1920), LTD., of Stowmarket. It possesses many unique features, and the manufacturers claim that a full week's washing can be accomplished



The "Klovak" electric washing machine of the Suffolk Iron Foundry (1920), Ltd.

in half-an-hour, the cost of electricity consumption being less than one penny. The special posser, which is made of copper, works up and down as the tub revolves. By this action dirt is not battered out of the garments, but gently " racked." The motor is direct coupled, the controls are very simple, and all movable parts are totally enclosed. The complete machine is guaranteed for twelve months.

LANE AND GIRVAN, LTD., Caledonia Stove and Electrical Works, Bonnybridge, near Glasgow, are making a special feature of their " Caledonia " series of electric fires. These comprise bowl and candle fires of various sizes and capacities, while a new bar type fire will find its way to the market in about two weeks' time. The bowl fires have been designed to meet all ranges of requirements as regards cost, from the cheap to the more expensive types with chromium reflectors, while the candle fires cater in a similar manner. The bar fires,

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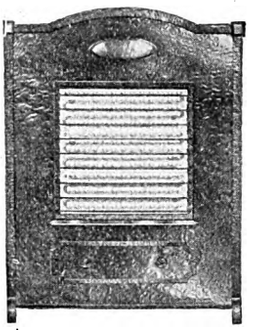
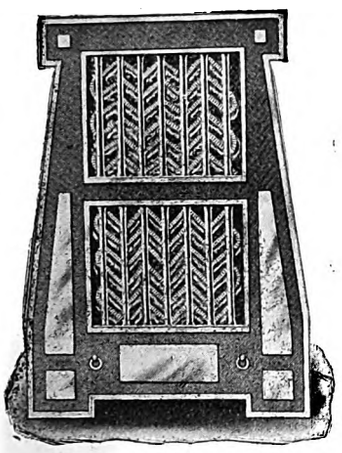
FURTHER SUGGESTIONS FOR AUTUMN TRADE.

A new fire offered by Electric Fires, Limited.

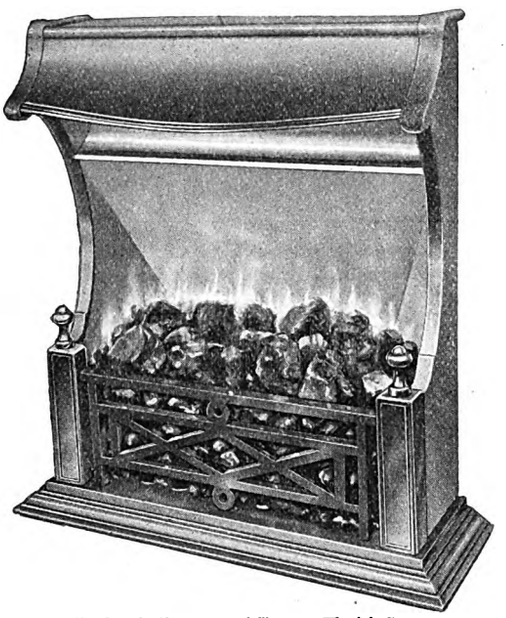
An attractive model by the General Electric Co., Ltd.



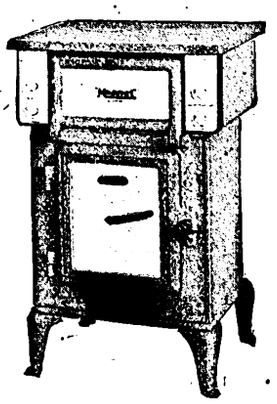
Another G.E.C. fire.



A suggestion by Electrical Utilities, Ltd.



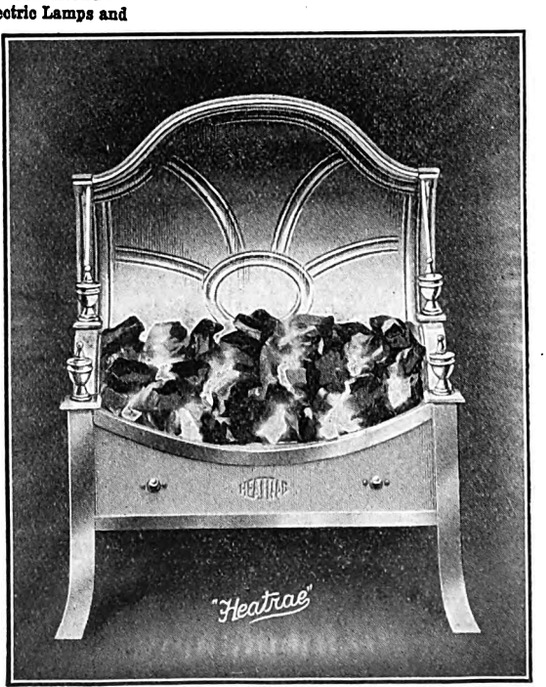
One of the fires in the range of Siemens Electric Lamps and Supplies, Ltd.



A cooker of "Magnet" design.

Another fire in the Siemens range.

A three-bar fire by the Jackson Electric Stove Co., Ltd.



Another suggestion by Electric Fires, Ltd.

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generally speaking, are low-priced and in a variety of finishes. The candle fire, which is rated from 1 to 3 or 4 kW, is a new departure in the " Caledonia " range, the better-class models of which have nickel-chromium reflectors. The finishes range from standard black stove enamel to cellulose and porcelain enamel in colours.

Radio Opportunities.

Another aspect of autumn trade is that dealing with radio, and with the rekindled interest brought about by the National Radio Exhibition, the forthcoming Manchester Exhibition and the starting up of the Brookman's Park station, electrical contractors would do well to keep their stocks of radio goods up to date. A number of new receivers and components have just been placed on the market in connection with the show at Olympia and among these may be mentioned the transportable all-electric three-valve screened grid receiver of RADIO INSTRUMENTS, LTD., 12, Hyde Street, London, W.C. This is a three-valve receiver using indirectly heated " Cosmos " valves in the a.c. model, while in the d.c. model, ordinary valves are used of the screened grid detector and pentode type. The receiver gives a wide choice of programmes without the use of an aerial or earth, though provision is made for connection to an external aerial, thus increasing the range of the instrument and the choice of programmes. The mains part of the set is fitted in a separate compartment below the cabinet. The latter is fully screened, the whole of the mechanism being contained in a screening box, so that when lifting the lid of the instrument, the aluminium top of the panel alone is seen. Another new set is a mains or battery operated 2-valve receiver in a bakelite case. The receiver is suitable for battery operation, and can be converted into an all-electric set for either a.c. or d.c. mains, by mounting it on a bakelite pedestal unit which contains the complete electric equipment. It has single dial tuning, the dial being set at an angle of 45 deg.

The " A.C.3 " receiver by the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4, is another new line comprising a three-valve all-mains receiver and employing a screened grid h.f. valve and a pentode valve. Many novel features appear in this receiver, which is made in table cabinet and in bureau type cabinet form, the latter incorporating an electric gramophone and a self-contained aerial. The " Igranic Neutrosonic Seven " receiver is another popular line made in transportable form with combined battery box, frame aerial and loud speaker. It is also made in table cabinets and bureau type cabinets, the latter incorporating the frame aerial. A model designed for entire operation off a.c. mains, and incorporating an additional l.f. amplifier and gramophone reproducer is also likely to prove very popular. The " Universal " receiver is also offered and this portable set is suitable for outdoor or permanent use in the home. Two screened grid valves are employed in the h.f. stages, and it is essentially a long range receiver.

"ELECTRICAL WIRING AND CONTRACTING."

Readers who are familiar with Sir Isaac Pitman and Sons, Ltd., and their past enterprises in connection with the publication of technical works, will be interested to learn that on October 9th the first part of a new serial issue will appear, namely, " Electrical Wiring and Contracting." This will comprise a series of eight practical volumes, divided up into 30 weekly parts, and obtainable from a newsagent at one shilling each. Mr. H. Marryat is the editor of the work, and he has been assisted by a large group of experts, a list of whom is contained in a prospectus issued by the publishers of the library.

THE E.D.A. window display for October [illegible] specially designed for promoting autumn trade and appropriately features " Warmth." This design, used in conjunction with the suggestions given on the preceding pages, should permit of electrical windows being made attractive enough to establish an unprecedented demand for electrical heating equipment of all types. A number of special posters for promoting autumn trade are also ready.

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THE NATIONAL RADIO EXHIBITION.

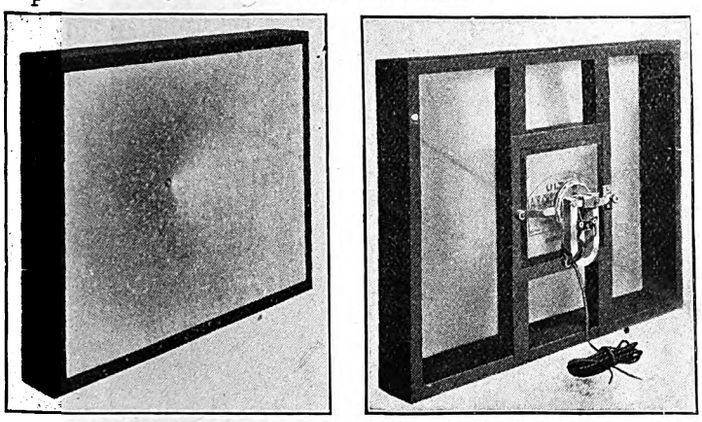
Increasing Popularity of the All-Electric Set—"Portable" Receivers Again Prominent—New Loud Speaker Designs.

A GENERAL impression of the National Radio Exhibition, which opened at Olympia, London, on Monday, is that manufacturers, anticipating the still wider use of electricity, have increased their number of "all-mains" designs. On the other hand, the exhibition includes a number of new high-tension batteries of the primary type, accumulators, and battery operated sets for those listeners not yet converted to mains working.

The exhibition as a whole does not include much that is new, which indicates, perhaps, that the industry is becoming more stable. Many standard sets have been redesigned insofar as cabinet work is concerned, their circuits arranged so as to include one or more screen-grid valves, and in some cases a pentode valve is fitted. One is impressed also with the number of "portable" sets now available, and though in most cases these are still too heavy to be regarded as really portable, their compact design warrants their popularity.

With respect to loud speakers, one of the most interesting is that shown by ULTRA ELECTRIC, LTD., of 661-663, Harrow Road, London, N.W.10. This incorporates the "air chrome" double diaphragm principle, and consists of two diaphragms, of chemically treated fabric, the respective area of each being closely related to the other, operated simultaneously by one driving pin. It is claimed that the large diaphragm gives a correct reproduction of the low notes, while the higher frequencies are dealt with by the small diaphragm. The unit used in the "air chrome" speaker is of the balanced armature type. The speaker is made in four sizes, ranging from 12 in. by 10 in. to 24 in. by 24 in. The latter size is one suitable for cinemas or other buildings where a volume larger than is usually required for domestic purposes is desirable, and we understand that special attention is being paid to the application of the "air chrome" to talking film reproduction.

The chassis of the instrument is illustrated below; the left-hand picture shows the front indicating the shallow curved cone formation of the larger diaphragm and the way it is stretched and secured to the rectangular wooden frame. The frame permits not only ease in handling and adaptability for mounting in any type of cabinet but also serves as a protection to the instrument. The right-hand picture shows the back of the speaker, the smaller diaphragm being stretched on the small frame.



Illustrating the construction of the Ultra "air chrome" loud speaker.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is showing among other sets a new and redesigned "Music Magnet" kit, girls demonstrating the easy construction in a very convincing manner. Apart from the already well-known products, a new 2-valve mains receiver designed to work on 200/260 V 50/100 cycle mains; a 3-valve screen-grid receiver in portable cabinet form (housing both h.t. and l.t. batteries); a 3-valve screen-grid receiver for mains operation; a 3-valve short-wave screen-grid receiver; a 4-valve screen-grid "portable"; a 4-valve screen-grid mains "portable"; and a 4-valve screen-grid table cabinet model are also shown. Among the new components of this company are a 2-valve mains amplifier and h.t. mains units for 20 and 40 mA respectively. The new l.f. "Hiflux" transformer is also attracting attention. Among the new loud speakers at the exhibition mention may also be made of the new G.E.C. "Stork" senior plaque model, a cone cabinet model, together with a new "Stork" loud-speaker unit.

Several new items are to be seen at the stand of GAMBRELL RADIO, LTD., of Buckingham House, Buckingham Street, London, W.C.2, but perhaps the most interesting is a special

A general view of The stand of the General Electric Co., Ltd.

device known as the "Novotone." The inventor of the unit, Dr. N. W. McLachlan, claims that the reproduction of gramophone records by loud speakers is unrealistic and the "Novotone" is intended for use as a compensator. The device is, we understand, also suitable for compensating any bad quality in the speech attending talking films.

The exhibits of RADIO INSTRUMENTS, LTD., 12, Hyde Street, London, W.C., are also interesting, including, in addition to the sets referred to on page 368, adjustable heavy duty chokes of 40/23 Henries at 200 mA and 0·085 to 0·025 Henries, 1 to 5 A. The inductance is changed by turning the adjusting screw, which varies the air gap in the centre of the core. Another new component is the "Dual Astatic" high frequency choke, specially designed for modern valves (including screened grid) and modern circuits using parallel choke feed. A further interesting exhibit illustrates the development in broadcast apparatus made by Radio Instruments, Ltd., since 1922, and shows the evolution of the low frequency transformer from the year 1915, and includes the first type of intervalve transformer designed by Latour. This historic exhibit also embraces high frequency transformers, a 5-valve set and a number of other accessories, popular in the early days of broadcasting.

Apart from the new receivers described on page 368, the IGRANIC ELECTRIC CO., LTD., of 147, Queen Victoria Street, London, E.C., includes in this year's exhibit a wide selection of new h.t. and l.t. supply units and battery chargers, together with such components as power transformers, smoothing chokes, potential dividers, etc., for the home construction of mains units. Another new product is the "dual wave" inductance, which, as its name implies, is a dual range coil, covering both the normal and higher broadcast wavebands. The coils are enclosed in a bakelite casing, and the unit has been designed to take the place of the six-pin coil, without the necessity of having to change coils, the change-over from one waveband to another being effected by means of a switch. In addition to plain and tapped triple honeycomb inductance coils and short-wave coils, a number of other interesting components are shown. Fixed coil holders for the "Igranic" coils have been redesigned, so that they are now capable of wider application. An improved short-wave choke and square law variable condensers, both for transmission and reception in various capacities, also the popular "Lokvane" condensers, together with a selection of micro condensers, screened reaction condensers, fixed condensers, and the "Pre-Set" condenser are other exhibits.

Amongst the l.f. coupling devices seen might be mentioned the new type "J" transformer, the "dual impedance" coupling unit and the "dual resistance" capacity coupling unit, the latter being particularly interesting in that it provides two alternative resistance values.

(*To be continued.*)

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ELECTRICITY IN AGRICULTURE.

Special Problems of Arable and Stock Farming—Barn Work provides Best Electrical Opportunity—Electric Driving of Small Machines.

By J. G. B. SAMS, A.M.I.Mech.E., M.Inst.Loco.E.

THERE has been much consideration given lately to the place that electricity should take in agriculture and many ideas advanced, some of which will scarcely "hold water"; but as far as the writer is able to discover, too little attention has been devoted to discovering to what operations in agriculture the use of electrical power can be economically applied. High-sounding claims, which cannot be substantiated in practice, are apt to harm, rather than to help, both the agricultural and electrical industries.

The term "farming" for the purposes of this discussion may be considered as excluding the small holding of, say, fifty acres or less, and it may be divided broadly into arable and stock farming, each of which have their special mechanical problems.

The work to be done can again be divided into field and barn work, the former being seasonal and the latter fairly continuous, and it is in the field work that the electrical engineer will meet with the greatest difficulties.

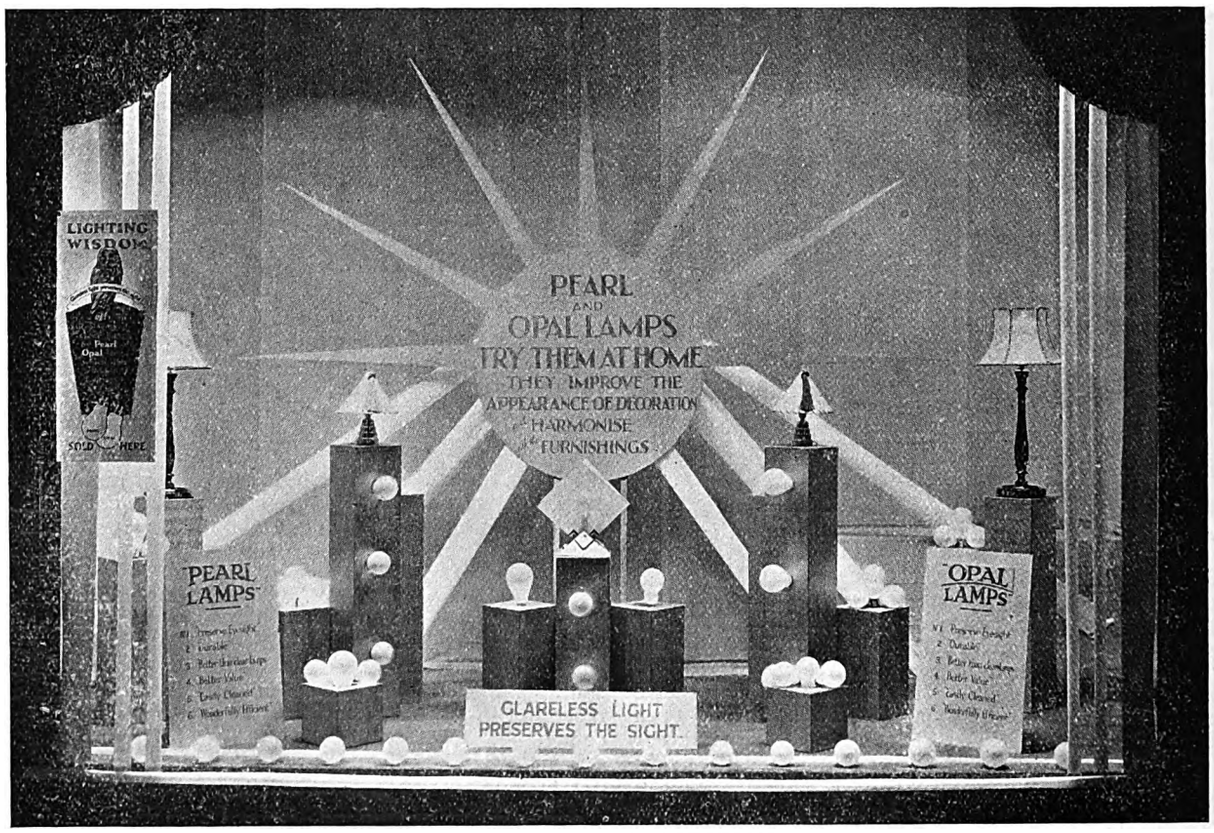
Field work can be outlined generally as ploughing and breaking up the land into a seed-bed, sowing the crop, cutting the weeds out from between the growing crop and cutting and carting the ripened result. Consider ploughing as an example of difficulty in electrical operation; at present the bulk of it is done by the farmers themselves with horse-teams at an acre a day, or with a paraffin tractor at three acres, supplemented on the heavier lands by heavy steam tackles using twin engines and cables (Diesels are beginning to appear in lieu of steam) capable of about 12 to 15 acres a day. Most farmers will only employ these heavy sets when they want some extra ploughing or cultivating strength in the summer or autumn, or, again, when some specially deep ploughing is required, such as sub-soiling. They are not invariably used, and are generally the property of contractors, who hire them out at so much per acre.

The farmers' argument against the complete use of these heavy sets is that in bad weather the wheels spoil the ground, and at times the engines are actually barred from going on the fields by the softness of the ground. Also that, observing that they have to retain horses and light tractors for other farming operations, these may as well be used for ploughing and cultivating, as they are not so severely incommoded by adverse weather conditions.

Reaping is frequently performed by mechanical power, in the shape of paraffin tractors, but the problem here differs from ploughing as the reaping machine travels continuously round the field until finished, instead of across, as with ploughing. In the absence of battery-run tractors, which may be ruled out in the present state of the science as too heavy, it will be seen from the foregoing explanation that the use of electrical power for field work argues the wiring of the country roads as well as the fields, and it may be said at once that this is a very doubtful problem from the point of view of economics.

Threshing offers an easier field, as it is possible to bring the stacks into such a close area that the motor of the threshing-drum can draw its power from a single fixed point of supply; but the arguments against are that the collection of the stacks into a closed area instead of having them scattered tends to increase the fire insurance rate as well as to increase cartage, though, if the fields were wired these points would not arise.

The writer, who is not without agricultural experience, is of the opinion that the horse can never completely be displaced in agriculture, on account of the number of light jobs for which it is economically suitable, but that a number of horses will be dispensed with on the larger farms in the early future in favour of light tractors designed to work in conjunction with a complete range of field implements and not with a bare one or two as at present, the tractors being equipped to travel when required upon the high road for cartage purposes to obviate the employment of motor lorries; and it does not seem possible to him in the present state of the science to operate these tractors electrically. These tractors will be additional to the heavy steam or Diesel tackles already dis-



A WINDOW SUGGESTION.

AN attractive display of pearl and opal lamps which has been designed by E.L.M.A. in connection with the Glareless Light Campaign. It is suggested that two similar table standards as shown above be installed, one with a glareless lamp and the other with a clear lamp, and arranged so that a thermal flasher automatically switches on first one and then the other. If the standards are placed against a whitish screen, the shadowless qualities of the glareless lamp are shown to advantage.

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cussed, which will always be required for their special purposes, and which again do not appear likely to be supplanted electrically.

It is in barn work that the best electrical opportunity exists, and it is suggested that manufacturers should make a special study of these requirements, with a view of creating a demand. Here, again, it must be recalled that the small internal-combustion engine of anything up to 10 or 12 H.P. has a firm hold on the market, and nothing but very cogent reasons will ever displace it, as farmers are usually averse to change. But there is still a large amount of hand labour in this direction which is capable of mechanical displacement, and here the electrical manufacturer is on the easiest ground, always providing that there is a reasonable supply of current.

On every farm there is always a group of small machines for the preparation of the food for the horses and other live stock, together with cream separators, churns, and in some cases milking machines where cows are kept on a fairly large scale. Most of these machines are manufactured as portable, but the tendency is to place them in the convenient barn or shed, and to leave them there permanently. Consequently they may be considered as fixed, and as they can usually be arranged to give a fairly constant load factor during working hours, it would seem that electrical operation is very suitable.

Barring exceptional cases, these machines—chaff and turnip cutters, cake-breaking machines, churns and cream separators—are always built in one man-power sizes, as up to quite recently men were the most suitable power available, besides which the capacity of the size was quite a useful one for by far the larger proportion of farms.

Turning to the question of power for driving, this is varied by the fact that fodder-preparing machinery will, when power-operated, be driven much harder and more continuously than when man-handled; separators and churns, however, must always be operated at a constant speed, and will have the same load factor in each case. Taking the man-power sized machine, the former group may be assessed at 2 H.P. and the latter at 1 H.P. in each case; the total power required for one set of appliances will be modified by the fact that all the machines are not necessarily required simultaneously; thus, generally speaking, the separator alternates with the churn, and the turnip cutter with the cake breaker, chaff cutting machines being in fairly constant use all the year round.

Milking machines may be assessed at about 1 H.P. for the first ten, and 0·75 H.P. for each succeeding ten cows milked. It will usually be inconvenient to attempt to drive all the above machinery with one central motor, as the buildings are not necessarily conveniently placed for central driving, and rebuilding is out of the question.

Water Pumping.

Water-pumping and grist-milling must be considered separately, as they are not common problems on every farm. In the former case it might be helpful to farmers to put on the market a complete set of overhead tank, automatically controlled motor and pump, distinguishing the sizes by the number of gallons the tank will hold. The price in each case could be pretty well approximated, as the only variant would be the depth of the well—farmers will always want to know right away what it will cost to instal.

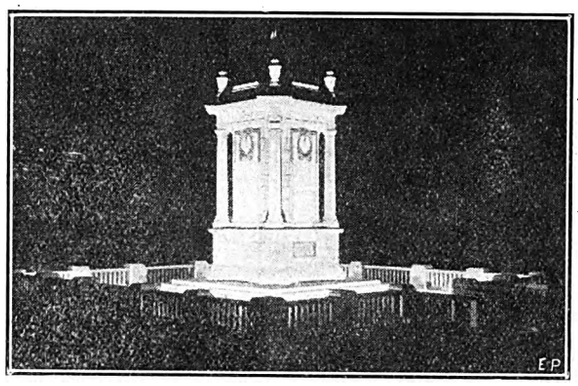
Grist-milling, that is the rough grinding of grain for fodder, is very frequently in the hands of local millers, but there is a tendency among farmers to acquire their own plant, which may consist of a pair of old-fashioned grindstones of about 4 ft. dia., or the modern equivalent in the shape of chilled steel rolls; both of these are always fixtures, and would absorb about 6 H.P. in driving. Here again a combination would be a useful marketing feature.

An account of the foddering, etc., machinery on the 1 000-acre arable farm on which the writer happens to be at the moment may be of some interest in this connection (of course, the plant would be much larger on a similar grass-land farm.) The pump is driven by a fixed 2½ H.P. non-automatic paraffin engine and runs for about three hours a day. In another shed is a similar engine driving a chaff cutter, and in a nearby shed is a 6 H.P. engine driving a turnip cutter, cake breaker, and small circular saw for firewood, etc., and as during the winter a large number of bullocks are kept for fattening, a small portable paraffin engine in conjunction with a turnip cutter is moved about to their location. Given electrical power, it would be better to distribute the prepared fodder from a central station. The churn and separator are hand-driven, and there is a petrol-electric set for lighting the house.

S. AFRICAN ELECTRICITY.

Electricity Supply Commission's Annual Report on Recent Progress.

THE sixth annual report of the Electricity Supply Commission of South Africa contains a record of the operations of the Commission during 1928, and a brief review of its work up to June 30th, 1929. The aggregate capacity of the Commission's five undertakings (Natal Central, Witbank, Capetown, Durban and Sadie) is 207 350 kW; and a 20 000 kW turbo-alternator is on order for the Witbank station. All these undertakings have reached the producing stage. The boiler plant at the several stations has a capacity of 1 800 000 lb. of steam per hour (normal rating), there are 453 route miles of overhead lines and cables carrying energy at pressures ranging from 380/220 to 88 000 V, step-up and step-down transformers installed amount to 281 720 kVA, and the motor-generators and rotary convertors in sub-stations have an aggregate rating of 68 000 kW. Plant and equipment in course of installation or on order includes generators, 52 000 kW; boilers, 520 000 lb. per hour; transmission lines and cables, 156 route miles; and transformers, 66 060 kVA. Coal consumption per kWh generated was 1·54 lb. at the Colenso station, 1·73 lb. at Witbank, 1·75 lb. at Salt River, and 1·7 lb. at Congella. At the date of the report the coal consumption at Congella had been reduced to 1·32 lb. per kWh, mainly due to the adoption of pulverised coal firing. At December 31st, 1928, the consumers from the Commission's five undertakings numbered 731, an increase of 345 during the year. Electricity sold during 1928 was 627 912 295 kWh, compared with 551 018 733 and 161 758 522 in 1927 and 1926 respectively. Up to December last the Commission's capital expenditure was £7 423 496, and the surplus (excess of assets over liabilities) at December, 1928, was £290 382. Revenue was £375 581, and after provision for generation and distribution costs and general expenses the balance was £260 378; of which interest required £163 478, and provision for repayment of loans £63 892, while £33 008 was placed to reserve. Up to the end of 1928, 145 municipal schemes had been reported on by the Commissioners, and supplementary reports upon tenders had been submitted in respect of 64 schemes. Schemes established number 148, and 14 are under construction.



THE floodlighting of the War Memorial at Bournemouth. The installation, designed by Siemens Electric Lamps and Supplies, Ltd., and carried out by the Corporation Lighting Department, comprises four 500 W units. The lighting of the memorial was carried out to demonstrate to members of the Public Lighting Engineers Conference, the possibilities of floodlighting.

Hammersmith (London) Electricity Committee recommends that, subject to a satisfactory agreement being reached, a quotation from the London and Home Counties Joint Electricity Authority for the supply of electricity in bulk to meet the whole requirements of the Council's electricity undertaking be accepted. The Joint Authority states that its proposal guarantees to the Council the progressive savings allowed for in the estimates which the Electricity Committee has submitted of the plant, etc., which the Council would find it necessary to install during the next seven years to provide for its own requirements and also provides for a further saving to the Council of approximately £38 000.

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NEWS IN BRIEF.

Germany's Telephone Exports—The Birmingham Electric Club—Milan Cathedral and Public Telephones—Lincoln Electricity Supply and the Drought.

THERE are 152 541 telephones in use in New Zealand, an average of 10·3 per 100 of the population. This average is exceeded only by the United States and Canada.

Two engines of 65 and 36 B.H.P. and electricity generating plant have been installed at the Bath Cinema. The plant will supply the whole of the electricity requirements of the cinema and the adjoining Palais de Danse.

Seaham Harbour U.D.C. Works Committee has decided that, with respect to the proposed purchase of two concrete mixers, arrangements be made for electric, instead of petrol motors, to be supplied at an additional cost of £7 10s. each.

Eastbourne (Sussex) Parish Church is to be equipped for electric lighting at an estimated cost of £275.

At the trade exhibition in connection with the Bolton civic week, which commenced on September 20th, Bolton Corporation had an attractive electrical stand.

Germany's total export of telephone apparatus and material in the first half of the present year was 922·7 metric tons, against 761·6 and 555·6 in corresponding periods of 1928 and 1927, respectively. The quantity sent to Great Britain was 42·5, against 37·8 and 14·6 tons.

In connection with the recent housing week at Cape Town, the Housing League arranged with local electrical firms to exhibit electrical cooking apparatus at the City Hall. As this work was in the nature of propaganda in the interest of the Corporation electricity department, the energy and labour required in connection with the exhibition was supplied free by the department.

The Isle of Thanet Joint Hospital Board has decided to instal electric light plant at Haine Hospital, Ramsgate, at an estimated cost of £3 244.

It is stated that if the river Witham falls another 2 ft., Lincoln electricity works may be unable to continue the supply of current to local engineering works.

The Gloucestershire Highways Committee has been informed by the Ministry of Transport and the Home Office that no grant can be made towards the cost of automatic road-traffic signal apparatus.

Dundee and Forfar Sheriff Court Houses Committee has decided in favour of the installation of electric lighting equipment and a new heating system in the Sheriff Court House buildings, but that no action be taken until it is ascertained whether the County Council intends to adopt electric lighting throughout the County Buildings.

To avoid collisions between vehicles when the leading ones are stopped by the automatic road-traffic control signals at Salford, the expedient has been adopted at the Great Cheetham Street West and Bury New Road cross-roads of erecting in each of the four cross-roads and about 100 yards from the traffic signals, a prominent sign reading "Traffic Signal Ahead."

Since the Italian State telephone undertaking was transferred about four years ago to five companies, the numbers of telephones in their respective districts have increased by from 43 to 108%. The automatic system has been installed in nearly all the large towns in Italy, and its installation in smaller centres is proceeding. A telephone has been installed in the dome of Milan Cathedral to enable visitors to order carriages to await them at the cathedral door.

Two churches in the Cotswolds, at Coln St. Aldwyn and Chipping Campden, are to have electric light. In the case of Coln St. Aldwyn, the cost, £70, will be defrayed privately, and at Chipping Campden, the amount to cover the outlay of £75 will be obtained by subscription.

The Swedish State Telephone and Telegraph Department has opened up telephone communication with Italy, by means of a new line about 1 865 miles in length. The entire telephone system in Sweden is now owned by the Government, and has 490 000 telephones, or eight to every hundred of the population.

There were several electrical stands at the third annual exhibition held last week under the auspices of the Rochdale Chamber of Trade. Henry Tattersall, Ltd., showed Exide batteries. Rochdale Corporation occupied five stands and showed the latest electrical appliances, and Messrs. Fryer and Hancock, electrical contractors to the organisers of the exhibition, and other firms also exhibited.

Dr. C. C. Garrard will lecture on "Development in Electric Power Control" at the opening meeting of the second half of the session of the Birmingham Electric Club to-day (September 27th), at 7 p.m. Programmes of this and the succeeding half-session can be obtained from the hon. secretary, Mr. J. Entwistle, 9–10, Phœnix Chambers, Colmore Row, Birmingham. Ladies' night will be on October 18th.

The prospectus of the University College (London) Faculty of Engineering for the 1929–1930 session contains a list of the teaching staff, particulars of terms and vacations, conditions of admission, fees, degrees, examinations, scholarships, medals and prizes, degree, college diploma and special courses, a time table of classes and an outline of their work, information regarding the societies connected with the University, etc.

On the new 20 000 ton Orient liner "Orontes," which made a cruise in the Channel during last week-end, the propelling machinery consists of two sets of Parsons turbines which develop 20 000 S.H.P. at a speed of 1 388 r.p.m. Electricity for lighting and radiators and for working deck and other machinery and engine room auxiliaries is generated by three 400 kW dynamos, driven by steam turbines.

The opening general meeting of the 46th session of the North-East Coast Institution of Engineers and Shipbuilders will be held on the evening of October 18th, when Mr. Launcelot E. Smith will be installed as president. The Tees-side branch opening meeting will be held on October 24th. Forms of application for membership can be obtained from the secretary, Mr. E. W. Fraser Smith, Bolbec Hall, Newcastle-on-Tyne. Members of the Institution paid an official visit to the Shipping, Engineering and Machinery Exhibition, Olympia, London, on September 19th.

The 1929–30 session of the Borough Polytechnic Institute, Borough Road, London, S.E.1, commenced on September 23rd. In the electrical engineering department, of which Mr. W. C. S. Phillips is the head, there are day and evening courses, and the subjects dealt with include machine construction, electricity, generation, transmission and distribution, electrical installation work, cable jointing, telephony, telegraphy, wireless telegraphy and telephony, automatic telephony, etc. Further particulars as to fees, syllabuses, etc., can be obtained on application.

LOOKING BACKWARD,

FIFTY years ago, according to THE ELECTRICIAN *dated September 27th, 1879:—*

St. Enoch's Station, Glasgow, was lighted electrically as an experiment.

A Halifax church service was "broadcast" by telephone to Saltaire.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *dated September 30th, 1904, stated that:—*

Mr. Campbell Swinton was developing a 40 000 V transmission scheme in Scotland.

Electric cranes and electrically driven mortar mixers were used in building the new Home Office.

Major-General C. E. Webber, who played a prominent part in originating the Institution of Electrical Engineers, died, aged 66 years.

* * *

FIFTEEN years ago it was stated in THE ELECTRICIAN *dated September 25th, 1914, that:—*

A standard charging plug for electric vehicles was being advocated.

A Doncaster civilian was court-martialled for being in possession of wireless telegraphic apparatus.

* * *

TEN years ago THE ELECTRICIAN *of October 24th, 1919, reported that:—*

Experiments in transatlantic wireless telephony were described by Prof. J. A. Fleming.

The E.C.A. "Peace Dinner" was the Association's first social function since 1914.

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PERSONAL.

ISLINGTON (London) Electricity Committee has appointed Mr. F. W. J. Corbett as relief charge engineer.

Fulham (London) Electricity Committee has appointed Mr. E. W. C. Day, of Finchley, as mains assistant.,

Mr. C. J. Fox, managing director of the Stanton Ironworks Co. has joined the board of Crompton Parkinson, Ltd.

Mr. James Fraser, chief Commissioner of Railways and Tramways in New South Wales since 1917, has resigned.

The Hon. Sir Charles and Lady Parsons arrived at 1, Upper Brook Street, London, on September 19th, on their return from South Africa.

Mr. C. E. Barton, of the Bradford Tramways Department, has been appointed rolling stock engineer to the Salford Tramways and Motorbus Committee.

Mr. C. A. Quarrington has been appointed head of the technical publicity department of Messrs. A. C. Cossor, Ltd., Cossor House, Highbury Grove, London, N.5.

The Igranic Electric Co. presented a canteen of cutlery to Mr. Arthur H. Browett and Miss Norah Towerton on the occasion of their recent marriage at Goring-on-Thames.

Mr. J. B. Parker, general manager of the Tees-side Railless Traction Board, has been appointed general manager of the Aldershot Traction Co. at a commencing salary of £1 200 a year.

It is announced that Captain P. P. Eckersley, formerly chief engineer of the British Broadcasting Corporation, has accepted an appointment as radio consultant-in-chief to the Amalgamated Press publications.

Mr. J. W. Spark, city electrical engineer, Bath, who met with a severe motoring accident during the summer, has made sufficient progress towards recovery to be able to relinquish his crutches. Mrs. Spark, who was also injured, is still using crutches, and it is expected that her convalescence will take longer.

Mr. S. B. Donkin has accepted office as President of the Association of Supervising Electrical Engineers for a further year. Mr. Donkin is a member of the firm of Kennedy and Donkin, a member of the Council of the Institution of Civil Engineers, and a member of the Institutions of Mechanical and Electrical Engineers, and the Association of Consulting Engineers, of which he was chairman during 1927–28.

On the eve of his impending departure from West Ham to take up his new post as chief engineer of the London and Home Counties Joint Electricity Authority, Mr. F. W. Purse was the recipient of two presentations last week-end. The first gift was that of a handsome silver cigarette box presented by members of the West Ham Rotary Club, of which Mr. Purse is a founder member and past president. The second presentation was by the West Ham Electric Power Users' Association, and consisted of an illuminated address and a fitted wardrobe bearing a suitably inscribed silver plate.

Referring to Mr. Victor Watlington's election as chairman of the B.E.A.M.A., the "English Electric Journal" recalls that he has been a working member of almost every important section from the earliest days of the Association, and has made a close study of the entire organisation, and that under his leadership the Association has entered upon a period of renewed activity and progress. After he completed his technical training at the Central Technical College of the City and Guilds of London under Professors Unwin, Ayrton, and Armstrong, Mr. Watlington concentrated his attention on tramway construction work, and following a period of service with R. W. Blackwell and Co., founded in 1906 a company that specialised in the supply of materials for electric traction. In 1911 he was appointed sales manager of Dick, Kerr and Co., Ltd., and subsequently took an active part in the organisation of the English Electric Co., of which he was sales manager until his appointment as managing director a few years ago. He is also a director of the Power and Traction Finance Co., and the Power and Traction Finance Co. (Poland).

Obituary.

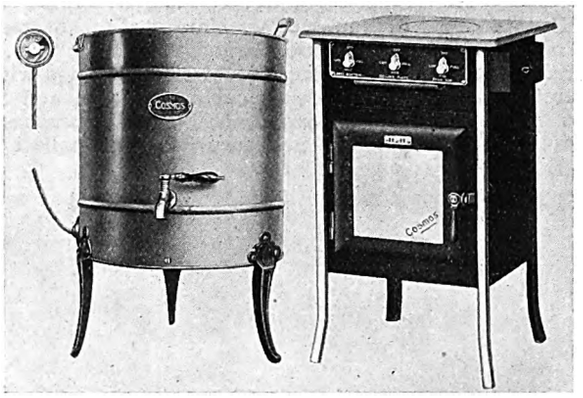
MR. C. COWLISHAW. He had for about 23 years been chief electrician at the works of Singer and Co., Ltd.

ALD. JOHN PYBUS, on September 20th, aged 84 years. Ald. Pybus was a member of Hull City Council 41 years, and was, for some time, chairman of the Electricity Committee. He was the father of Mr. P. J. Pybus, a director of the English Electric Co., Ltd., who was elected to Parliament as a representative of the Harwich division of Essex at the last general election.

BUSINESS ITEMS.

MESSRS. W. H. AXWORTHY AND CO., 4, Duke Street, Plymouth, have removed to 106, Tavistock Road.

With reference to the notice on page 341 of our last issue to the effect that the telephone number of the RELIANCE



ILLUSTRATING the type of wash boiler and cooker supplied by Metro-Vick Supplies for the Parkhall Housing Scheme. See paragraph on this page.

TELEPHONE CO., LTD., has been changed to Temple Bar 1010—this should have read Temple Bar 1011.

The firm of W. W. COOK AND PARTNERS, consulting engineers, will cease to carry on business after September 30th, as Mr. Cook is retiring and Mr. Pook is joining the International Telephone and Telegraph Corporation, in London.

In order that the name of the WALSALL HARDWARE MANUFACTURING CO., LTD., may more accurately accord with the products known as "Walsall" specialities, the name of the company has been changed to WALSALL CONDUITS, LTD.

The new automatic telephone exchange at Mitcham has been completed by SIEMENS BROTHERS AND CO., LTD., and was brought into service on September 11th. This exchange, which is included in the London automatic network, opened with 700 subscribers and has equipment for extending to 1 600 with an ultimate capacity for 3 000.

It is interesting to note the growing popularity, particularly in certain districts, of the all-electric house, a notable example of which is the Parkhall Housing Scheme, Clydebank, for which the CLYDE VALLEY ACCESSORIES, LTD., have recently placed with METRO-VICK SUPPLIES an order for 346 electric cookers and the same number of 10-gallon wash boilers.

With reference to the notice which appeared in our issue of August 16th (page 204) relating to an invitation of tenders for the erection of an electric bakery in Smyrna, the Acting British Consul-General reports that the Municipality of Smyrna has now decided to defer awarding of the contract, and that certain alterations may be made in the specifications.

IMPERIAL AND INTERNATIONAL COMMUNICATIONS, LTD., announce that on and after September 30th they will operate the cable and radio systems of the Eastern Associated Telegraph Companies and of Marconi's Wireless Telegraph Co., Ltd., together with the direct Empiradio and Imperial Cable Services, which are at present under the control of the General Post Office.

In connection with the description of the B.B.C. station at Brookmans Park, which appeared in our last issue, we are asked to point out that no less than 8 "D.P." batteries have been supplied. The largest consisting of 115 cells in lead-lined wood boxes, the battery having a capacity of 2 000 Ah. In addition to this and the filament lighting batteries there are three sets of 300-V 10 Ah batteries, all the batteries being supplied and installed by the "D.P." BATTERY CO., LTD., of Bakewell and London.

During this week the "Philips Wonder Van," escorted by a fleet of radio receivers on wheels, toured the Metropolis. The van is as large as the latest London omnibus, and contains the most up-to-date Philips radio apparatus. The equipment includes a studio for broadcast and public address work, and apparatus powerful enough to enable the loud speaker to be heard over a range of several miles. All current supplies are generated on board. By night the van presents a brilliant spectacle with a show window which contains an artistic display of the company's products, brilliantly illuminated.

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THE SHIPPING, ENGINEERING AND MACHINERY EXHIBITION.

A Further Review of Some of the Exhibits of Outstanding Electrical Interest—Equipment for Marine and Industrial Application.

(*Concluded from page* 307).

THE MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD., Marconi House, Strand, London, W.C.2, exhibited a comprehensive range of wireless and non-wireless apparatus. Replicas of wireless cabins on large and small ships were erected on the stand, and other apparatus was so arranged that the space necessary for the installation on

Two vertical furnaces, type 16R, with an output of nearly 2½ tons of steel parts, and type 12 with a similar output of 1¼ tons. Both furnaces were shown by Wild-Barfield Electric Furnaces, Ltd.

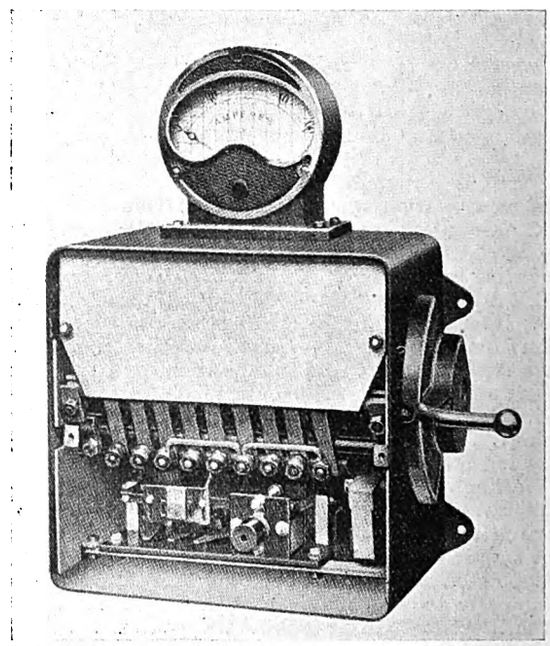
board ship could readily be estimated. In the larger cabin a 2 kW valve transmitter type M.C.6 for c.w. and i.c.w. telegraphy, and a short-wave transmitter type 295, were shown, together with a quenched spark emergency transmitter, and long and short wave receivers. The latest model Marconi direction finder, type 11G, in which screened grid high frequency amplifier valves are used, was also installed as on board ship. The smaller cabin illustrated the ¼ kW quenched spark transmitter, two-valve receiver, and direction indicator, installed in accommodation such as is usually found in small ships. The direction indicator is a modified form of direction finding receiver, comprising a small untuned single rotating frame used in conjunction with an amplifier of the type supplied with the type 11G direction finder. The instrument is designed to work over two bands of wavelengths—180 to 300 and 450 to 1 100 metres. A number of other transmitters were exhibited, including new types of i.c.w. transmitters of ½ kW and 1½ kW rating, a self-contained wireless telephone set intended for use on board yachts, whalers, trawlers, and other small vessels. A section of the stand was devoted to the Marconi marine electrical equipment. Here were exhibited depth sounding devices based on the Langevin-Florisson supersonic system, to which certain modifications have been applied—in particular, a new indicator which shows directly and visibly the depth of water, the pointer remaining stationary for a definite period at the depth last obtained.

THE RADIO COMMUNICATION CO., LTD., 34, Norfolk Street, London, W.C.2, also exhibited marine radio apparatus for all classes of ships. A ship's cabin containing a complete 1½ kW transmitter and receiver conveyed an accurate impression of the appearance and space required for efficient operation. The valve transmitter was of c.w. and i.c.w. type, with an independent emergency transmitter embodied in the main transmitter. The two-valve receiver shown covers a wave range of from 220 to 22 000 metres and is capable of receiving from all types of transmitters. An i.c.w. valve transmitter with a power of ½ kW designed for cargo and small passenger ships, and a wireless installation for lifeboats was also included in the transmitting installations exhibited. The Radio Communication Co. exhibited its new radio direction finder for large and small ships. This instrument has been specially designed for installation in chart rooms, and was installed in a representative chart room on the stand. It has a small frame having no exposed wires and giving a minimum of visual obstruction, an instantaneous sense indicator, automatic quadrantal corrector, and a selective amplifier with a wide wave range. An extra frame with its supporting pedestal was mounted on the floor of the stand to afford visitors an opportunity of detailed examination. The auto alarm for use on ships which do not keep a continuous wireless watch was demonstrated.

AEROSTYLE, LTD., 174/6, St. John Street, London, E.C.1, exhibited a full range of spray painting equipment, including spray pistols, pressure control and purifying equipment, air compressors, fume exhaust plant; also portable air compressor sets and spraying plants, both electrically-driven and petrol engine-driven. Demonstrations on all classes of work were undertaken continuously throughout the run of the exhibition.

ALLEN LIVERSIDGE, LTD., 123, Victoria Street, London, S.W.1, showed a full range of welding equipment. Included in the exhibit were A-L dissolved acetylene (high pressure) and A-L "Imperial" (low pressure) plants for welding and metal-cutting, A-L electric arc welders and A-L "Pontelec" resistance welders, together with blowpipes, welding wires, fluxes and all accessories.

BATTERIES, LTD., Redditch, displayed their "Nife" nickel steel alkaline batteries. These, being constructed mainly of steel, will, it is claimed, withstand vibration, will not sulphate or suffer from any kindred disease and can, therefore, remain idle indefinitely. The absence of acid fumes enables the "Nife" accumulator to be placed next to delicate instruments or



An internal view of the steel case air-break cam type star-delta starter exhibited by the Electro-Mechanical Brake Co., Ltd.

machinery without damage to the latter. It is claimed that it is impossible to buckle the plates by a short circuit or even accidentally charging in the wrong direction.

CELESTION, LTD., London Road, Kingston-on-Thames, showed two major exhibits. The first group was of a range of electric gramophone reproducers and automatic band repeaters for marine use, and the second was the "Loudaphone," a new type of loud-speaking telephone.

S. G. BROWN, LTD., Western Avenue, Acton, London, W. 3, exhibited for the first time a new gyroscopic artificial horizon. A complete Brown gyro compass equipment was also shown in operation, together with an automatic helmsman, 350 deg. course recorder, bearing, steering and radio repeaters.

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THE CABLE MAKERS ASSOCIATION, Sardinia House, Kingsway, London, W.C.2. This exhibit was intended to be generally representative of the various types of cables used in electric light and power installation. These include india-rubber insulated cables, with various metallic and non-metallic protective covering in single conductor, concentric and multi-core cables. Special cables for ship work, for flexible protected cables for deck lights, motors, cranes, etc., were included. Types of telephone cables for ship and land installations were also exhibited. Heavier cables for land installation were shown, with various types of insulations such as paper and bitumen, armoured and unarmoured. These types of cables are made by the members of the Cable Makers Association, whose names are set out below:—The Anchor Cable Co., Ltd.; British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; the Craigpark Electric Cable Co., Ltd.; the Enfield Cable Works, Ltd.; the Greengate and Irwell Rubber Co., Ltd.; W. T. Glover and Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; the India-Rubber Gutta-Percha and Telegraph Works Co., Ltd.; Johnson and Phillips, Ltd.; Liverpool Electric Cable Co., Ltd.; the London Electric Wire Co. and Smith's, Ltd.; the Macintosh Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. and Co., Ltd.; St. Helens Cable and Rubber Co., Ltd.; Union Cable Co., Ltd.; Standard Telephones and Cables, Ltd.

CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, London, S.W.1. Here was seen a representative collection of instruments for ships and engineering works, including electrical apparatus for indicating and recording CO_2 and CO percentages in flue gases, etc., apparatus for recording the percentage of dissolved oxygen in boiler feed water, draught and pressure gauges, temperature measuring instruments, etc.

THE CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester. Storage batteries covering a wide range of marine purposes, from small hand lamp cells to the cells used for under water propulsion of submarines were included in this exhibit. An Exide-Ironclad battery, for yacht and marine work, was displayed in a "cut-away" which showed the sectional construction. Another exhibit was an Exide-Ironclad cell of the very largest size, as used for the propulsion of submarines.

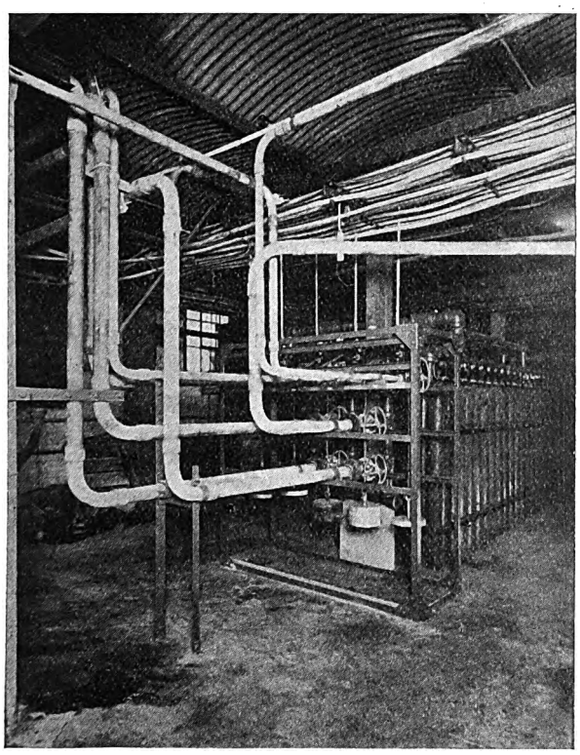
CROSSLEY BROS., LTD., Openshaw, Manchester, exhibited in working operation heavy oil engines of entirely new construction as follows: Vertical marine auxiliary set, comprising Crossley 5-cylinder compressorless Diesel engine, 137 brake H.P. direct coupled to a Metro-Vickers 90 kW 220 V, marine type d.c. dynamo at 450 r.p.m. complete on underbaseplate. The set is specially designed for ship lighting or for electric power purposes to drive winches, pumps, etc. The engine is cold starting and totally enclosed with forced lubrication to all the moving parts, and operates with the cheapest grades of fuel oil. Compressed air starting equipment is provided including a 3 B.H.P. petrol paraffin engine with air compressor, storage receiver, etc. Another item was a horizontal 4-cylinder Crossley heavy oil engine, 80 brake H.P. at 375 r.p.m., enclosed type, with pump lubrication to the moving parts and occupying small headroom. This type of engine is especially suitable for placing between decks to drive air compressors, pumps, or electric generators for lighting or power to drive ship auxiliaries. The engine is cold starting from compressed air.

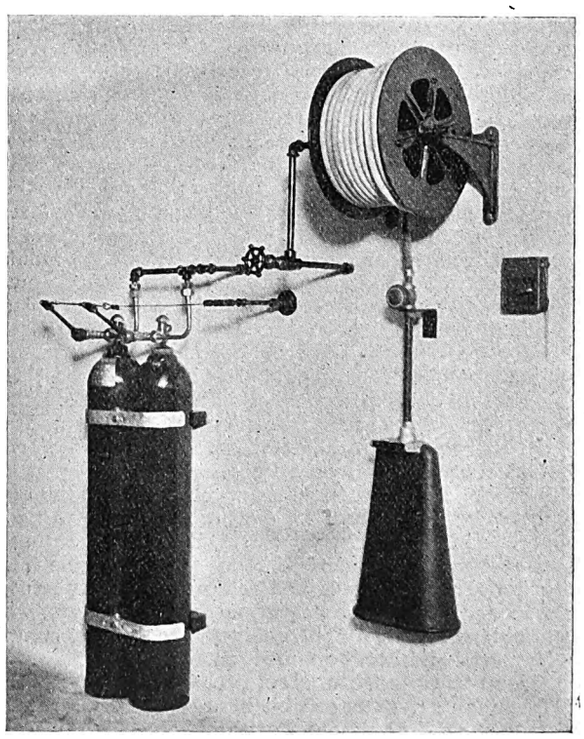
THE DRAYTON REGULATOR AND INSTRUMENT CO., LTD., West Drayton, Middlesex, showed a complete range of automatic regulators, including self-acting water-operated and air operated temperature regulators for controlling valves, also time temperature regulators and temperature regulators actuating more than one valve and one temperature impulse, air and water pressure regulators up to the largest sizes, thermostatic and pressure operated switches, thermo and pressure contactors, automatic humidity regulators, boil feed regulators, dial thermometers, temperature and pressure recorders. A new exhibit was the "Drayton" transmitting boiler and water level indicator.

THE EDISON-SWAN ELECTRIC CO., LTD., 123, Victoria Street, London, E.C. This company showed lamps, cables, stationary batteries and the new Ediswan house wiring systems.

ELECTROFLO METERS CO., LTD., Abbey Road, Park Royal, London, N.W., exhibited a comprehensive range of modern industrial instruments, including typical "Electroflo" all-electric multiple metering systems. These provide, by electrical methods, the continuous measurement of fluid flows, temperatures, pressures, CO_2 percentages and vacua, the necessary records being made on a 12 in. wide, continuous strip chart driven by a synchronous motor clock, and lasting 1 200 hours. The recorders are so designed that no intermingling of records occurs except where such intermingling is characteristic of plant operation.

ALFRED GRAHAM AND CO., LTD., St. Andrew's Works, Slough. The apparatus displayed gave some idea of the application of telephony and amplification of speech. A 2-wire telephone system was included, its purpose being to obviate the use of the usual four-wire connections but at the same time maintaining the four-wire quality and volume of speech. One common source of power supply only is required for signalling and for speech. Another exhibit was a 2-wire "exchange" for use with the two-wire telephone system.





The left hand photograph shows the main cylinder battery of the fire extinguishing system at Barking power station as installed by Walter Kidde & Co. On the right is a typical hose installation by the same firm.**—See next page.**

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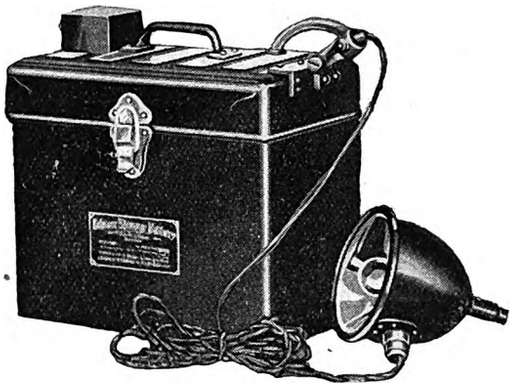
FRIGIDAIRE, LTD., Kingsway, London, W.C. exhibited several of their latest types of automatic electrical refrigerating machines of various sizes.

HADFIELD'S, LTD., East Hecla Works, Tinsley, Sheffield, made a display of their "Hecla" and "Era" brands of heat resisting steels.

INVENTUM ELECTRICAL APPLIANCES, LTD. (Mr. Alan Wright), 124, Chancery Lane, London, E.C., exhibited a range of the well-known "Inventum" electric fires, water heaters and cabin heaters.



The "Nite Box" exhibited by the New Distributors of Edison Storage Batteries, Ltd. See next page.

KELVIN, BOTTOMLEY AND BAIRD, LTD., 18, Cambridge Street, Glasgow. This firm, the original manufacturers of the late Lord Kelvin's nautical and electrical inventions, displayed the latest models of their well-known "Kelvite" navigational specialities and also a number of new developments for marine use. A range of magnetic compasses for the mercantile service included the original Sir William Thomson lightcard compass, the "Kelvite" standard compass, embodying Lord Kelvin patents, a vertical card liquid steering compass, also a liquid steering compass with reduced diameter modern high-pressure boilers. A new departure of Messrs. Kelvin, Bottomley and Baird, Ltd., was a range of medical apparatus for the ship's surgery and hospital. Here was seen a K.B.B. shadowless operating lamp, arranged for use on ship board, an apparatus for sterilising drinking water on an adequate scale by means of ultra-violet radiation. Lamps for radiant heat and artificial sunlight treatment and a portable X-ray outfit.

LACY-HULBERT AND CO., LTD., Boreas Works, Beddington, Surrey, exhibited "Boreas" patent high speed air compressors, designed for running at high speeds direct coupled to petrol engines, electric motors, etc.

LAURENCE SCOTT AND ELECTROMOTORS, LTD., Gothic Works, Norwich, showed electric motors, generators, and control gear specially designed and manufactured for use on board ship, and several types of the "Scott" silent worm-geared winch with contactor controller:—(1) 5A Scott winch, lifting up to seven tons; 3B Scott winch lifting up to four tons; 3BNL Scott winch, with special lever control; D3 Scott winch, motor-generator control. (2) Marine type motors (deluge pattern), drip-proof, splashproof, specially designed for ships' engine rooms, vertical and horizontal patterns. (3) Donkin-Scott "all electric" steering gear. (4) Electrical equipment for windlasses and capstans, including contactor control and motor-reducer control. (5) Electric boat winches, Welin-Maclachlan type. (6) Special barrel starters for engine-room motors, with ratchet handle and circuit-breaker. (7) Contactor starters for ships' motors. (8) Ships' generator.

THE RELAY AUTOMATIC TELEPHONE CO., LTD., Relay House, Streatham Hill, London, S.W.2, exhibited working installations continuously every day throughout the period of the exhibition. All connections on the "Relay" system are made in three seconds, and all conversations are protected from overhearing or interruption. The Relay automatic telephone system is characterised by the use of simple relays, specially designed to possess and retain a fixed adjustment. With the exception of the Relay armatures themselves, which have a standard travel of $\frac{1}{32}$ of an inch, the system contains no moving parts, and needs no lubrication.

THE RAPID MAGNETTING MACHINE CO., LTD., Lombard Street, Birmingham. The exhibit here comprised a range of various types of drum type separators; a high intensity chute separator; lifting magnet, on suitable gantry with lifting tackle; electro-magnetic chuck; a representative size clutch; and a combined high intensity drum and chute separator.

THE YOUNG ACCUMULATOR CO. (1929), LTD., Rigault Road, London, S.W.6, exhibited a range of "Young" accumulators covering ship lighting, marine, wireless, yacht lighting and motor boat starting and lighting. These accumulators, which have never before been exhibited, are filled with electrolyte known as Dry-Power. It is claimed that this electrolyte overcomes all the trouble previously associated with solid electrolytes, and will give greater capacity compared with other batteries. It takes the form of a thick jelly, which replaces the usual acid and is entirely unspillable. By its use, the space usually left above and below the plates can be reduced, and the space occupied by the batteries can be diminished. When it is necessary to add distilled water, this can be done in the usual way. Sulphation is said to be eliminated, and no injury results when the accumulators are left in a discharged condition or even short-circuited over long periods.

THE TELEPHONE MANUFACTURING CO., LTD., Hollingsworth Works, West Dulwich, London, S.E., exhibited a varied collection of telephone instruments and apparatus. The principal display consisted of "Laryngaphone" noise-excluding ship's telephones. A new model loud-speaking telephone for ships and noisy positions in factories was shown. This instrument has been designed to make speech easily audible in the noisiest positions on the deck of a ship or in the engine room.

MESSRS. H. C. SLINGSBY, 89-97, Kingsway, London, W.C. Here was exhibited a selection of about 60 from over 1 900 varieties of trucks, ladders and barrows made and catalogued, including hand and telescopic revolution revolving, electric-driven starters; automatic electric trucks, electric load-carrying trucks, electric elevating platform trucks for loads up to two tons, electric lifting-tiering trucks up to 75 in. for loads up to two tons, and electric trackless tractor-trailer truck trains, electric industrial engines, trackless and for railways.

THE A.C. WELDING CO., City Mills, High Street, Stratford, London, E.15. This exhibit consisted of various types of portable "Alternarc" alternating current arc cutting and welding machines for use with any welding electrode on the market, whether bare or coated. The machines embody the necessary transformers, choke or impedance and regulator as one single unit transformer of special design, housed in a distinctive ruggedly constructed case. The case is provided with sedan handles, so that the plant can be readily carried by two men. The design of transformer, in each instance, is such that high arc stability is present in the arc to meet the varying conditions of load. Means of adjusting the open circuit voltage arc current, shape of characteristic curve, penetrative effect and permissible length are provided to suit the varying conditions of type and size of electrode, class of work being welded, etc.

Extinguishers for Electrical Fires.

WALTER KIDDE AND CO., 2, Victoria Street, London, S.W.1, showed examples of extinguishing systems as installed in many power stations, for dealing with fires in oil switchrooms, transformer vaults, generators, etc., a typical example of which is the plant at the Barking station of the County of London Electric Supply Co., Ltd. We reproduce on page 375 a photograph showing the main cylinder battery of this installation, which is arranged to flood with inert "Lux" gas any of four main switchrooms, four basements or 26 transformer rooms, from a control position outside the rooms affected. This firm also showed examples of hand-applied hose reel units and portable extinguishers, which are useful for extinguishing fire without any damage and without danger to switchboards, electric motors, small oil switches, etc. A typical hose reel installation is also illustrated on page 375. An example of the "Derby" system of automatic electric fire alarm for cabins of passenger vessels formed another exhibit, while the "Rich" system was also on view. This latter enables the presence of smoke in any hold of the ship to be accurately located by means of a detecting cabinet installed in the wheelhouse of the ship. The cabinet is fitted with electric fans for drawing samples of air continuously up from the holds and with special electric light arrangements for rendering the presence of smoke visible.

THE RELIANCE TELEPHONE CO., LTD., Magnet House, Kingsway, W.C.2, exhibited a comprehensive display of telephone apparatus in various finishes under working con-

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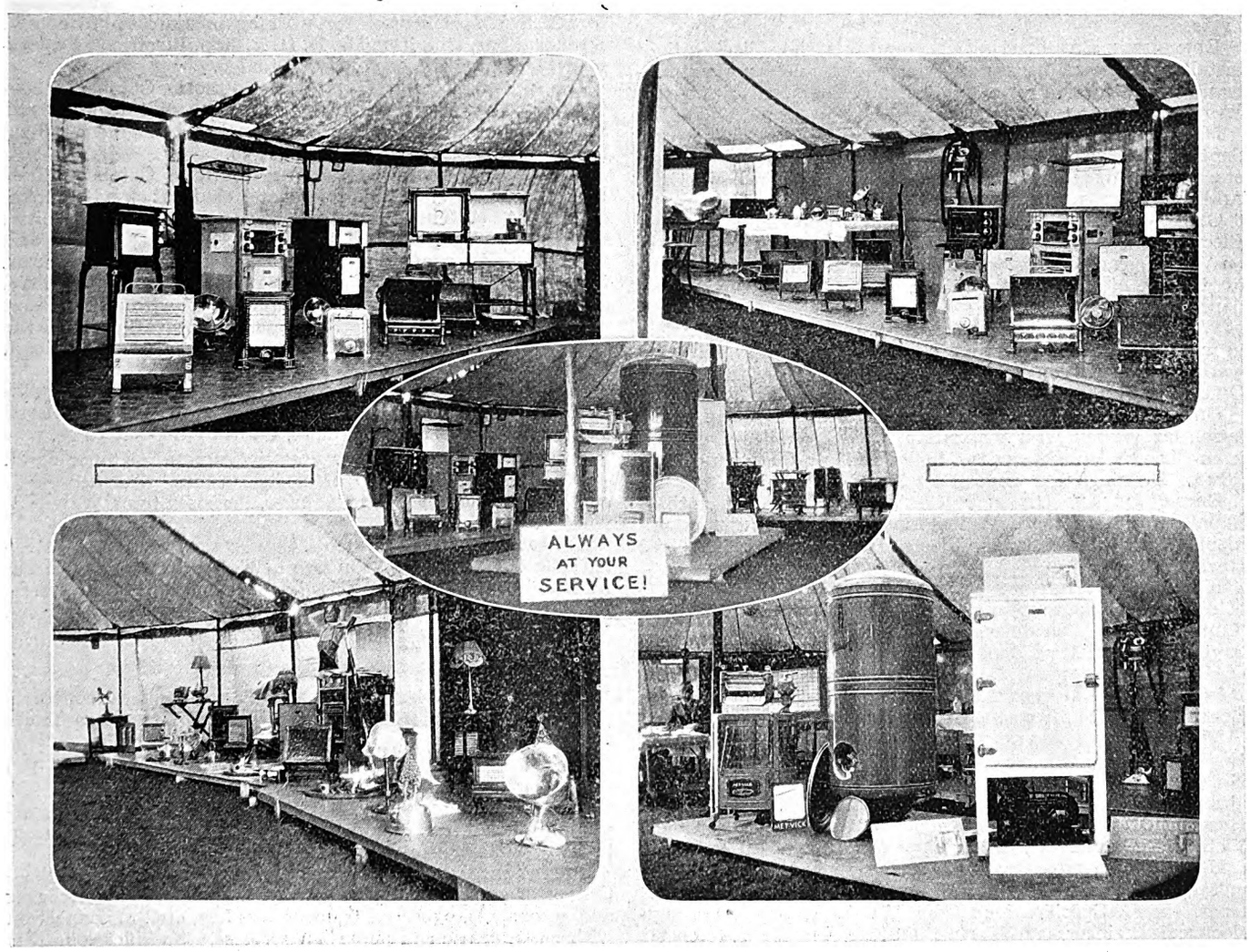
ditions. These units are especially designed for use on sea or land where reliability and efficiency is essential. They can be arranged either for full inter-communication, i.e., that every instrument can call every other, or alternatively, partial inter-communication can be made, i.e., certain instruments, are barred from calling certain other stations. Secret lines. staff calls and alarm keys can be fitted to all standard models. G.E.C. automatic telephone exchanges were also shown under working conditions, together with specimens of manual telephone exchanges so arranged that they can be connected up to the land service whenever a boat is in harbour. A luminous indicator system and bell apparatus for ship work was another interesting exhibit. This is one of the latest types of luminous staff signalling equipment which consists of a multiple push in each cabin to call the steward or stewardness. When operated, it will light the corresponding lamp outside the cabin and also in the steward's room and the respective corridor. The steward or stewardess releases the signal when entering the room.

THE A-S REFRIGERATING MACHINES, LTD., Magnet House, Kingsway, W.C.2, exhibited a range of refrigerating gear. The exhibits comprised various sizes of hermetically sealed leakage and explosion proof A-S refrigerating machines and a small marine type A-S ice maker was demonstrated under working conditions.

NEW DISTRIBUTORS OF EDISON STORAGE BATTERIES, LTD., Victoria House, Southampton Row, London, W.C.1. Here was demonstrated the Edison steel alkaline battery made at Orange, New Jersey. Due to its engineering construction, the makers are able to offer, for the Edison battery, practical guarantees of maintenance of capacity during periods extending from 10 to 16 years, according to duty. This cell is stated to have been in use for twenty years, and has, according to the makers, demonstrated its power to stand idle for long periods without loss of charge or deterioration of its nickel-iron elements or alkaline solution. This characteristic makes it especially suitable for yacht-lighting, rudder operation on motor and steam ships, also for sailing vessels, trawlers, motor boats and lifeboats, and for wireless service. The battery has considerable vogue for traction purposes, such as industrial trucks, tractors, locomotives, portable cranes and commercial and municipal vehicles. The exhibitors provided a complete demonstration board which showed step by step the constructional features, and on this stand was also shown the Edison Nite Box, an effective and handy source of illumination, comprising a five-cell Edison storage battery, enclosed in a sheet-steel box heavily japanned and equipped with carrying handles, strong hinges and toggle catch. On one end of the cover is mounted a spot-light containing 12 ft. of extension cord wire automatically wound on a spring reel, a parabolic reflector and a standard 6-8 V bulb of 21 c.p. A rotary switch and means for the accurate focussing of the bulb are provided. A swivel mounting provides for swinging the lamp in any direction, and also allows the disconnection of the lamp from the box for inspection purposes within a radius of 12 ft. A bayonet contact socket is furnished to allow the use of an additional lamp on any length of flexible cord. The Nite Box is wired in a substantial manner, all wires being rubber covered and grouped under the lid. The entire unit is self-contained and readily portable.



RURAL ELECTRICITY.

THE Trent Valley and High Peak Electricity Co., Ltd., exhibited at the Chapel-en-le-Frith Agricultural Society's Annual Show in a marquee 30 ft. by 50 ft. in extent. The photographs reproduced above show the general arrangement of the exhibits. Owing to the fact that the company was able to arrange to take a limited supply at 110 V from the private plant of a prospective consumer, a good proportion of the apparatus was at work. It is estimated that nearly 3 000 people passed through the exhibition and this in spite of the fact that they had previously had to pay 2s. to enter the show grounds, many having come solely to the electricity company's tent.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

EVESHAM RURAL DISTRICT COUNCIL.—Electric light installation in 78 houses at Broadway, Evesham. Particulars from the Surveyor.

EAST LOTHIAN EDUCATION AUTHORITY, September 27th.—Electrical work in connection with erection of public schools at Longniddry and Aberlady. Forms of tender, etc., from Messrs. Morham and Brotchie, 29, Hanover Street, Edinburgh.

HORSHAM URBAN DISTRICT COUNCIL, September 27th.—Supply and erection of (*a*) rotary convertor, 125 kW step-up transformer, two draw-out truck type e.h.t. switch units; (*b*) sub-station equipment: two 100 kVA transformers, e.h.t. switchgear, l.t. switchboard and cable works; (*c*) one e.h.t. feeder cable, laid complete. Specification, with form of tender, drawings, etc., from the electrical engineer, Mr. F. Ffrench Electricity Works, Horsham, deposit £3 3s. (or £1 1s. for any one section).

E.H.T. Transmission Line.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, September 27th.—Supply and erection of a double circuit, 33 000 V, three-phase, 50 cycle, overhead (steel towers) transmission line. Specification (No. 33/T/1), from Mr. E. F. Hetherington, chief engineer and manager, at the offices of the Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

EDINBURGH CORPORATION, September 28th.—Electric light installations in 48 houses at Quarryholes and 24 at Sunnybank. Specification, etc., ftom the Engineer, Electricity Works, Dewar Place, Edinburgh.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, September 28th.—Six months' supply of electrical fittings, etc. Forms of tender from the clerk and treasurer, Mr. C. L. Addison Smith, 19, Heriot Row, Edinburgh.

OTLEY URBAN DISTRICT COUNCIL, September 28th.—Electrician's work in connection with erection of 100 houses on Westbourne housing estate, Bradford Road, Otley. Forms of tender, etc., from the clerk, Mr. C. J. F. Atkinson; deposit £1 1s.

WARRINGTON CORPORATION, September 28th.—Electrical gear in connection with pumping plant for river filtration works. Specification from Mr. J. Gray, Water Engineer's Offices, Warrington; deposit £1 1s.

BIRMINGHAM GUARDIANS, September 30th.—Lighting installation at Witton Hall Institution, Erdington. Specification from Mr. N. W. Greenway, Lloyd's Bank Chambers, New Street, Birmingham; deposit £2 2s.

ERITH URBAN DISTRICT COUNCIL, September 30th.—Supply of h.t. switchgear, transformers and sub-station equipment. Particulars from the Electrical Engineer, Walnut Tree Road, Erith.

KIRKCALDY DISTRICT COMMITTEE, September 30th.—Electrical installations in 30 houses at Thornton and 20 at Lumphinnans. Schedules, etc., from Mr. W. Williamson, architect, Kirkcaldy; deposit £1 1s.

HULL CORPORATION, October 1st.—Road lighting at new infectious hospital known as the City Hospital, Cottingham. Specification, etc., from the City Architect, Guildhall, Hull.

METROPOLITAN ASYLUMS BOARD, October 2nd.—Installation of electric bells at Paddington Casual Ward (Contract No. 6): new storage battery for t.s. "Exmouth" (No. 7); and alterations to electric lighting in "X" block at Eastern Fever Hospital (No. 8). Specification from the Board's Office, Victoria Embankment, E.C.4; deposit £1 for each.

HASTINGS CORPORATION. October 3rd.—Supply of (*a*) 11kV metal clad switchgear; and (*b*) one 5 000 kVA outdoor type transformer. Specifications from Mr. A. J. Ryan, borough electrical engineer, 12, York Buildings, Hastings; deposit £1 1s. for each contract.

GRIMSBY CORPORATION, October 4th.—One year's supply (about 25 000 yds.) of paper insulated, lead covered, low pressure cables. Specification (No. 269) from Mr. S. R. Windle, borough electrical engineer, Electricity Works, Grimsby.

LEEDS GUARDIANS, October 4th.—Electric lighting installation at the two children's homes, Roundhay. Particulars from the clerk, Mr. J. H. Ford, 11, South Parade, Leeds.

HALIFAX CORPORATION, October 7th.—Electrician's work in connection with erection of filter house, etc., for the waterworks department. Specifications, etc., from the Borough Engineer; deposit £2 2s.

GLASGOW CORPORATION, October 8th.—(1) Water-tube boiler plant; (2) 10 000 kW steam turbo-alternator, with condensing plant and auxiliaries; and (3) e.h.t. switchgear and control gear, for Pinkston generating station (separate tenders for each contract). Specifications, etc., from Mr. L. Mackinnon, general manager, Tramways Department, 46, Bath Street, Glasgow.

GREAT WESTERN RAILWAY CO., October 8th—October 25th.—Supply of telegraph instruments (list 18); electrical apparatus (insulators, etc.) (19); electric wires and cables (20); electric lamps (24), etc. Samples and patterns may be seen from September 23rd to 27th at the office of the Stores Superintendent, Swindon, where specifications and forms of tender can be obtained. Forms of tender for list 20 will be issued on October 17th. Tenders for list 20 by October 25th and for other above-mentioned lists by October 8th.

WEST RIDING EDUCATION COMMITTEE, October 8th.—15th.—Electric light installation at Thurlstone New School. Specifications, etc., from the Education Officer, County Hall, Wakefield, until October 8th. Tenders by October 15th.

DUNDEE CORPORATION, October 9th.—Supply of l.t., paper insulated, lead covered and double steel tape armoured cable, to B.E.S.A. specification for working pressure up to 660 V. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links, one 30 000 kVA busbar coupler equipment, with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18–24, Lower Clapton Road, E.5; deposit £3.

CLUTTON GUARDIANS, October 14th.—Electric light installation at the Institution. Specification, etc., from Mr. J. Wayne Morgan, 9, Mount Stuart Square, Cardiff; deposit £2 2s.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 22nd.—Twelve months' supply of electric cables. Further particulars from the Electrical Engineer, Penrose Street, Walworth Road, London, S.E.17.

STAFFORDSHIRE EDUCATION COMMITTEE, October 31st.—Electric light installation in two new elementary day schools in Brettell Lane, Brierley Hill. Specification from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

DURBAN CORPORATION, September 27th.—Supply of three-phase, ironclad, compound filled switch panels (specification, S. 778). (Reference B.X. 5 505.)

SOUTH INDIAN RAILWAY CO., LTD., September 27th.—Convertor equipment for sub-stations, transformer switchgear and accessories, overhead transmission line, etc., in connection with electrification of suburban services. Specifications (£1) from the Company's Offices, 91, Petty France, Westminster, S.W.1.

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Supply and erection of electric power station for the town of Samannoud (Gharbieh Province). (Reference B.X. 5 596.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 28th.—Machine tools, Diesel and semi-Diesel engines, boilers, electric batteries, etc., for the Prisons Administration. (Reference A.X. 8 245.)

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MARLBOROUGH (N.Z.) ELECTRIC POWER BOARD, September 28th.—Supply and erection of 600 B.H.P. Diesel-driven generating plant and switchgear. (Reference B.X. 5 556.)

COMPANHIA DOS CAMINHOS DE FERRO PORTUGUESES, September 30th (extension of time).—Signalling apparatus. (Reference A. 8 427.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 30th.—Supply and erection of electric power station, with overhead and underground networks, for the town of Deirout. (Reference B.X. 5 598.)

STATE ELECTRICITY COMMISSION, VICTORIA, September 30th.—Supply and delivery of three 3 000 kVA, 50 cycle, oil immersed, self-cooled, outdoor type single-phase transformers and spare coils and bushing. (Reference B.X. 5 523.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 30th.—Twelve months' supply of electric lamps (tender No. 1 526). (Reference B.X. 5 590.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply of 48 busbar-supporting insulators, for use on three-phase, 50 cycle transmission system, 66 000 V between phases (specification 29/120). (Reference B.X. 5 686.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Three 3 000 kVA transformers and spares. (Reference B.X. 5 523.)

VICTORIAN ELECTRICITY COMMISSION, September 30th.—Supply, erection and maintenance of coal conveying plant. Specification (No. 29/68) from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; returnable deposit £2 2s.

WELLINGTON CORPORATION, September 30th.—Electric motors, starters and switchgear, for the Milk Department. (Reference B.X. 5 508.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 1st.—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B.X. 5 567.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—Supply of electric lamp standards. (Reference A.X. 8 251.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 1st.—Supply and delivery of switchboard cords. (Reference B.X. 5 515.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 1st.—Supply of bolts, brackets, screws, springs, etc., for British Post Office No. 121 wall telephones and No. 2 receiver switch (Tender No. P. and T., 151/1 700.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 2nd.—Supply and erection of electric power station for Dessouk Town (Gharbieh Province). (Reference B.X. 5 597.)

SYDNEY CITY COUNCIL, October 2nd.—Supply of 6 600 V metal-clad switchgear for Argyle sub-station (specification No. 858; 2s. 6d.); 2 200 V ironclad switchgear for Town Hall sub-station (No. 856; 2s. 6d.); and 1 500 V switchgear for Argyle sub-station (No. 857; 2s. 6d.). Specifications can be obtained from the Chief Engineer, 61, Hunter Street, Sydney, N.S.W.

VICTORIAN RAILWAY COMMISSION, October 2nd.—Supply of a.c. line relays for power signalling. (Reference B.X. 5 563.)

SOUTH AFRICAN POLICE, October 3rd.*—Supply of electric torches, etc. (local indent No. 50.) (Reference C.X. 3 118.)

NEWRY URBAN DISTRICT COUNCIL, October 10th.—Electric lighting of Town Hall and Technical School. Specifications, etc., from the Electrical Engineer and Manager, Electricity Works, King Street, Newry; deposit £2 2s.

Telephone Equipment for Australia.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 15th.—Switchboard instruments, test plugs and sleeves (schedule C. 472). (Reference B.X. 5 541.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 15th.—Telephone jacks (schedule No. C. 488). (Reference B.X. 5695.)

JOHANNESBURG MUNICIPALITY, October 17th.—Tramcar motors (contract No. 253). (Reference B.X. 5 664.)

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Turbo-alternators, steam piping, crane and switchgear (contract 52). (Reference B.X. 5 607.)

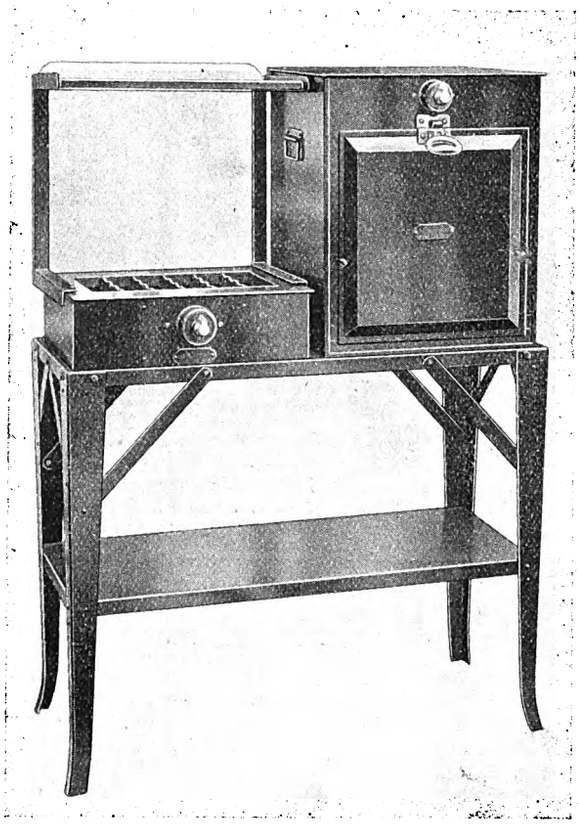
SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Supply of h.t. cables, transformers and sundries, in connection with extensions of the electricity undertaking (contract 53). (Reference B.X. 5 604.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 17th.—One 10-ton electric overhead travelling crane (tender No. 1 533) (Reference A.X. 8 463.)

ROUMANIAN GENERAL POST OFFICE, October 18th.—Supply of 31 500 kilos of 3 mm. h.d. copper wire. (Reference A.X. 8 551.)

WELLINGTON CORPORATION, October 21st.—High and low tension switchgear (contract No. 449). (Reference B.X. 5 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Supply of insulated wire (schedule C. 475). (Reference B.X. 5 580.)



ONE of the new cookers introduced by the Wynsor Electric Range Co., Ltd.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Telephone transformers (schedule C. 474). (Reference B.X. 5 581.)

VICTORIAN RAILWAY COMMISSION, October 23rd.—Dry-core telephone cable (contract No. 43 384). (Reference B.X. 5 638.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, October 29th.—Railway traction motor testing equipment, comprising electric motor, booster, main field excitation generator and short field exciter (quotation No. B.E. 508). (Reference B.X. 5693.)

MELBOURNE CITY COUNCIL, October 30th.—Two 2 500 kW motor-convertors and accessories, or two 2 500 kW rotary convertors, with transformers and accessories. (Reference B.X. 5 570.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 30th.—Head receivers (P. and T. 151/1 725.) (Reference V.X. 5 603.)

JOHANNESBURG MUNICIPALITY, October 31st.—Steel tramway rails, fishplates, manganese points, etc. (contract No. 257). (Reference A.X. 8 523.)

ARGENTINE STATE RAILWAYS, November 4th.—Turbo-generator sets, and headlights for locomotives. (Reference B.X. 5 657.)

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Distribution pillar shells and link units and cable sealing ends. (Reference B.X. 5 682.)

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Low tension porcelain insulators, etc. (Reference B.X. 5 648.)

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VICTORIAN ELECTRICITY COMMISSION, November 4th.—Circuit breakers and operation recorders. (Reference B.X. 5 677.)

VICTORIAN ELECTRICITY COMMISSION, November 4th.—Supply of 6 600 V automatic voltage regulators and spares (specification 29/83). (Reference B.X. 5 637.)

VICTORIAN ELECTRICITY COMMISSION, November 4th.—Circuit breaker operation recorders (tender sheet No. 29/111.) (Reference B.X. 5 677.)

THE new showrooms of Allen-Liversidge, Ltd., at 123, Victoria Street, London, S.W.1. The building was at one time the residence of Lily Langtry, the actress.

NEW ZEALAND POSTS AND TELEGRAPHS, November 12th.—Four-conductor telephone operators' cords. (Reference B.X. 5 685.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 12th.—Supply of 15 kW generating set for installation on the "Maui Pomare" (tender No. 369). (Reference B.X. 5 683.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Transmitters and associated parts (schedule C. 476). (Reference B.X. 5 653.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Receivers and associated parts (schedule C. 477). (Reference B.X. 5 656.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 14th.—Supply of 400 000 lb. of hard drawn copper wire, 2 000 lb. of soft drawn copper wire and 2 000 lb. of soft drawn, tinned copper wire (tender No. 173). (Reference A.X. 8 510.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Supply of telephone generators and motor generators (schedule No. C. 479). (Reference B.X. 5 662.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Motor generators (schedule C. 486). (Reference B.X. 5 694.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92.) (Reference B.X. 5 614.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Vitreous resistances, each consisting of wire element wound in vitreous spool, for telegraph battery feeds (schedule C. 489). (Reference B.X. 5 696.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General for Western Australia, Savoy House, Strand, London, W.C.2.

INDIAN STORES DEPARTMENT, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

ARGENTINE NATIONAL SANITATION WORKS DEPARTMENT December 9th.—Supply of 8 electrically driven centrifugal pumping sets, 3 air compressor sets and 20 centrifugal exhausters. (Reference A.X. 8 509.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 10th.—Three single-phase, oil insulated, water-cooled transformers, with accessories (section 295). (Reference B.X. 5 600.)

VICTORIAN ELECTRICITY COMMISSION, December 16th.—Oscillographic equipment (specification No. 29/115). (Reference B.X. 5 692.)

Tenders Accepted.

PORTSMOUTH CORPORATION.—English Electric Co., Ltd. supply of four kiosk sub-stations, £1 080.

CHESTERFIELD CORPORATION.—Chesterfield Engineering Co., electric wiring at swimming bath, £11 17s.

DUDLEY CORPORATION.—Cook and Son, electric light installation in 564 dwelling-houses on the Priory Estate, £2 566 4s.

WATLINGTON (OXFORDSHIRE) PARISH COUNCIL.—Watlington Estates Development Co., electric street lighting.

GAINSBOROUGH URBAN DISTRICT COUNCIL.—Worthington-Simpson, Ltd., electrification of the river punping plant, £438.

PAIGNTON URBAN DISTRICT COUNCIL.—A. R. and E. Wallis, electric light installation at School of Science and Art, £39.

MANCHESTER CORPORATION.—Edgar Allen and Co., Ltd., and Titan Trackwork Co., Ltd., tramway special track work.

BARKING URBAN DISTRICT COUNCIL.—A. Reyrolle and Co., Ltd., supply and erection of three panels of switchgear, £822. (Recommended).

HORNSEY CORPORATION.—Hewittic Electric Co., supply of Hewittic balancer, at Oakfield Road sub-station, £1 308. (Recommended).

LEICESTER CORPORATION.—Oerlikon, Ltd., reconstruction of turbine and construction of pipe line, £15 700 (Recommended). English Electric Co., Ltd., also tendered, £17 082.

DUNDEE CORPORATION.—D. J. Macdonald, Ltd., electric light installation in connection with erection of 192 single-apartment, 72 two-apartment, and 44 three-apartment houses, £1 280.

UTTOXETER URBAN DISTRICT COUNCIL.—Power Lines Construction Co., contracts 1, 2, and 2a, £2 807, £7 866 and £1 933, and Crompton Parkinson, Ltd., contract 3, £1 480, in connection with the electricity scheme.

BANGOR (IRELAND) COUNCIL.—Johnson and Phillips, Ltd., cable and transmission line work, £33 000; Metropolitan-Vickers Electrical Co., Ltd., e.h.t. switchgear, £189; G. Ellison, h.t. and l.t. switchgear, £2 192; Chamberlain and Hookham, Ltd., meters, £846.

PORTSMOUTH ELECTRICITY COMMITTEE.—Transformers: English Electric Co., Ltd., four 100 kVA, £84 each, and six 200 kVA, £124 10s. each; Hackbridge Electric Construction Co., Ltd., two 300 kVA, £163 each, and two 500 kVA, £234 each; Western Electric Co., Ltd., supply of magneto switchboard, at mental hospital, £58 10s.

GENERAL POST OFFICE.—Manufacture, supply, drawing in, etc., of cable: Maidenhead-Reading, Callender's Cable and Construction Co., Ltd.,; Sunderland-Sheraton, British Insulated Cables, Ltd.; telephone exchange equipment: Cowley and Headington (Oxford area), and Whitworth (Rochdale area) and Rochdale, Standard Telephones and Cables, Ltd.; Wednesbury (Birmingham), Putney North, Terminus, and Paddington (London), Automatic Telephone Manufacturing Co., Ltd.; Rochdale, G. Clark and Son, Ltd., and Relay Automatic Telephone Co., Ltd.; telephone repeater equipment, Standard Telephones and Cables, Ltd.

CAPE TOWN CORPORATION.—British Insulated Cables (S.A.), Ltd., 25 tons 0·1 stranded h.d. copper wire, £102 12s. 9d. per ton, 3 tons galvanised iron stay wire, £19 per ton; Associated Engineers' Co., Ltd., 10 tons 0·025 stranded copper wire, £103 8s. 6d. per ton; Johnson and Philips, Ltd., 15 miles of insulated wire, £23 3s. per mile; Albert Vaux, Ltd., ½ ton tinned copper binding wire, £124 per ton; F. W. Searle, supply of motors, £1 354 10s.; Hubert Davies and Co., supply of 4 000 single-phase house service meters, of Sangamo type, 17s. 11d. each; A. Reyrolle and Co., Ltd., supply of 11 000 V switchgear, £1 632, and l.t. switchgear, £4 101; Allenwest (S.A.), Ltd., switchgear for New Somerset Hospital, £218 10s., and for premises in dock area, £357 10s. (All recommended.) G. H. Langler and Co., cable, manufactured by Netherlands Cable Works, £1 116 16s. 11d. (Recommended.) (Lowest British tender: Paul Gregson and Urquhart, for cable made by Craigpark Electrical Co., £1 243 10s. 11d.)

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WORK IN PROSPECT.

ASHTON-UNDER LYNE.—Housing scheme (92). Particulars from the Borough Surveyor.

BEXLEY.—Houses (62), Westwood Lane, Welling, for Mr. T. H. Jones.

BRISTOL.—Extensions, female sick block, Eastville Institution. Particulars from the clerk, Mr. Thomas S. Lamb, St. Peter's Hospital.

BURNLEY.—Housing scheme (120). Particulars from the Borough Surveyor.

RICHMOND (SURREY).—Bank extensions, Westminster Bank. Particulars from Brewer, Smith and Brewer.

ROMFORD.—Four schools. Particulars from the Director of Education, Chelmsford.

ROTHERHAM.—Houses (40), Thrybergh, for the Rural District Council. Particulars from contractors, Messrs. R. Snell and Sons, Ltd.

SHANKLIN.—Additional housing scheme, for Urban District Council. Particulars from Surveyor.

SITTINGBOURNE.—Additional 60 houses. Particulars, the District Surveyor.

SLOUGH.—Church and Sunday schools, Stoke Poges Lane, for Mr. W. C. Edwards.

SLOUGH.—Secondary school, and extensions to Montem School. Particulars from Education Architect.

SOUTH MIMMS.—Houses (120). Particulars, the Grosvenor Construction Co.

SOWERBY BRIDGE.—Development of Willow House Estate for houses, for Helliwell and Shaw.—Houses (18), for Mr. E. Richardson.

SPENNYMOOR.—Cinema theatre to cost £10 000. Particulars from Mr. Arthur Vasey, Tivoli (Spennymoor) Ltd.

STOCKTON-ON-TEES.—Sunday schools. Particulars, Mr. J. C. Watson.

ST. AUSTELL.—Hotel. Particulars from architects, Messrs. Andrew and Randall.

ST. HELENS (LANCS).—Bank, Hardshaw Street, for the Union Bank of Manchester, Ltd.

ST. HELENS.—Maternity hospital block, etc. Particulars from the architects, Biram and Fletcher, 17, George Street.

THORNE.—Schools. Particulars, Education Architect, County Hall.

WAKEFIELD.—Housing scheme (64). Particulars, Mr. H. Plewes, Council Hall.

WATFORD.—Grammar school extensions. Particulars from clerk, Mr. Frederick Wilson, 7, Church Street.

WELWYN GARDEN CITY.—Hospital. Particulars, the Secretary.

WESTGATE-ON-SEA.—School, for Roman Catholic Managers, Particulars from Correspondent, Tower House.

BATTERY SALES.

Details of the "Exide Fortnight"—Competitions for Trade and Public.

THIS year the CHLORIDE ELECTRICAL STORAGE CO., LTD., has extended the customary "Exide Week" into double that period, October 7th to 19th, and definite schemes are in operation to induce wireless users and car owners to choose and buy "Exide" batteries during the "fortnight." These plans, besides resulting in an immediate improvement in sales, will provide valuable propaganda. This will be consolidated and maintained by an extensive national advertising campaign, which the Chloride Co. has already decided upon.

Two schemes to secure record sales during the fortnight have been prepared. These are, for the trade, an "Exide" window display competition with over £200 in cash prizes; and, for the buying public, a limerick competition with over £1 000 in prizes. The first prize in the limerick competition is an "Essex Challenger" six-cylinder coach priced at £250, and there are 124 other prizes consisting of wireless sets, loud speakers, trickle chargers, other wireless accessories, and batteries for wireless or cars.

Full details of the window display competition are contained in a specially prepared illustrated folder obtainable from the Chloride Co., Clifton Junction, Manchester. The limerick competition is a new departure and the trade must inevitably benefit, because the qualification for entrance is the purchase during "Exide Fortnight" of an Exide battery or trickle charger. The competition is being advertised all over the country, and competitors can obtain competition entry forms on which the limericks to be completed are printed only from "Exide" dealers.

TRADE PUBLICATIONS.

MESSRS. JAMES MILLS, LTD., of Bredbury, near Stockport, have issued a new folder relative to grooved pins.

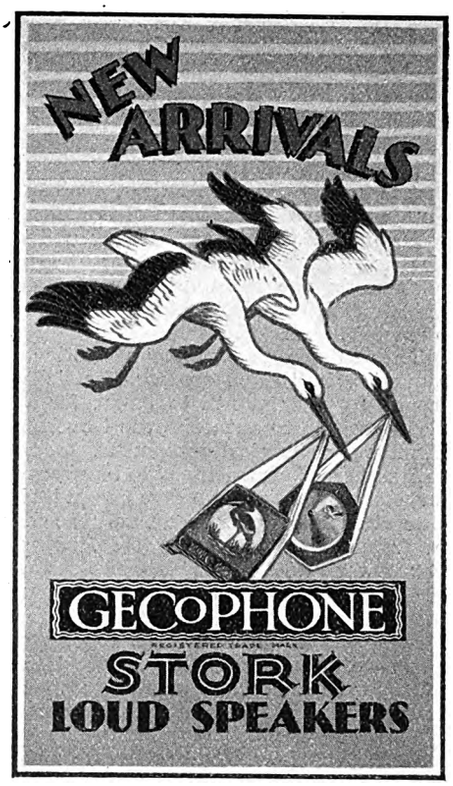
We have received from FRY'S (LONDON), LTD., 24/26, Water Lane, London, E.C.4, a new leaflet dealing with "Enox-It" hack-saw blades.

Aerial cable unions form the subject of publication P. F. 58, just received from BRITISH INSULATED CABLES, LTD., of Prescot, Lancs.

Book 7, section 4A, dealing with the unification of workmen's recorders, has been published by GENT AND CO., LTD., Faraday Works, Leicester.

The BRUSH ELECTRICAL ENGINEERING CO., LTD., Falcon Works, Loughborough, has issued new brochures dealing with liquid starters.

SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham, have issued a special mailing letter relative to industrial and street lighting reflectors.



A new show card issued by the General Electric Co., Ltd.

Among the latest literature of J. H. TUCKER AND CO., LTD., of Kings Road, Tyseley, Birmingham, is folder F. 2, describing fuseboards in iron and teak cases.

A copy of list No. 617, concerning "Sunstar" reflectors, has been received from FALK, STADELMANN AND CO., LTD., of 83/93, Farringdon Road, London, E.C.1.

Among the latest publications of A. P. LUNDBERG AND SONS, LTD., is leaflet E.77 which deals with multiple water-control switches for aeroplanes, motor boats, etc.

A special leaflet has been issued by STERNOL, LTD., of Royal London Square, Finsbury Square, London, E.C.2, dealing with "Cooloricid" for the prevention of overheated bearings.

"What you can get for £4," is the title given to a mailing card issued by the CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Road, London, S.W.1. The subject-matter deals with a complete lamp and scale outfit.

Cab tyre sheathed cables are the subject of a new publication by CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, London, E.C.4. A special leaflet relative to "Anchor" adhesive tape has also been issued.

"Induced Draught and Fuel Dust Arresting" is the title given to a new publication of JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, London, E.C.4. Catalogue No. VI, dealing with volume fans, has been reprinted in revised form.

The STANDARD WET BATTERY CO., 184/188, Shaftesbury Avenue, London, W.C.2, has issued a new booklet dealing with the company's new cartridge cells. Literature regarding radio testing instruments, "Star" loud speaker units and wet batteries is also available.

The MARTINDALE ELECTRIC CO., LTD., The Hyde, Hendon, London, N.W.9, has issued further literature concerning armature air gap gauges and coil tapping tools for armature repairs, mica slotting files, commutator cements, and the "Martindale" electrical etcher.

Recent publications of the MULLARD WIRELESS SERVICE CO., LTD., Charing Cross Road, London, W.C.2, include leaflet W.A. 19/1A, dealing with "C" type loud speakers, W.A. 12/1A relative to the "P. 17" grid leak, and W.A. 17/2A describing the combined grid leak and condenser holder.

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ELECTRICITY SUPPLY.

Fresh Negotiations for Sale of Peterborough Undertaking—Southend Corporation Refuses to Defy Commissioners—Dover Committee Favours Bulk Supply—Irish Municipalities Oppose Valuation Charging.

HULL Corporation has received sanction to a loan of £79 000 for extensions of its electricity undertaking.

It is stated that Peterborough Corporation is about to negotiate with a syndicate for the sale of its electricity undertaking.

The new electricity supply for the Barnoldswick area, which is being obtained from Nelson Corporation, was switched on last Saturday by Mr. A. Carr, chairman of the Council, and Mr. J. S. Windle, chairman of the Electricity Committee.

Torquay T.C. has applied for a Special Order to supply electricity in the urban district of Ivybridge and to certain parishes in the rural districts of Kingsbridge and Totnes. The Council has also decided to oppose a similar application by Mr. W. G. Heath.

The Ontario Government's election manifesto promises a reduction in the charge for electricity supplied to farmers from $4·55 per month to $2·50, for a 100-acre farm. It is also proposed to authorise the Government to lend money to farmers for electrical equipment.

A supply of electricity is to be given to the Hockley Heath and Lapworth district before the end of the year by Birmingham electricity department, and the charges for lighting will be from 6½d. to 4½d. per kWh, according to consumption. For power and heating the charges will range from 2d. to 1¾d., and for water heating for domestic purposes the price will be ¾d.

Members of Southend T.C., at a meeting of the Council last week criticised the action of the Electricity Commissioners in postponing the inquiry concerning additional plant, and the Electric Lighting Committee recommended the purchase and installation of machinery costing £210 000, without waiting for sanction, the amount to be paid out of revenue or reserve. The proposal was rejected by 23 votes to 9.

Burton-on-Trent T.C. is to extend the mains to Hartshorne from Woodville, and to lay a duplicate main from Woodville to the Milton Waterworks at an estimated cost of £6 392 12s. 9d. Provided there is a guarantee of revenue up to £200 per annum, an extension is to be made to Anslow at a cost of £847 13s. 8d., and also to Stanton at an estimated cost of £831 2s. 4d.

At a recent sitting of the Valuation Committee of the Stewartry County Council the Dalry Electrical Supply Co., Ltd., appealed against the assessment of its engine house, machinery, and mains, and asked for a reduction from £155 to £50. The assessor said he did not know of any reason why a small electrical undertaking should be on a different basis than a large one. He consented to a reduction of the valuation to £139.

An objection is to be lodged by Chailey R.D.C. against an application by Johnson and Phillips, Ltd., for a Special Order to supply electricity in the Council's area, on the ground that part of the parish of Ditchling is included in the area of the Central Sussex Electricity, Ltd., and should be withdrawn, and that portions of the parishes of Beddingham, Glynde, Hamsey, Ringmer and West Firle should be included in the compulsory area.

At a recent sitting of a Commission to consider the application of Douglas (Isle of Man) T.C. for permission to supply electricity to parts of the parish of Onchan, including the Howstrate Estate, the Manx Electric Railway, Ltd., claimed to have legal rights to supply electricity on the Howstrate Estate, from which £1 200 a year was derived. Mr. Kneen, for the Corporation, contended that the Railway Co. had the right to use the estate for the purposes of the railway only.

Glasgow Corporation has granted sanction to the district engineer, Central Electricity Board, to the laying of an auxiliary pilot cable in connection with the Central Scotland Electricity Scheme, to connect (1) the Dalmarnock and Port-Dundas power stations with the Yoker power station of the Clyde Valley Electrical Power Co.; (2) the Yoker station with the Blackhall station of Paisley Corporation; and (3) the Dalmarnock station with the Cambuslang station of the Clyde Valley Electrical Power Co.

Mr. J. S. Highfield has reported to Dover Electricity Committee on a proposal of the Central Electricity Board to give the Corporation a bulk supply at not exceeding £3 17s. 6d. per kW of maximum demand, plus 0·2d. per kWh, subject to a coal clause. Mr. Highfield states that he can see no better way of providing for the future on the general lines of this offer. The Committee recommends the Corporation to agree to the proposal in principle, and has asked Mr. Highfield to negotiate further with the Board and report again.

At a recent meeting of Bradford Gas Committee a report was presented with reference to damage to a gas main which is said to have been caused by the fusing of an electric cable, and the Gas Engineer was instructed to take the matter up with the City Electrical Engineer with a view to co-operation between the two departments regarding the laying of mains.—The Electricity Committee recommends the extension of e.h.t. mains from Valley Road power station to Roundhill Street transformer chamber, and the provision of a transformer chamber in Bowling Old Lane district, etc., at a total cost of £24 000.—The Committee has agreed to the proposal of the Yorkshire Electric Power Co. to give a supply to the Leeds Fireclay Co. in the Tong Lane district.

At the Ministry of Transport inquiry by Mr. F. Gordon Tucker, at Eastbourne recently, the Central Electricity Board's proposal to erect overhead lines between Brighton, Eastbourne and Hastings was opposed by the East Sussex County Council, Eastbourne Corporation and other district authorities, on the ground of disfigurement of the countryside and town approaches by the suggested line of 285 steel lattice masts eighty feet high, with an average span of 900 feet. Mr. O. L. Sherrard, for the Central Board, asked the Ministry to sanction the official scheme, which had been carefully designed in furtherance of the Government's national plan of electricity supply. The opposition, he said, was from a few local bodies and was narrow and selfish. Mr. Seagar, for local areas other than that of the East Sussex County Council, said there was nothing in the Act to say the supply was to be overhead.

At the sitting of the Irish municipal authorities in Cork, on September 11th, exception was taken to basing charges for electricity supplied by the Shannon scheme on valuation instead of on the consumption per kWh. The mayor of Clonmel (Ald. Condon) said the charge on the basis of valuation was not equitable, because the valuation varied very much in the different towns and cities. Mr. T. D. Donnelly (Waterford) said that if the Electricity Board were going to ignore the wishes of the people the Shannon scheme had no hope of success. In the city of Waterford hundreds of people had got their houses wired, but when they heard the basis of the proposed charges they made up their minds that they would let those installations go by default. Mrs. Kettle (chairman, Rathmines U.D.C.) urged that the public should be supplied either on a flat rate or under the valuation system. It would appear that, under the valuation system, they would pay at least double, unless they used a very large amount of electricity. A resolution was passed asking for the alternative system of payment, according to the wishes of the consumers, and the fixing of a uniform charge per lamp for public lighting.

Mr. F. X. Algar, director of public lighting contracts to the Irish Free State Electricity Supply Board, attended a recent meeting of Limerick Corporation Electricity Committee, called to consider the question of lighting the city entirely by electricity. Mr. Algar said there were 507 gas and 53 electric lamps in the city. There were in the city at the present time certain net-works put up by the Electricity Supply Board which were available for public lighting. If the Corporation were satisfied with his price he would have the net-work system established in the whole city. When the Board's system came into operation the Corporation could cut out 200 gas lamps, which gave 24 000 c.p. against 122 000 c.p. from the 356 lamps, which he would provide within two months. In addition to the 53 lamps at present in existence, gas lighting was now costing £2 616, and he proposed to give 356 electric lamps, plus 53 at present, for £1 031 13s. 4d. He would give 409 electric lamps for £2 561 and more than that number if they had the poles erected. He would guarantee to supply the Corporation next year with a minimum 800 electric lamps without exceeding the estimate (£4 000) for public lighting this year. The matter was referred to a special meeting.

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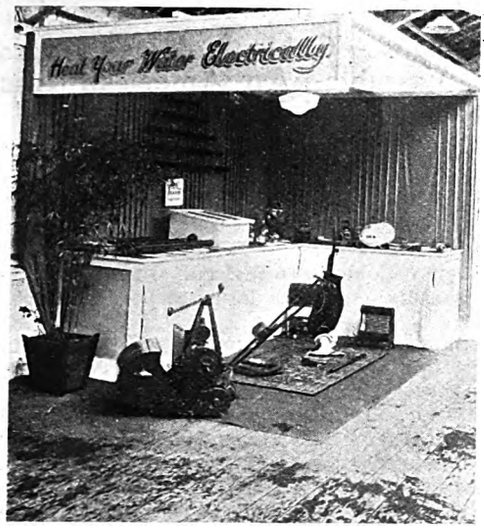
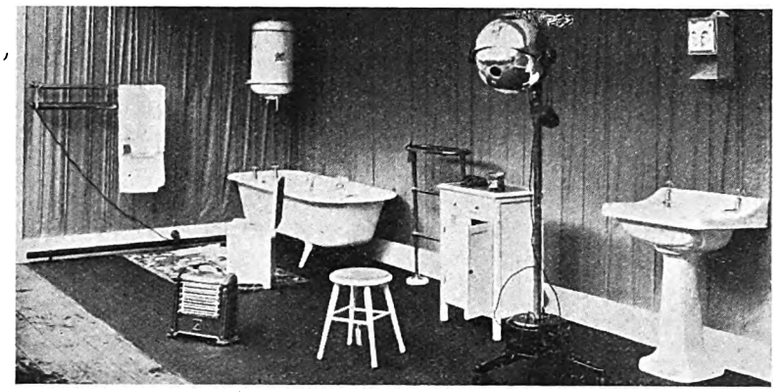
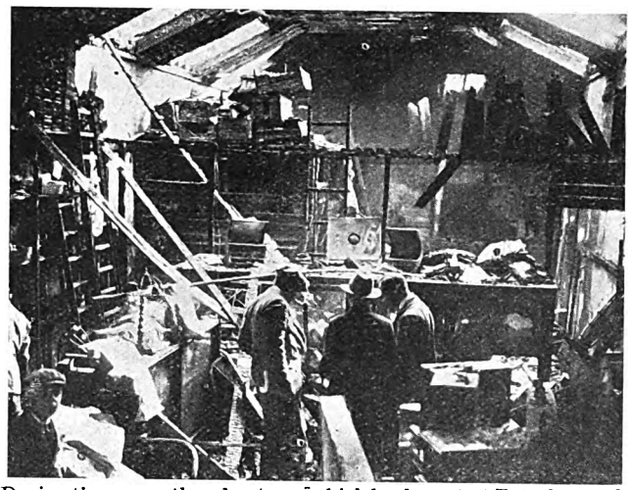
ELECTRICAL NEWS OF THE WEEK IN PICTURES.





A system of tubular heating for conservatories and an electrically-operated lawn mower were features in a well staged display by Birmingham Electric Supply Department at the annual flower show promoted by the "Birmingham Gazette" and held at Bingley Hall, Birmingham, recently. The department's exhibit also included model dining rooms and a lounge, bathroom and kitchen, in each of which the uses of electricity were demonstrated in a practical manner. There were also on view appliances for water heating, room heating, washing, cooking, etc. These two photographs of the exhibit are typical of the well laid out arrangement.

The Lord Mayor of Cardiff opening the new local showrooms of the General Electric Co., Ltd., last week, by switching on the light by means of a photo-electric cell. To his left may be seen Mr. W. E. Hobbs, manager of the Cardiff Branch, and to his right Ald. Snook and Mr. M. J. Railing, joint managing director of the G.E.C. See page 358.



During the severe thunderstorm which broke out at Peterborough last week the premises of Northants Electrical Installations, Ltd., were struck by lightning and, as this picture shows, considerable damage was done by fire following the hit. Many of the electric heaters and other appliances which were on show may be recognised among the debris.

A general view of the National Radio Exhibition which opened at Olympia, London, on Monday. The exhibition is this year larger than ever. From the popular point of view the most important feature of the exhibition is that for the first time loud speaker demonstrations are being given and the public thus have an opportunity of judging the merits of apparatus by audible tests. This important innovation, which overcomes one of the drawbacks of previous shows, has been made possible by the construction of a number of "sound-proof" demonstration rooms round the hall. The loud speakers used in them are fed from a common apparatus controlled by the B.B.C. thus eliminating the possibility of a multitude of different receiving sets producing mutual interference. See page 369.

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COMPANY NEWS.

Electrical Descriptions Not Seriously Hit by Hatry Collapse—Cable Holdings Improve—Manufacturing, Supply and Communication Interests Variable—An American Insulating Materials Combine—Company News, Reports and Dividends.

THE market for electrical shares shows, despite the Hatry collapse, a number of substantial rises in the manufacturing section. Henley's are up to £6 13s. 9d., 6s. 3d. higher than a week ago; British Insulated Cables have risen 2s. 6d., and Callender's 1s. 3d. English Electric 6% preference are 7½d. higher at 8s. 9d., and Crompton-Parkinson 6% preference 3d, higher at 17s. 9d. General Electrics are 1s. 3d. down, as also are Ever Readies, and, in the lighting and supply section. Metropolitan ordinary, Cables and Wireless "B" have dropped sharply to 60, and Marconi's Marine are 2s. 6d. lower at 57s. 6d.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	1926 to 1928. Lowest.
	Electricity Supply.				
(*l*)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	23/-	23/-	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	57/6	57/6	68/6	25/9
6	" " " " 6% C.P.	23/-	23/-	24/-	21/3
(*c*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
1/93	Lon. Elec. Sup. Ord. (£1)	27/6	27/6	37/6	23/-
1/98	Metro. Elec. Sup. Ord.	46/3	47/6	53/-	24/9
4½	" " " 4½% C.P.	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/28	N'castle-upon-Tyne Elec. Sup. Ord.	26/10½	26/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P.	23/-	23/-	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	22/6	22/6	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord.	36/6	36/6	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	127½	127½	152	117
7·67	" " " " 6% Pf. Stk.	127½	127½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4	" " " 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	77½	78½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	76½	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	59½	60½	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	67	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk.	72	72½	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	114½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
7	Underground Electric Rlys. Ord.	23/-	23/-	28/2	11/-
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	80/-	77/6	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	22/6	22/6	24/9	19/7
7	" " " 7% Deb.	104½	103½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	130½	153½	120
15	Callender's Cable Ord.	80/-	78/9	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
8	Crompton-Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	17/9	17/6	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/-
—	English Elec. Ord.	8/1½	8/1½	15/9	5/-
—	" " 6% C.P.	8/9	8/1½	18/9	7/-
7	Ericsson Telephones 7% Pref. ..	20/-*	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	20/6	21/9	92/3	18/1
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	56/3	57/6	46/6	26/6
25	W. T. Henley's Ord.	133/9	127/6	120/-	69/3
10	Johnson & Phillips Ord.	40/-	40/-	67/11	34/-
7½	Lon. Elec. Wire. & Smith's Pref.	23/9	23/9	25/-	22/3
7½	Siemens Bros. & Co. Ord. ..	28/9	28/9	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	84½	84½	—	—
	"B" Ord Stk.	60	70½	—	—
	5½% Cum. Pref. Stk. ..	94½	95½	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Gt. Northern Telegraph (£10) ..	31	31	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	57/6	60/-	90/-	16/6
4	Western Tel. 4% Deb. Stk. ..	77½	77½	82	76

(*a*) 19⅞d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. * Ex dividend.

BURNDEPT WIRELESS (1928), LTD.—Transfer books are closed until Sept. 30, inclusive.

BRITISH ALUMINIUM CO., LTD.—Intm. div. of 4% actual, less tax (same as last year) on ord. shs. will be payable on Oct. 1.

ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. at rate of 8% p.a., less tax (same as last year) on ord. shs. is announced.

ELECTRICAL FINANCE AND SECURITIES CO., LTD.—Intm. div. of 4%, less tax, on ord. shs. (same as last year) will be payable on Sept. 30.

PARKER, WINDER AND ACHURCH, LTD.—Intm. div. at rate of 5% p.a. on ord. shs. for half-year ended June 30 (same rate as last year) is announced.

ASSOCIATED FIRE ALARMS, LTD.—Div. of 8%, tax free, on ord. shs. for year ended June 30, 1929 (same rate as last year), will be payable on Oct. 9.

FOLKESTONE ELECTRICITY SUPPLY CO., LTD.—Intm. div. at rate of 8% p.a., tax free (same as last year) on ord. shs. for half-year will be payable on Oct. 1.

BRUCE, PEEBLES AND CO., LTD.—Div. at rate of 7½% p.a., less tax, on the 7½% cum. participatg. pref. shs. for half-year ended June 30, 1929, will be payable on Sept. 30.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.—Transfer books will be closed from Oct. 1 to 14, inclusive, for preparation of pref. and ord. div. warrts.

DIRECT SPANISH TELEGRAPH CO., LTD.—Div. for half-year to June 30, 1929, at rate of 10% p.a. on pref. shs. and intm. div. of 4%, tax free, on ord. shs. will be payable on Oct. 1.

KUCHENMEISTER INTERNATIONAL WIRELESS CO.—This company, a subsidiary of the Kuchenmeister International Co. for Acoustics, has been formed in Amsterdam with a cap. of £200 000.

TELEPHONE COMPANIES' ARRANGEMENT.—It is reported that the L.M. Ericsson Telephone Co.'s Mexican subsidiary has arrived at an agreemt. with the Bell Telephone Co. of America with regard to telephones in South America and Mexico.

PHILIPS' GLOWLAMPWORKS, LTD.—An issue of £1 300 000 ord. shs. at 120% and £440 000 cum. pref. shs. at 130% to hldrs. in proportn. of three old shs. to one new was announced on Tuesday. The new shs. are entitled to a qrtr. of the 1929 div. This will make total cap. £5 200 000 ord. and £1 770 000 cum. pref. shares.

OFFICIAL QUOTATIONS.—Official quotations have been granted by the Stock Exchange Committee to £344 916 7½% non-cum. "A" ord. stk., £198 083 "B" ord. stk., and £275 892 5½% cum. pref. stk. of Cables and Wireless; and 4 626 £1 fully paid ord. shs. of Underground Electric Railways Co. of London, Ltd.

POWER CORPORATION OF CANADA.—Accts. for year to June 30, 1929, show increase of over $1 000 000 in net earngs. of $2 846 418 compared with previous twelve months. Int. $400 589, pfd. stk. div. $680 000, div. on common stk. $394 842; disct. on deb. issued $550 000. Blce. at credit raised from $1 681 932 to $2 502 919.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—Rev. for 1928, £1 034 619; balance to net rev. acct., £373 517. Int. on mtges., tempy. loans and deb. stk., £37 506; to res. for 5% mtges. £2 000; to redemptn. fund, £8 750; to res. acct., £120 705; div. on 6% cum. pref. shares to Dec. 31, 1928, £69 000; div. on ord. shares at rate of 10% p.a., £127 500; fwd., £28 202.

UNITED STATES ELECTRIC POWER CORPORATION.—In conjunctn. with American Founders' Trust, Equitable Trust, and certn. other American interests, Hydro-Electric Securities Corporation has formed the United States Electric Power Corporation, with cap. of 2 000 000 "A" shs. of no par value and 4 000 000 common shs. of no par value. The Hydro-Electric Securities Corporation holds 1 300 000 shs.

AMERICAN INSULATING MATERIALS COMBINE.—It is reported that the Johns-Manville Corporation, the Insulite Co., and the United States Gypsum Co., which have combined assets of $250 000 000, have formed a cartel, under which their distributing facilities at home and abroad will be pooled. The companies control a number of mines, electric power plants, railways, etc., and they have a big export business.

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COMPANIA DE ELECTRICIDAD DE LA PROVINCIA DE BUENOS AIRES, LTD.—Hldrs. of coupons No. 36 attached to 5% 1st mtge. gold bonds, payable on Oct. 1, will receive payment at rate of 8s. p. coupon, tax free, provided that they are domiciled in United Kingdom and subject to British income-tax, on presentation of such coupons at the offices of Messrs. Binder, Hamlyn and Co., River Plate House, 12-13, South Place, London, E.C.2.

QUEBEC POWER CO.—Div. on common shs. of $\$\frac{5}{8}$ p. sh. for qrtr. ended June 30, 1929 (agst. $\$\frac{1}{2}$ p. sh. last year), will be payable on Oct. 15.—Shhldrs. are offered right to subscribe for an issue of common shs. of no par value at $50 p. sh. in proportn. of one new sh. for every ten old shs. held. Paymt. must be made to Aldred and Co., 24-28, Lombard Street, London, E.C.3, on or before Nov. 30. The new stk. will rank for divs. payable Jan., 1930, in respect of qrtr. ending Dec. 31, 1929.

COMPANIES TO BE STRUCK OFF THE REGISTER.—The following companies will be struck off the register, unless cause is shown to the contrary, before Dec. 13: Aladdin Lamps (Midlands), Elec. Car and Accessories Co., Farad Electrical Co. The following will be struck off the register unless cause to the contrary is shown before December 17th: General Battery Co.; Midland Radiotelephone Manufacturers; N.S. Battery and Equipment Co.; Winsum Electric Diffusers. It is also intended to remove the following companies from the register unless cause to the contrary is shown before December 20th: Auto-Sign Co., Skipton Electrical Co., Wireless Distributing Co.

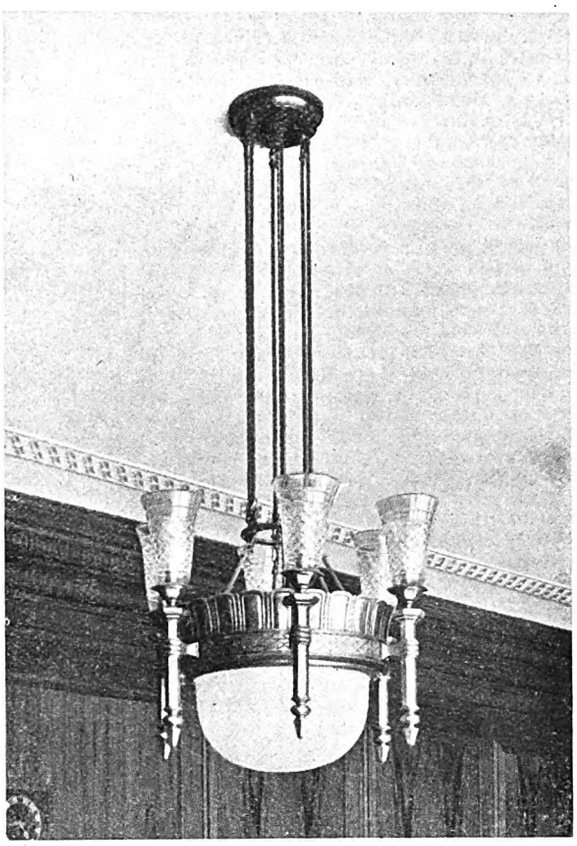
AMERICAN ELECTRICAL INVESTMENT COMPANIES.—A plan is to be submitted shortly to the shhldrs. of the Electric Bond and Share Co. and Electric Investors for the former company to take over the assets of the latter, on the basis of 8 shs. of common stk. of the former for each 5 common shs. of the latter. Hldrs. of pfd. stks. of Electric Investors are to receive pfd. stk. of Electric Bond and Share Co. on a sh. for sh. basis or $100 in cash and accumulated divs. The Electric Bond and Share Co. controls American and Foreign Power, which owns the bulk of the common stk. of companies supplying electric power and light, etc., in several South and Central American republics, and has also large interests in electrical undertakings in Canada, Italy, France and Germany.

SOUTHERN BRAZIL ELECTRIC CO., LTD.—Accts. for 1928 show loss of £3 530, compared with pft. of £9 055 for precedg. year. Pfts. earned in Brazil were £13 809, agst. £16 414, and income from investmts. in Brazil was £58 137, agst. £42 823. Loss is due primarily to amt. demanded by amortisatn. agreemt. of 6½% mtge. debs. made in 1927 (£13 500) and int. on £200 000 7% prior lien deb. stk. issued August, 1927. Int. has been paid in full on that stk., and also int. on original 6% deb. bonds at increased rate of 6½%, part of which has been met by moneys from issue of £200 000 of prior lien stk. The several undertakgs. in which company is interested continue to show satisfactory progress in currency rev. in almost every directn. So far the negotiatns. with municipal authorities for revisn. of rates to which subsidiary companies are in justice entitled in consequence of depreciatn. of Brazilian currency, which has increased the cost of maintenance and operatn., have not been concluded. The mtg. was held on Sept. 20 in Brazil.

BRITISH COLUMBIA TELEPHONE CO.—Operatg. rev. for year ended March 31, 1929, $4 768 312; maintenance, operatg., taxes, etc., absorbed $2 759 671; amt. placed to employees' benefit fund was $39 753, and depreciatn., $906 102; leavg. $1 062 784. Deb. int., $88 204; employees' savings plan int. $6 351; pension fund, $60 000; sinkg. fund. $24 234; divs. on ord. shs. $360 000, on pref. shs. $60 000; and on pfd. shs., $270 000; fire loss res., $20 000; blce., transferred to surplus, $98 995. At March 31, 1928, number of telephones in use was 102 010, and at March 31, 1929, 109 301. Company has under way engineering surveys with a view to conversn. of its metropolitan areas to dial system working. Result of these studies so far has warranted setting up plans to convert complete Victoria network, which will be cut over about July, 1930. Victoria has been selected for first conversn., principally due to the fact that large expenditures would have to be made for additional manual equipmt. and one or more central offices.

Company Meeting.

CROMPTON PARKINSON, LTD.—Mr. E. F. Parkinson, presiding at the meeting on September 19th, said the net profit during the twelve months ended June 30th, 1929, after provision for depreciation, interest and all other charges, was £82 572, compared with £70 826 for the previous financial period of fifteen months. The total sales of the company's products had exceeded those of any previous period; the net trading profit was the highest ever recorded, and their unexecuted order book at the close of the financial year was the largest they had ever had. The net profit, after providing for the dividends on the first and second preference shares,



ONE of the fittings recently installed by Messrs. Best and Lloyd in the Board room of the Permanent Co-operative Building Society's new headquarters, New Oxford House, London.

amounted to £49 308, equivalent to nearly 50% on the nominal amount of the ordinary share capital. In deciding the conservative recommendation of a final dividend on the ordinary shares of 18¾%, making 30% for the year, the board had borne in mind the proposal to make a further issue of ordinary shares, to which he would refer later. The sum of £12 000 which had been written off for depreciation this year was in excess of the normal depreciation written off in previous years. In order to maintain their manufacturing plant at the highest standard of efficiency the directors were pursuing the policy of installing the most up-to-date automatic machine tools and other equipment, and had decided to increase the amount written off as depreciation to cover the plant superseded. During the year they had repaid the whole of the debentures outstanding, amounting to £83 800. A complete review of the world's markets for electrical machinery and a careful consideration of the trend of future developments in electrical engineering showed that in certain directions the redesigning of certain lines and the introduction of new lines of manufacture were necessary. This work had been actively pursued during the past year, with the result that the company's products to-day represented the highest standard of manufacture in their respective lines, and were the leaders in many directions. The output from each factory had this year been the highest ever recorded, notwithstanding the abnormally large amount of development work which had been proceeding. The board considered that the employees' share scheme, started in 1919, was not achieving the object for which it was introduced, and therefore decided it should be discontinued. All the shares issued had been converted into 8% first preference shares, ranking *pari passu* with the other shares in this class. The board had decided to extend to the employees at Chelmsford the superannuation scheme which had been in operation at

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their Guiseley factory for some years. The board had decided to ask the shareholders to create for issue 200 000 ordinary shares, nominal value 5s. each, which would be offered to the existing ordinary shareholders at 10s. each in the ratio of one new share for every two shares at present held. The report was adopted, the dividends were approved, and the election of Col. R. E. Crompton as a director was confirmed.

New Companies.

L. CADEC, LTD.—Cap., £100. Electricians, etc. Reg. Office: 27, Greek Street, London, W.1.

R. DARBYSHIRE (WHOLESALE), LTD.—Cap., £2 000. Electricians, electrical and mechanical engineers, etc. Reg. Office: 2, St. John's Walk, Abingdon Street, Blackpool.

WALSALL HARDWARE MANUFACTURING CO., LTD.—Cap., £200. Electrical engineers and machinists. A permanent director: A. E. Read (man. dir.), Oakdale, Streetley, Staffs.

CRAVEN HYDRO-ELECTRIC SUPPLY CO., LTD.—Cap., £5 000. To carry on business of electric light and power company. Reg. Office: Linton Mills, near Skipton, Yorks. (Public Co.).

SIGNS AND PRODUCTS, LTD.—Cap., £500. Advertising contractors or agents, manufacturers of and dealers in illuminated and other signs, electricians, etc. Office: 45, Bedford Row, London, W.C.1.

A. AND E. DURN AND CO., LTD.—Cap., £1 000. Electrical and general engineers, manufacturers of and dealers in wireless, electrical and general sundries, etc. Permanent managing director and chairman: A. J. Durn, 432, Mawneys Road, Romford.

GREENWOOD AND SONS (MOTORS), LTD.—Cap., £3 000. To acquire business of a motor, electrical and general engineer carried on by S. J. Greenwood at Farley Works, Farley, South Norwood, as "Greenwood and Sons." Solicitors: Tatton, Gaskell and Tatton, 144, Kensington High Street, W.8.

VOCOSOL, LTD.—Cap., £30 000. To acquire, turn to account and trade with certain inventions relating to a system of translating mechanical vibrations into electrical waves, to carry on business of radio, electrical and cinematograph engineers, etc. Solicitor: J. E. M. Crowther, 23, Abingdon Street, Westminster, S.W.1.

ACE ENGINEERING CO., LTD.—Cap., £500. To acquire business of general engineer carried on by J. S. Bayfield at 20, Bucklersbury, London, E.C., as the Ace Engineering Co., and to carry on same and business of motor and electrical engineers, etc. Solicitors: Parsons, Evans and Francis, 5 and 6, Cork Street, Bond Street, London, W.1.

RUSHTON TRACTOR CO. (1929), LTD.—Cap., £200 000. To acquire undertaking of Rushton Tractors, Ltd., and to carry on business of electrical and general engineers and contractors, manufacturers of and dealers in motor and other tractors, omnibuses, etc. Solicitors: Slaughter and May, 18, Austin Friars, London, E.C (Public Co.).

BANDOLUX, LTD.—Cap., £5 000. To adopt agreement with Alois Geisen to manufacture and exploit travelling sign known as "Bandolux," to carry on the business of advertising agents and contractors by signs or by any other means, electricians, dealers in electricity, etc. Solicitors: Woolfe and Woolfe, 13a, Old Burlington Street, London, W.1.

J. W. LONCASTER AND SONS, LTD.—Cap., £5 000. To acquire the business of engineer and shipwright formerly carried on by the late J. W. Loncaster at Madeley Street, Hull, as "J. W. Loncaster and Sons," and to carry on same and business of electrical and general engineers, etc. A director: F. C. Loncaster, 269, Hawthorne Avenue, Hull.

SPEYER SCHWERDT AND CO. (1929), LTD.—Cap., £20 000. To acquire business of general merchants carried on at 5 and 7, Golden Lane, E.C., as Speyer Schwerdt and Co., Ltd., and to carry on the business of manufacturers of and dealers in insulators, etc., telegraphic, telephonic and electrical engineers, etc. Reg. Office: 5 and 7, Golden Lane. London, E.C.2.

ROSE AND PARTRIDGE, LTD.—Cap., £1 000. To acquire business of electrical engineers and dealers in electric novelties and merchants now carried on by A. H. Rose at 6, South Street, London, E.C., as Rose Bros., and the business of electrical engineer and dealer in electric novelties now carried on by S. Partridge at 43a, Barbican, London, E.C., as "S. Partridge," to carry on the business of manufacturers of and dealers in electric batteries, lamps, torches, accumulators, instruments and novelties, wireless installations, loud speakers, etc. Reg. Office: 6, South Street, London, E.C.2.

COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

C. A. W. ENGINEERING CO., 41, Parkhouse Street, S.E.5, general electrical engineers. £14 15s. 10d. August 12th.

CURTIS, Mr. J., 247, Stockport Road, Levenshulme, wireless dealer. £20 0s. 10d. July 29th.

DAVENPORT AND CO., 11, King Street West, Manchester, electrical engineers. £21 16s. 10d. July 22nd.

DAVIES BROS., 34, Mill Street, Crewe, wireless agents. £10 5s. 2d. July 17th.

GIFFORD AND GIFFORD, 37, Green Lane, Ilford, radio dealers. £36 2s. 11d. August 7th.

HUSBANDS, Mr. E. C. A., The Old Post Office, Bridgegate, Retford, wireless dealer. £26 3s. 7d. July 16th.

INTERNATIONAL ELECTRICAL CO., LTD., Ashley Road, Tottenham. £26 7s. 11d. July 17th.

NOBLE, J. Hall, 12, High Bridge, Newcastle-on-Tyne, radio engineer. £13 4s. 6d. July 31st.

PARSONS, Ernest M., 57, Paragon Street, Hull, electrical contractor. £25 14s. 10d. August 21st.

SAUNDERS, Cyril Augustus Victor, 87, Cambridge Road, New Malden, electrical accessory factor. £42 14s. 3d. July 18th.

SENIORS WIRELESS STORES, 961, Abbeydale Road, Millhouses, Sheffield, wireless dealers. £20 18s. 3d. July 31st.

SUMMERS, Mr. (trading as SOUTH ESSEX ELECTRICAL CO.), 30, London Road, Romford. £25 10s. 4d. August 2nd.

TUMILTY, Mr. H. G., 55, High Street, Dovercourt, electrical engineer. £19 11s. 6d. July 17th.

VERNON, L. G. W., The Garage Llanymynech, wireless dealer. £20 13s. 7d. July 26th.

Deed of Arrangement.

PARCELL, Ernest, Eastcheap, and Empress Avenue, Letchworth, wireless dealer, electrical and radio engineer. Dated September 11th, filed September 17th. W. A. J. Osborne, 119, Finsbury Pavement, E.C., C.A. Liabilities unsecured, £636; assets, less secured claims, £171.

Receivership.

BAILEY AND INCLEDON, LTD.—E. V. Weller, of 17, Soho Square, W., was appointed receiver and manager on September 14th, 1929, under powers contained in debenture dated November 21st, 1928.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

BRITISH ELECTRICAL REPRODUCTION CO., LTD., Lee Valley Road, Ponders End, Middlesex. The creditors were called together on September 18th at the offices of Mr. F. P. Woodcock, solicitor, 5, Holborn, W.C., when a balance sheet was presented as at September 6th last, which showed that the amount due to trade creditors was £2 390, and there were loan creditors for £1 275. There are also debentures and interest amounting to £539, and preferential creditors, salaries, rent, wages, etc., £135. On the assets side the cash at bank was put down at £93; there were sundry debtors, £55; stock estimated at £940; furniture and fittings, £44; and patent rights, £597. There was a debit balance on the profit and loss account of £3,128 and preliminary expenses £35. The authorised capital of the company is £600 in £1 shares, of which 553 shares have been issued. It was stated that the debit balance referred to included research and experimental expenditure. It was reported that on September 5th last the debenture holder appointed a receiver, and that action was taken in the interests of the general body of creditors and the debenture holder intended to defer his claim and was anxious that immediate steps should be taken in order that the company should not go on incurring liabilities. The company was formed in July, 1928, and acquired certain patent rights in connection with sound reproducing instruments. The company first had small premises at Cricklewood, where mostly experimental work was carried on. In May, 1929, arrangements were come to for the company to manufacture radio gramophones for another company, and the Cricklewood premises were then given up and the company carried on at Ponders End. That other company supplied the cash to enable wages to be paid and bought goods for the company. An order was given for a thousand machines, but after materials had been ordered the arrangement was modified so that the machines would be taken when required. The company's business was to fit a radio machine into a gramophone which had been supplied by the other company. One of the directors had also invented a talking film machine, but it could not be developed owing to lack of funds, and it was stated that if it could be developed and sold the creditors would probably get a substantial dividend, if not 20s. in the £. Negotiations had been pending by a syndicate who would form a company and exploit the machine. After some discussion it was decided that the meeting should be adjourned to enable the company to prepare a scheme to submit to the creditors.

SHANNON, William, trading as J. SHANNON AND CO., electrical engineers, New Market Street, Londonderry. The creditors were called together on September 20th at the offices of Colquhon and King, solicitors, Londonderry. A statement of affairs was submitted by J. Howard Wilson and Co., I.A., of Castle Street,

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Londonderry, showing liabilities of £3 956, of which £1 884 was due to unsecured creditors, and £2 072 to the bank, who claimed £2 722 and held securities consisting of life policies of the surrender value of £650. In addition, a local building society were fully secured creditors for £1 128, holding as security a charge on leasehold premises. There were further secured creditors for £300 in respect of an engine installed under a hire purchase agreement. The assets were estimated to realise £810, from which had to be deducted £187 for preferential claims, leaving net assets of £623, or a deficiency of £3 333. It was stated that the debtor had been in business for a considerable number of years as a finisher to the shirt and collar trade. His brother had for some time carried on an electrical contracting business, and about four years ago he gave it up and the concern was taken over by the debtor. At the time there were liabilities of between £800 and £900. The debtor had since attempted to continue the two businesses, but the electrical contracting one had not been a success. The liabilities and assets of both the businesses were included in the statement of affairs. It was further stated that the shirt and collar section of the business was considerably affected by the coal stoppage, and had also suffered through recent changes in fashion. The turnover in the finishing business was from £400 to £500 a month whilst that of the electrical contracting side had been between £1 500 and £1 700 per annum. During the year to March, 1927, the net profits were £131, and in the following year they fell to £83. The drawings in those two years were £771 and £362 respectively, but these amounts included certain payments to creditors. After some discussion, it was decided to accept an offer of 4s. in the £.

London Gazette, etc.

Winding-up Petition.

ELECTRAMONIC CO., LTD.—A creditor's petition for winding-up has been presented by Celestion, Ltd., Celestion Works, London Road, Kingston-on-Thames, radio manufacturers, and is to be heard at the Royal Courts of Justice, Strand, London, W.C.2, on October 15th.

Bankruptcy Information.

TATTERSALL, John Harold Barlow, 456, Burnley Road, Scout Bottom, Waterfoot, Lancashire, trading as H. TATTERSALL, plumber and electrician. Receiving order September 18th. Debtor's petition.

SAUNDERS, Thomas Alfred, and RIDDALL, William John (trading as TUNBRIDGE WELLS MOTOR RADIATOR CO.), Basinghall Street, Tunbridge Wells, Kent, motor engineers. Receiving order, September 16th. Creditor's petition.

Notice of Intended Dividend.

BROCK, Reginald Lewis, trading as R. L. BROCK AND CO., 5, Bedford Row, Tavistock Road, Plymouth, electrical engineer. Last day for receiving proofs, October 5th. Trustee, J. S. B. Hole, 240, High Holborn, London, W.C.1.

Application for Discharge.

WHEELER, Frederick George, Wynchwood, Broadlands Avenue, Shepperton-on-Thames, Middlesex, electrical engineer. Hearing October 18th, 10.30 a.m., Assize Court, Kingston, Surrey.

Partnership Dissolved.

C. AND P. ELECTRICAL AND PLUG CO. (James COOPER and William Stanley PICKARD), electrical engineers and sparking plug manufacturers, Cottingley Bridge, Bingley, Yorkshire, as from July 24th, 1929, by mutual consent.

HIGGS, J., AND CO. (Joseph Henry HIGGS and William George STEVENS), wireless engineers, 4, Stoney Stanton Road, Coventry, by mutual consent as from August 12th, 1929. Debts received and paid by W. G. Stevens.

MEREDITH AND SIMMS (Ivor Llewellyn MEREDITH and James SIMMS, automobile electrical engineers, Stanley Street, Rotherham, Yorks, by mutual consent as from September 2nd, 1929. Debts received and paid by J. Simms.

Bankruptcy Proceedings.

BRAYSHAW, Durwell, 78, Granby Street, Liverpool, electrician, At his public examination this debtor, whose statement of affairs showed liabilities of £240 and assets of £142, a deficiency of £98, stated that his drawings from his business did not exceed £4 a week. He said he began business on his own account in April of 1927 with £250 savings. Some time after prices began to be "cut" owing to intense competition, and he found himself undertaking contracts at a loss, and at other times unable to obtain work. Asked why other firms could quote less than he could when his own overhead charges were quite small, he replied that they employed boy labour and paid no wages. Debtor admitted that he had not included in his statement of liabilities £60 borrowed from a personal friend, and £97 owing to a moneylender. The examination was closed.

GREEN, William, 3, York Street, Stourport, Worcestershire, wireless dealer, etc. At the first meeting of creditors, held at Kidderminster, the statement of affairs showed liabilities amounting to £91, against assets of £36, less preferential claims of £12, or a deficiency of £67. Debtor attributed his failure to his household expenses exceeding his profits, and to law costs. He stated that early in 1920 he commenced business at his present address as a watch repairer, he then being possessed of tools of trade and a few pounds capital only. In the same year he became entitled to two cottages, household furniture, and a sum of money, representing his interest under his father's will. The cash received was used in the business for the payment of accounts then outstanding and for the purchase of jewellery for sale in his business. His profits then were barely sufficient to meet his necessary expenses, and he was unable to save. In about 1923 he disposed of his two cottages, receiving £80 cash and jewellery to the value of £100. The cash was used to settle accounts then owing and to obtain further supplies for his business. Debtor subsequently introduced to his business that of a wireless dealer, but his takings did not greatly increase, and throughout his profits do not appear to have covered his household expenses. He had been sued on several occasions during the last few years, and judgments have been recorded against him. In May of this year he was taken ill, and for six weeks was unable to attend to his business. After he returned in July several creditors commenced to press for payment of their accounts, and his principal creditors issued a writ, which resulted in an execution being levied on September 3rd, 1929. He then consulted his solicitors, and on their advice filed his petition. The debtor further stated that he had not kept any books of account beyond a record, for a short period, of the repairs executed, and he had never taken any steps to ascertain his financial position or the result of his trading. He admitted that he became aware of his position early in July, 1929, after returning to his business from his illness, but stated that he had contracted two small debts only since that time, as he hoped to pull the business round. The case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate.

WHITTLE, Frank, 41, Mawdsley Street, Bolton, Lancs, electrician. The public examination of this debtor was held on September 17th at the Court House, Mawdsley Street, Bolton, when a statement of affairs was presented showing liabilities of £122, assets estimated to produce £24, and a deficiency of £98. The debtor stated that he had traded since 1912, when he commenced without capital. Prior to September, 1927, the weekly profits had averaged £3, but after that time they fell to about half that amount, due to other similar businesses opening in the town and to the Corporation commencing to do electric light installations on the hire-purchase system. The examination was closed.

WOODHEAD, Titus Ernest, 26, Central Drive, Blackpool, electrical factor. This debtor has attributed his failure to extravagance in living, betting losses, keen trade competition in Blackpool and some bad debts. At his public examination last week he was questioned about his betting losses, and he stated that he lost about £40 at two meetings. The Official Receiver asked for an order for a statement to be made of the race meetings that debtor had attended, and the money he actually won and lost. Debtor was ordered to produce the statement of his betting account within 28 days and the examination was then adjourned.

METAL AND CHEMICAL PRICES.

TUESDAY, September 24th

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£78 15 0	—	15s. 0d.
Electro Wirebars	,,	£84 15 0	—	5s. 0d.
H.C. Wires, basis	per lb.	11 11/16d.	—	—
Sheet	,,	11 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2 11/16d.	—	—
Brass 60/40—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10 1/4d.	—	—
Wire ,,	,,	11 1/4d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£25 0 0	—	—
Foreign or Colonial	,,	£23 12 6	5s. 0d.	—
Tin—				
Ingot	per ton	£205 17 6	2s. 6d.	—
Wire, basis	per lb.	2s. 8 1/2d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£24 0 0	—	5s. 0d.
Mercury	per bottle	£22 10 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2 1/2d.
Sodium Bichromate—Per lb. 3 1/4d.

Rubber—Para fine, 10 3/4d.; plantation, 1st latex, 10 3/4d.

*** The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

The market has, according to James Forster and Co., been dull and uninteresting with minor fluctuations. The recent arrivals having been absorbed by consumers, the contango has once more disappeared and been replaced by a small backwardation, while prompt supplies are again rather short. The American price remains unchanged at 6·90 cents.

Closing prices on September 20th were £23 11s. 3d. for September, £23 8s. 9d. for October, and £23 10s. for November and December, 2s. 6d. up to 2s. 6d. lower on the week.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patents Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

315 563 STERLING TELEPHONE AND ELECTRIC CO., LTD., N. BLADES, and J. R. BEARD. Relays and like components of telephone apparatus. (4/7/28.)
293 395 BRITISH THOMSON-HOUSTON CO., LTD. Electric immersion heaters, particularly for type-metal pots. (5/7/27.)

THE street lighting demonstration stand of the General Electric Co., Ltd., at the recent Public Lighting Engineers' Conference at Bournemouth Town Hall.

298 975 ELECTRICAL RESEARCH PRODUCTS, INC. Constant-frequency wave source (18/10/27.)
294 108 H. J. KÖCHENMEISTER. Selenium and like cells. (16/7/27.)
294 574 BRITISH THOMSON-HOUSTON CO., LTD. Electric control systems. (26/7/27.)
315 570 SOC. ITALIANA PIRELLI and L. EMANUELI. Multicore oil-filled high-tension electric cables. (17/7/28.)
315 571 H. DEAN and CHLORIDE ELECTRICAL STORAGE CO., LTD. Electric accumulators. (17/7/28.)
315 578 BRITISH THOMSON-HOUSTON CO., LTD., and L. B. AULT. Diaphragms for acoustic devices. (23/7/28.)
301 886 ELECTROACUSTIC GES. Subaqueous sound apparatus. (8/12/27.)
313 553 O. SCHNEIDER. Positive electrode for electrical accumulators, more particularly for use in miners' lamps. (14/6/28.)
315 583 W. GEIPEL, LTD., and K. S. GEIPEL. Electric switches. (27/7/28.)
315 596 E. ASCH and IDEAL WERKE AKT.-GES. FÜR DRAHTLOSE TELEPHONIE. Electric sound-boxes or pick-ups for talking machines. (13/8/28.)
304 748 SIEMENS-SCHUCKERTWERKE AKT.-GES. Electrodes for contact rectifiers. (27/1/28.)
315 598 GENERAL ELECTRIC CO., LTD., and N. R. CAMPBELL. Photo-electric cell systems. (16/8/28.)
315 613 A. E. SHORT and H. O. SHORT. Electric wiring applicable to metal vehicle construction. (31/8/28.)
297 038 ALLGEMEINE ELEKTRICITÄTS GES. Apparatus for transmitting railway signals to a moving train. (12/9/27.)
315 621 ELECTRO-MECHANICAL BRAKE CO., LTD., and J. H. WILLIAMSON. Trucks for tramway and railway rolling stock. (14/9/28)
297 389 TELEFONAKTIEBOLAGET L. M. ERICSSON. Telephone call bells. (20/9/27.)
315 623 GENERAL ELECTRIC CO., LTD., and E. L. RANDALL. Supports for electric lamps. (19/9/28.)
298 642 FABRIK ELEKTR. APPARATE F. SAUTER AKT.-GES. Motor operated electric switch and valve apparatus. (13/10/27.)
298 905 BRITISH THOMSON-HOUSTON CO., LTD. Apparatus for generating mercury vapour or other vapour having a low heat-conducting characteristic. (14/10/27.)
315 638 R. P. A. ANDERSON. Multiple filament electric incandescent lamps. (16/10/28.)
299 318 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Systems for automatically paralleling alternating current circuits. (20/10/27.)
306 523 P. ALGRAIN. Rolling stock of railways, tramways, or road transport. (23/2/28.)
299 895 ALLGEMEINE ELEKTRICITÄTS-GES. Device for transmitting signals from the railway track to a moving train. (4/11/27.)
301 902 SIEMENS-SCHUCKERTWERKE AKT.-GES. Gas-proof housing for electrical apparatus. (8/12/27.)
304 324 BRITISH THOMSON-HOUSTON CO., LTD. Systems of electric distribution. (19/1/28.)
283 971 ERICSSON-FATME and A. ROSA. Electric circuits for central telephone offices. (20/1/28.)
315 674 J. FIDDES. Registering and/or recording devices for electromotors. (16/2/28.)
315 893 S. G. S. DICKER (N.V. 'PHILIPS'S GLOEILAMPENFABRIEKEN). Transformer cores and the methods of assembling such cores. (20/2/28.)
302 140 SIEMENS UND HALSKE AKT.-GES. Circuit arrangement for telephone installations with semi-automatic working. (10/12/27.)
299 298 J. Q. MACDONALD and W. M. SCOTT. Electroplating. (22/10/27.)
315 775 R. MAWBY and A. C. HOLT (trading as HOMA ENGINEERING CO.). Electric light and like switches. (10/4/28.)
315 679 G. L. PORTER and FERRANTI, LTD. Electric relay devices. (12/4/28.)
315 735 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., W. O. PASSMORE and R. TAYLOR. Telephone systems. (16/4/28.)
315 685 N. C. F. JENSEN. Electric igniters for cigarettes and the like. (16/4/28.)
292 530 ELECTRICAL RESEARCH PRODUCTS, INC. Regulators for controlling the speed of electric motors. (21/6/27.)
315 739 V. HOPE. Contacts for electric fuses, switches and the like. (17/4/28.)
315 744 A. REYROLLE AND CO., LTD., and J. A. HARLE. Apparatus for energising potential circuits in accordance with the voltage on the high tension side of a power transformer. (17/4/28.)
291 084 SIEMENS-SCHUCKERTWERKE AKT.-GES. Junction and fuse boxes for multicore cables. (28/5/27.)
315 817 J. LUCAS, LTD., and O. LUCAS. Motor vehicle electric head lights. (19/4/28.)
315 907 J. NEALE. Construction of selenium bridges or cells. (20/4/28.)
315 908 SIR C. A. PARSONS and J. ROSEN. Brush gear for dynamo-electric machines. (20/4/28.)
289 381 SIEMENS UND HALSKE AKT.-GES. Gas-filled discharge vessels, more particularly for use as rectifiers. (25/4/27.)
289 065 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Telephone systems. (22/4/27.)
289 773 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Switches for use in telephone or like systems. (30/4/27.)
298 216 C. A. CAMBAY. Coin-freed telephone apparatus. (6/10/27.)
291 758 SIEMENS-SCHUCKERTWERKE AKT.-GES. Means for transmitting mechanical movements to the interior of vacuum vessels. (8/6/27.)
315 926 PARK ROYAL ENGINEERING CO., LTD., and HOLDER, J. E. D. Electric relays. (30/4/28.)
295 702 BRITISH THOMSON-HOUSTON, CO., LTD. Electrons discharge devices. (19/8/27.)
315 937 J. P. ANNACKER. Watertight electrical switch and fuse cases. (9/5/28.)
297 670 LANDIS AND GYR SOC. ANON. Adjusting device for the driving system of induction measuring instruments. (24/9/27.)
315 938 A. H. MACKLEY and L. W. SLADE. Electric lighting systems. (9/5/28.)
315 940 J. F. GILL, J. N. CHAVIARA and F. J. TEAGO. Commutation of electric currents. (10/5/28.)
315 942 H. BARON (COMPAGNIE LORRAINE DE CHARBONS POUR L'ELECTRICITÉ) Electric couplings. (12/5/28.)
290 633 DR. DIETZ AND RITTER GES. Transformers for supplying electric current to discharge tubes. (18/5/27.)
308 244 M. SURJANINOFF. Watertight motor with short circuit rotor. (20/3/28.)
315 962 A. WEINBERGER. Process of rapid electric-stunning of cattle and pigs for slaughter. (11/6/28.)
292 107 AKT.-GES. BROWN, BOVERI ET CIE. High tension transformers. (13/6/27.)
315 964 E. J. LEVER (TRIX), LTD. and D. A. LYONS. Frame or loop aerials for radio sets. (14/6/28.)
292 480 ELECTROLUX, LTD. Absorption refrigerating apparatus. (16/6/27.)
298 556 ELECTRO METALLURGICAL CO. Process for thermally decomposing hydrocarbons. (11/10/27.)
292 930 SIEMENS SCHUCKERTWERKE AKT.-GES. Distance relays. (25/6/27.)
315 983 B. THOMAS and E. THOMAS. High speed circuit breakers. (30/6/28.)
315 990 RADIO COMMUNICATION CO., LTD., and F. P. BEST. Radio direction finders. (7/7/28.)
315 994 BUTLERS, LTD., and A. REEVES. Vehicle electric lamps. (14/7/28.)
294 115 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Remote electric metering systems. (15/6/27.)
294 934 DR. W. ROGOWSKI and DR. E. FLEGER. Cathode ray oscillographs for taking photographs of non-repeating phenomena. (1/8/27.)
316 005 BRITISH THOMSON-HOUSTON CO., LTD., L. B. AULT, A. P. YOUNG and J. H. BUTCHER. Apparatus for reproducing and transmitting sound. (23/7/28.)
316 015 OCTRON, LTD., W. HOLT and G. H. STEDMAN. Manufacture of oxide-coated cathodes for use in vacuum electric devices. (28/7/28.)
295 394 AKTIESELSKABET KJOBENHAVNS LAMPE-OG. LYSEKRONEFABRIK. Incandescent filament lamp fittings. (12/8/27.)
816 026 N. G. JOHNSON and AUTO ELECTRIC DEVICES, LTD. Means for winding up spring motors, more particularly of talking machines. (11/8/28.)
315 342 SIEMENS-SCHUCKERTWERKE AKT.-GES. Combined dry surface contact rectifier and small output transformer. (12/7/28.)
316 038 J. GAUNT and L. E. GAUNT. Telephone number indicator. (27/8/28.)
297 030 AKT.-GES. BROWN, BOVERI ET CIE. Transformers. (12/9/27.)
316 042 K. SCHAFFLER-GLOSSL. Electric low tension or incandescent igniters for blasting fuses. (4/9/28.)
299 301 SIEMENS-SCHUCKERTWERKE AKT.-GES. Switch with compressed air arc extinction. (22/10/27.)
296 760 BRITISH THOMSON-HOUSTON CO., LTD. Electric contact fingers. (7/9/27.)
297 084 LIMITED COMPANY, formerly the SKODA WORKS, PLZEN. Process of manufacturing closing wedges for the grooves of dynamo-electric machines. (14/9/27).
316 046 M-L MAGNETO SYNDICATE, LTD., and E. A. WATSON. Magneto of dynamo electric machines. (14/9/28.)
299 853 WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. Vacuum electric tube devices. (2/11/27.)
316 071 H. ZSCHOCKE. Apparatus for cleaning the electrodes in electrical gas-purifying plants. (19/11/28.)

Applications for Patents.

June 26th.

19 596 C. ANDREW and H. SHELMERDINE. Electric switch.
19 707 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Telephone systems. (19/10/27, U.S.)
19 607 BIRMINGHAM ELECTRIC FURNACES, LTD., and A. G. LOBLEY. Electric furnaces. (28/12/28.)
19 642 BRITISH THOMSON-HOUSTON CO., LTD. Electric protective arrangements. (27/6/28, U.S.)
19 641 A. F. BULGIN. Electric induction lamps.
19 709 C. G. CARRUTHERS and R. O. KAPP. Electric protective arrangements. (23/5/28.)
19 710 C. G. CARRUTHERS and R. O. KAPP. Electric protective arrangements. (12/6/28.)
19 711 C. G. CARRUTHERS and R. O. KAPP. Electric protective arrangements. (21/6/28.)
19 683 A. CIANCHI. Radio receiving apparatus.
19 692 M. COLLINS and LIMIT ENGINEERING CO., LTD. Portable wireless apparatus.
19 585, 19 586 W. P. CONLY and W. R. DUNN. Electric liquid heaters.
19 619 V. FRASCHETTI. Disinfecting device for telephone, etc., mouthpieces.
19 712 — GARTIN and M. E. HAMPSHIRE. Panel for wireless receivers.
19 608 A. E. HILL. High frequency oscillation generators.
19 643 INTERNATIONAL GENERAL ELECTRIC CO., INC. Heat resisting insulating material. (10/7/28, Germany.)
19 644 INTERNATIONAL GENERAL ELECTRIC CO., INC. Production of insulating material. (11/7/28, Germany.)
19 576 E. KELSEN. Producing metal sheets by electrolytic means. (27/6/28, Austria.)
19 654 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Radio systems. (5/3/29, Poland.)

(*Continued on page* 390.)

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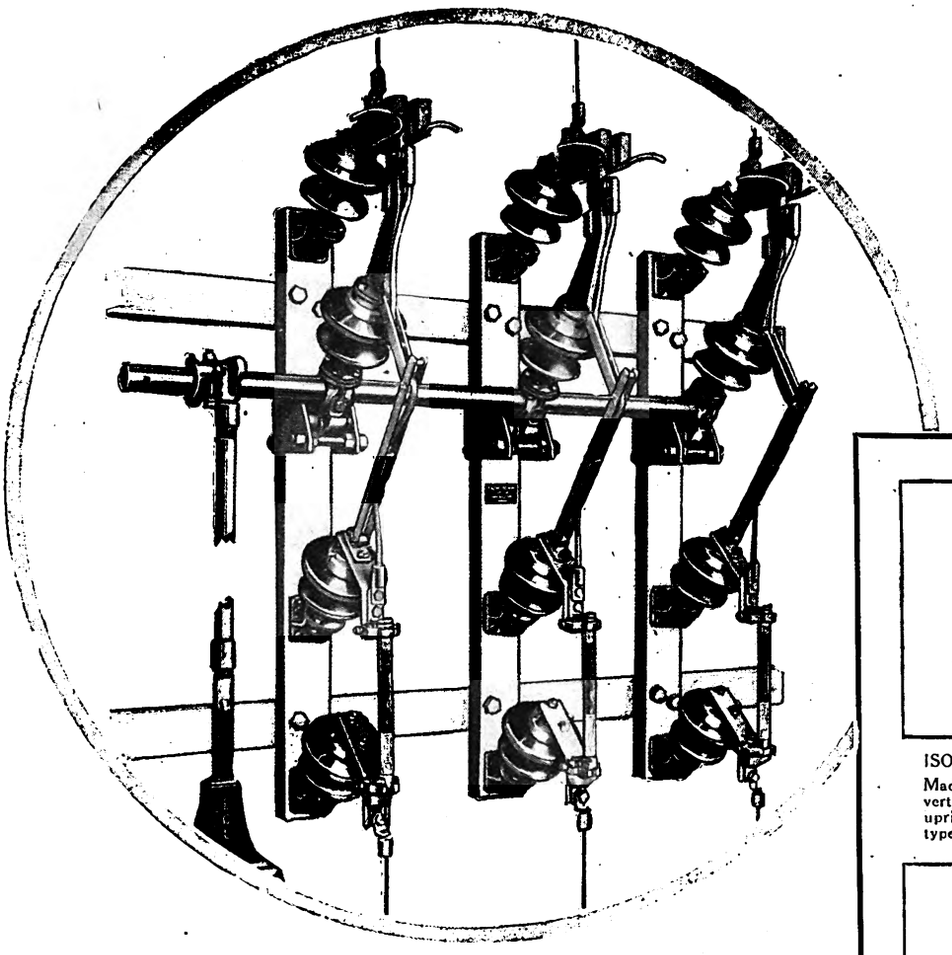
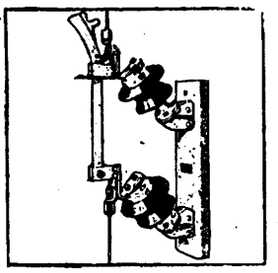


Rural Electrification

'ELECTRIC CONTROL' specialize in switch gear and fuses which are especially suitable for Rural Electrification schemes.

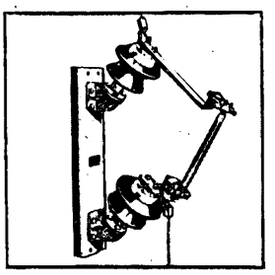
The top photograph shows a vertical disconnecting switch for disconnecting a section of overhead line from an underground cable or from a transformer situated at the foot of a pole or structure. This switch has many special features and has been designed expressly as a vertical switch, thus avoiding the reduction in flash-over value which is inevitable in the adaptation of a horizontal switch to vertical mounting.

Full particulars of these and other 'Electric Control' products will be sent upon application.



ISOLATING SWITCHES

Made in the horizontal inverted type, the horizontal upright type and the vertical type illustrated.



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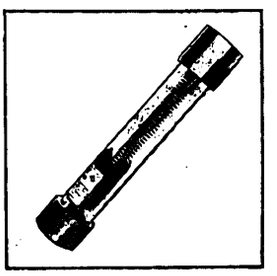

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19 635 L. F. Savage Apparatus for elimination of batteries in wireless apparatus etc.
19 699 Siemens-Schuckertwerke A.G. Electric motors. (13/7/28, Germany.)
19 627 Standard Telephones and Cables, Ltd. (G. Deakin and L. J. J. Schreiber). Selector switches for telephone systems.
19 613 Westinghouse Lamp Co. Vacuum electric tube device. (26/6/28, U.S.)
19 700 G. W. Wortley. Indicators for thermostatically controlled valve device.

June 27th.

19 816 Associated Electrical Industries, Ltd. Marine propulsion.
19 817 Associated Electrical Industries, Ltd., F. E. Bancroft and C. R. Burch. Electrical glow discharge tubes.
19 794 Associated Telephone and Telegraph Co. Electric signalling systems. (29/6/28, U.S.)
19 739 British Thomson-Houston Co., Ltd. Electric control systems. (27/6/28, U.S.)
19 741 British Thomson-Houston Co., Ltd., and L. Griffiths. Electric lamps.
19 771 C. Day. Disinfecting attachments for telephone mouthpieces.
19 793 S. G. S. Dicker (N. V. Philips's Gloeilampenfabrieken.) Thermionic valve detector circuits.
19 767 H. Green. Synchronisation of sound records with moving picture films.
19 802 Imperial Chemical Industries, Ltd., and H. Martin. Electric arc welding.
19 740 International General Electric Co., Inc. Light sensitive plates, etc. (12/7/28, Germany.)
19 768 E. Kelsen. Electrolytically manufacturing metal sheets and tubes. (27/6/28, Austria.)
19 776 H. Kohler. Mercury contact switch tube.
19 638 Maschinenfabrik Oerlikon. Automatic reclosing switches. (5/7/28, Switzerland.)
19 792 N. V. Philips's Gloeilampenfabrieken. Controlling terminal pressure of electric device. (31/7/28, Holland.)
19 778 M. Paul and P. Wangemann. Electric a.c. meter.
19 832 J. Pintsch A.G. Electric convertors. (29/6/28, Germany.)
19 822 19 823, Polymet Manufacturing Corporation. Electrical condensers. (4/2/29, U.S.)
19 746 H. Thoma. Electric regulating transformers.

June 28th.

19 965 Associated Telephone and Telegraph Co. Automatic switches for telephone systems. (28/6/29, U.S.)
19 983, 19 984 H. C. Atkins and Gramophone Co., Ltd. Wireless receivers, etc.
19 985 H. C. Atkins and Gramophone Co., Ltd. Induction motors for talking machines.
19 897 K. Baranowski, Einstein's Electro Chemical Process, Ltd., and M. Perrin. Holders for work in electrolytic baths.
19 950 Bohmische Gluhlampenwerke A.G., K. Schreitter and J. Skalda. Electric glow lamp chain.
19 941 H. R. M. Bourne. Telephone device.
19 915 Crompton, Parkinson, Ltd., and R. A. Lochner. Electric potential indicating means, etc.
99 955 Electrical Research Products, Inc. Magnetic devices. (28/6/28, U.S.)
19 956 R. Frank and W. Wilkins. Disinfecting attachments for telephone mouthpieces.
19 966 H. A. W. Klinkhamer and N. V. Hengelosche Elektrische en Mechanische Apparatenfabrik. Asynchronous motors. (10/10/28, Germany.)
19 967 J. F. P. de la Riboisiere. Electric clocks, watches, etc.
19 926 Leclance Soc. Anon. Electric condensers. (10/6/29, Switzerland.)
19 901 Soc. pour la Fabrication des Projecteurs Electriques Marchel. Light reflectors. (30/6/28, Belgium.)
19 888 W. W. Triggs (Felten und Guilleaume Carlswerk A.G.). Electrical controlling apparatus, etc.
19 946 C. J. F. Tweed. Picture, etc., telegraph systems.
20 056 A. D. Blumlein. Electrical transmission systems.
20 044, 20 046 S. G. S. Decker (N. V. Philips's Gloeilampenfabrieken). Electric supply circuits, etc.
20 045 S. G. S. Decker (N. V. Philips's Gloeilampenfabrieken). Electric lamps.
20 011 B. K. Green. Diaphragm for reception of wireless signals.
20 015 E. J. Lightheart and A. Taylor. Electric heating systems.
20 012 B. Lowe. Manufacture of high emission cathodes. (30/6/28. Germany.)
20 074 C. Lorenz Akt. Ges. Wireless communication. (3/7/28, Germany.)
20 031 A. E. White (Cheney Bros.). Electric switches.

July 1st.

20 109 Associated Electrical Industries, Ltd. Arc extinguishing devices. (29/6/28, U.S.)
20 102 R. G. Ballard. Wireless and gramophone reproduction, etc.
20 165 H. H. Berry and C. A. Painton. Electric water heaters.
20 173 British Thomsgn-Houston Co., Ltd. Gaseous discharge devices. (2/7/28 U.S.)
20 174 British Thomson-Houston Co., Ltd. Thermionic valve amplifying systems. (9/7/28, U.S.)
20 175 British Thomson-Houston Co., Ltd. Electric transmission of pictures. (24/7/28, U.S.)
20 155 D. A. Christian, E. W. Palmer and Siemens Bros. and Co., Ltd. Control of alternating currents in electrical circuits.
20 193 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Telephone installations.
20 194 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric lighting installations.
20 195 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Incandescent lamps.
20 120 J. Dieux. Electromagnetic pick-ups. (10/5/28, France.).
20 183 General Electric Co., Ltd. Luminous electric discharge tube. (16/7/28 Germany.)
20 158 S. M. Hallam and R. E. Hine. Electric light fixtures.
20 184 Kolster-Brandes, Ltd. Cabinets for acoustic devices.
20 185 Kolster-Brandes, Ltd., and W. S. Percival. Thermionic valve holder.
20 091 B. H. J. Kynaston. Wireless receiving apparatus.
20 082 R. Nettl. Electric lampholders.
20 131 W. W. Richardson. Flex for transmission of electricity.
20 110 Siemens-Schuckertwerke A.G. Separator for absorption apparatus. (20/7/28, Germany.)
20 156 Siemens-Schuckertwerke A.G. Protecting insulating sleeves of electrical machines from glow discharge phenomena. (2/7/28, Germany.)
20 199 A. R. Thomas. Electric starters for engines.
20 163 A. E. Young. Indicating and recording apparatus. (10/7/28, U.S.)

July 2nd.

20 308 Associated Electrical Industries, Ltd. Tap-changing system. (14/7/28 U.S.)
20 309 Associated Electrical Industries, Ltd. Electric switches. (11/7/28, U.S.)
20 310 Associated Electrical Industries, Ltd., and R. Brooks. Electric traction equipment.
20 205 R. A. Bedford and C. V. Brindley. Electric furnaces.
20 307 B. O. W. Patents, Ltd., and H. J. Osborn. Controlling electric circuits.
20 269 British Thomson-Houston Co., Ltd. Electron discharge devices. (2/7/28. U.S.)
20 212 W. Bullen. Inductance coils.
20 268 M. Compare. Electrical transmission of facsimiles.
20 313 General Electric Co., Ltd., and S. Kates. Electric light fittings.
20 304 C. L. Lipman and Nalder Bros. and Thompson, Ltd. Electrical measuring apparatus, etc.
20 232 C. McAllister and A. Munn. Remote controls for wireless apparatus.
20 248 T. McClelland. Cable identification tickets.
20 292 Telefunken Ges. fur Drahtlose Telegraphie. Aerials. (17/7/28, Germany.)
20 226 P. D. Tyers. Electric gramophone pick-ups.
20 311 W. S. Werner. Voltage regulating apparatus. (12/7/28, U.S.)
20 312 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Television systems.
20 318 D. Wolff. Electric device for rewinding motors of phonographs.
20 203 E. Young. Burglar alarms, etc.

July 3rd.

20 454 Associated Electrical Industries, Ltd. Focussing mechanism for lighting units. (14/7/28, U.S.)
20 455 Associated Electrical Industries, Ltd., and W. Orr. Dynamo-electric machines.
20 389 J. H. E. Baker and Standard Telephones and Cables, Ltd. Switching arrangements for telephone systems.
20 470 E. F. Chabot. Electric centering machine. (11/7/28, Belgium.)
20 375 W. A. Chovit. Electric lamps for vehicle headlights.
20 370 Electrical Research Products, Inc. Electro-optical transmission systems. (11/7/28, U.S.)
20 401 Electrolux, Ltd. Nozzles for suction cleaners. (21/7/28, Sweden.)
20 335 C. M. Escare. Electric light fittings.
20 467 Felten and Guilleaume Carlswerk A.G. Electric cable. (3/7/28, Czecho-Slovakia.)
20 336 M. H. Goldstone. Contact plugs.
20 434 Gramophone Co., Ltd., and W. F. Tedham. Thermionic amplifiers.
20 463 F. J. Hooper. Electric couplers.
20 429 A. M. Jacobs. Choking coils.
20 368 J. R. Laird and G. Pate. Electrically heated kettles, etc.
20 369 Landis and Gyr Soc. Anon. Time switches.
20 440 J. E. Long. Electric circuit control apparatus.
20 390 C. P. Smith, M. S. Snell and Standard Telephones and Cables, Ltd. Selector switches for telephone systems.
20 439 Sperry Development Co. Detecting flaws in conductors. (10/8/28, U.S.)
20 385 Standard Telephones and Cables, Ltd., S. Chapman and W. Lawrence. Signalling systems.
20 386 Standard Telephones and Cables, Ltd., and A. D. Blumlein. Signalling systems.
20 387 Standard Telephones and Cables, Ltd. (Western Electric Co.). Electrical system of communicating with moving vehicles.
20 388 Standard Telephone and Cables, Ltd. (Western Electric Co.). Signal transmission systems.
20 473 Submarine Signal Co. Mounting sound producing, etc., apparatus. (7/7/28. U.S.)
20 480 Telefunken Ges. fur Drahtlose Telegraphie. Glow discharge lamps (4/7/28. Germany.)
20 481 Telefunken Ges. fur Drahtlose Telegraphie. Current limiting devices for valves. (27/7/28, Germany.)
20 382 Telehor Akt. Ges. Means for starting synchronous motors. (7/3/29, Germany.)
20 391 L. F. Wade. Portable wireless apparatus.

July 4th.

20 596 Akt. Ges. Brown, Boveri et Cie. Commutation of continuous current. (5/7/28, Germany.)
20535 A. W. Blair. Resistance units.
20 600 Brecknell, Willis and Co., and A. M. Willis. Swivelling bases for trolley poles.
20 547 British Thomson-Houston Co., Ltd. Electric lamps, etc. (18/2/29, U.S.)
20 513 Brookhirst Switchgear, Ltd., and J. A. Hirst. Starting, etc., electric motors. (16/6/29, U.S.)
20 514 Brookhirst Switchgear, Ltd., and J. A. Hirst. Starting, etc., electric motors. (5/7/28, U.S.)
20 548 Edison Swan Electric Co., Ltd. Signs, advertisements, etc.
20 487 E. A. Hailwood. Insulators.
20 488 E. A. Hailwood. Lighting motor vehicles.
20 494 W. Johns. Electric lamp reflectors.
20 544 Koch and Sterzel, A.G. Transformers. (14/7/28, Germany.)
20 584 C. Lorenz Akt. Ges. Telegraphic systems. (5/7/28, Germany.)
20 555 T. McClelland. Magnetic pick-ups, etc.
20 574 R. Mitsuda. Arc commutator. (5/7/28, Japan.)
20 557 Telefunken Ges. fur Drahtlose Telegraphie. Electro-optical devices. (4/7/28, Germany.)

July 5th.

20 686 J. Brennan and J. Murphy. Electrically controlling speed of shafts.
20 712 British Thomson-Houston Co., Ltd. Incandescent lamps. (10/7/28, U.S.)
20 744 M. A. Bontch-Brouewitch and V. V. Tatarinov. Antennæ for short waves.
20 662 W. Bullen. Aerial tuning unit.
20 664 A. E. Chapman. Luminous electric discharge vessels.
20 665 A. E. Chapman. Selenium cells.
20 762 A. E. Clarke and J. I. Smith. Electric circuits for amplification of electrical impulses.
20 713, 20 714 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
20 697 Electrical Research Products, Inc. Signalling systems. (19/7/29, U.S.)
20 708 General Electric Co., Ltd. Cement for incandescent lamp caps. (1/8/28, Germany.)

COMING EVENTS.

Friday (To-day), September 27th—Thursday, October 3rd.

National Radio Exhibition.—Olympia, London.

Electrical Association for Women.—Visit to the Shipping, Engineering and Machinery Exhibition, Olympia.

Birmingham Electric Club.—Grand Hotel, Colmore Row. Lecture by Dr. G. C. Garrard on "Development in Electric Power Control." 7 *p.m.*

Tuesday, October 1st.

Electrical Society of Glasgow.—30, Gordon Street. Paper by Mr. W. Imrie Smith on "Architectural Lighting." 7.30 *p.m.*

Electrical Contractors' Association (Derby Branch).—Ordinary meeting. 5 *p.m.*

Television Society.—Engineers' Club, Coventry Street, Piccadilly Circus, London. Lecture by Mr. H. S. Ryland on "Talking-Films," preceded by an informal discussion. 8 *p.m.*

Wednesday, October 2nd.

Electrical Contractors' Association (Southern Section).—Ordinary meeting
Electrical Contractors' Association (Belfast Branch).—Ordinary meeting.
Electrical Contractors' Association (London Branch).—General meeting.
Electrical Contractors' Association (Bath Sub-Branch).—Ordinary meeting
Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting. 2.30 *p.m.*

Thursday, October 3rd.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 a.m.

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

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THE ELECTRICIAN

Vol. CIII.—No. 2679. Friday, October 4, 1929. [Registered at the General Post Office.] Sixpence

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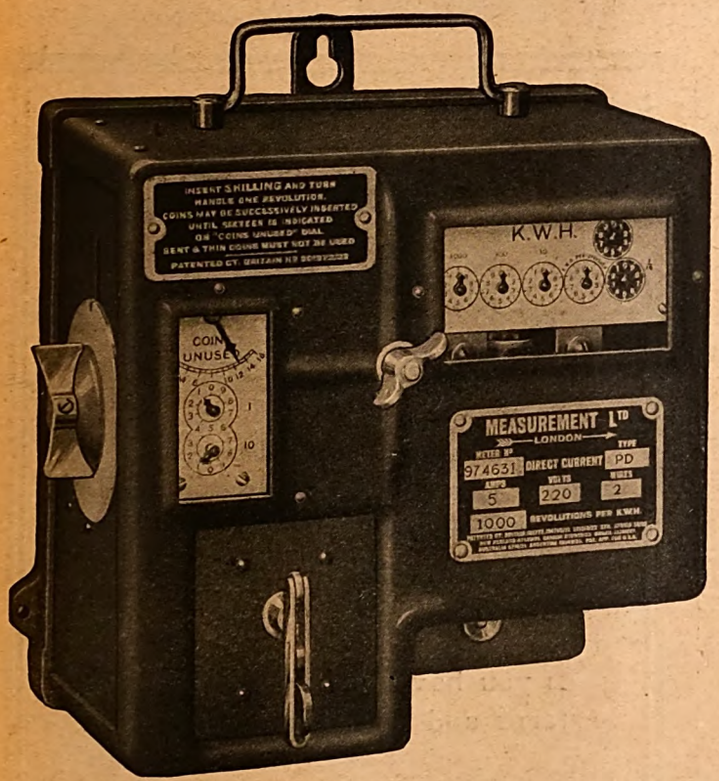

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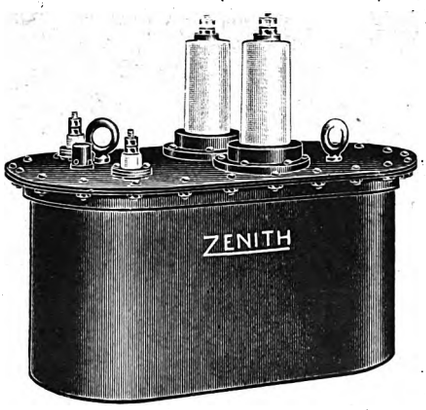

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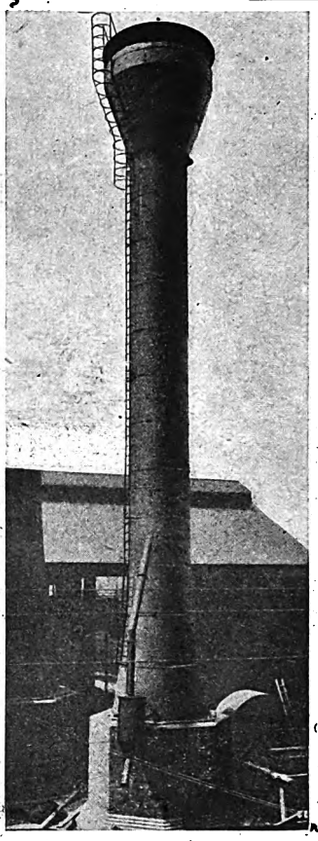

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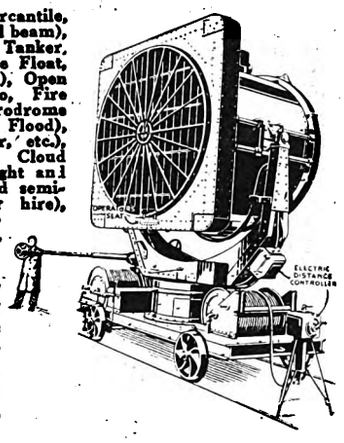

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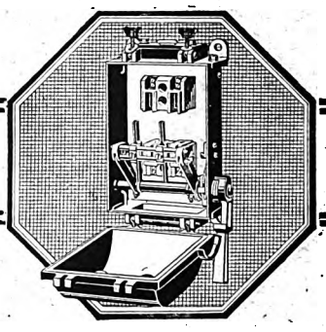

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No. 2679. [No. 14. Vol. CIII.] Friday, October 4, 1929. Annual Subscription, 25s. Overseas, 30s.

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Current Topics.

Unfair Propaganda.

In considering the opposition which is being worked up against the Central Electricity Board's grid scheme in South-Eastern England, we can at least appreciate the motives—though we hold them mistaken—of those conservative Britons who object, on principle, to any sort of progress, no matter how beneficial it may be to their fellow countrymen. Living with their heads in the clouds, they picture England as a veritable Arcadia, and resolutely shut their eyes to the fact that the greatness of this country is founded on its capacity to produce and sell goods to the rest of the world. People in this category are entitled to their opinions, even though they show how illogical they are by their unprotesting acceptance of stucco villas, telegraph poles, petrol pumps, hoardings and other signs of a commercial age.

But the motives of the most vociferous of the opponents of this very necessary electrical development are not so disinterested, and their methods of conducting their propaganda are definitely unfair and misleading. We refer of course to the series of photographs of the Sussex Downs which appeared last Friday in a prominent daily paper. These pictures had superimposed upon them some grossly exaggerated drawings of overhead lines which were designed to show the disastrous effect they would have on the charm of the Downs. One picture showed a line of towers stretching some two miles into distant hills, in which not only every tower but practically every conductor was clearly visible throughout its entire length. As a representation of the Forth Bridge it would have passed unnoticed, but as a transmission line it was obviously impossible. Attempts to arrive at the proportions of these supposititious structures gave each of the conductors a diameter of approximately 1 ft. 3 in., instead of an actual ¾ in., and in some cases the thickness of the individual conductors was practically identical with that of the members of the supporting structures, which also showed signs of considerable distortion and exaggeration.

The most effective picture showed a tower dumped down right in the village of Offham, but much of its effectiveness was naturally discounted by the fact that local representations, made before the inquiry, resulted in the abandonment of this particular site.

While the misleading nature of these illustrations was immediately and unmistakeably evident to electrical engineers, the layman would quite naturally accept them at their face value, and nobody with any regard for the amenities of the countryside could have been blamed for being persuaded by such startling evidence to lend his support to the opposition. Fortunately, the newspaper concerned has since reproduced an actual untouched photograph of part of a 132 kV line already erected in Scotland which shows how unobtrusive these lines are, and which should have allayed any reasonable fears aroused by the earlier pictures. The organised opposition, however, is manifestly unwilling to accept this evidence, and though it inferentially admits the inoffensiveness of the portion of the Scottish line shown in the photograph, falls back on the quibble that the line runs at the foot of a low range of hills, and so does not interfere with the skyline.

The Sussex Downs controversy is of direct interest to all electrical engineers concerned with overhead construction, and if allowed to proceed unchecked, may gravely affect future progress of electricity supply in this country. We, therefore, hope that members of the electrical industry, both individually and collectively, will take every possible opportunity to correct the prevailing misconceptions, and indicate the consequences which would inevitably attend an obstructionist victory.

The Electric Homes Campaign.

To give a send-off to the E.D.A. Electric Homes Campaign a series of conferences was held last week in London, Birmingham, Leeds, Manchester, Newcastle, Glasgow, Edinburgh, Cardiff and Bristol. Attendances at these meetings were generally most satisfactory, and excellent discussions followed the addresses given by Col. W. A. Vignoles and Mr. V. W. Dale on the objects and methods of the campaign. Particular emphasis was laid on the need—frequently stressed in these columns—for establishing new E.D.A. Electric Circles and reviving those Circles which have become inoperative. There was universal recognition that in the new campaign the Association had provided the industry in general, and the E.D.A. Circles in particular, with sufficient co-operative publicity work to engage their active attention for a long time to come. It is confidently anticipated at headquarters that the immediate result of these conferences will be seen in a general revival of E.D.A. Electric Circle activities. In this connection we are asked to state that supply engineers and others proposing to convene meetings for that purpose

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are cordially invited to notify their Area Officer, or the Director at 15, Savoy Street, where, if possible, arrangements will be made for the Area Officer or another E.D.A. Officer to be in attendance at inaugural meetings.

The E.D.A. Conferences.

READERS will find on another page the syllabus for the 1929–30 session of the London E.D.A. Conferences, and will note with interest that at least two out of the four subjects already chosen are directly concerned with selling, while the other two may well be treated from the sales point of view. In emphasising, as we have done frequently during the past few seasons, the need for concentration on selling, we do not overlook the fact that the title of these conferences has been modified by the omission of the word "salesmanship," though why this has been done we are at a loss to discover. There are to-day so many opportunities for electrical men and women to hear the reading of papers on technical subjects and to take part in discussions on these matters. The old E.D.A. Salesmanship Conferences were the one place where one could expect to learn about some of the intricacies of the selling art. Selling is a sphere of activity in which the electrical industry has much to learn. The fact should be recognised, and the E.D.A. Conferences should be made the headquarters for the dissemination of information on the many problems involved. The E.D.A. has provided adequate facilities for sales talks this winter, and it only remains for the speakers at the meetings to remember that reminiscences of the early days of the industry, and involved theoretical descriptions of the design and operation of apparatus, are definitely out of place at an E.D.A. Conference. The future progress of the entire electrical industry directly depends on our attitude to salesmanship. At present we most of us lack a definite sales policy for the domestic market, and though development is certainly proceeding, there is little doubt that it is more due to the growing desire of the public to have certain kinds of electrical apparatus than to the operation of an orderly electrical sales plan.

The Radio Exhibition.

THE Radio Exhibition which closed at Olympia, London, yesterday, has been one of the most successful wireless exhibitions so far held in this country, and from all branches of the industry good business is reported. Attendances have been good, and, in most cases, the daily totals of last year have been easily exceeded, many days recording figures around 20 000. The public interest this year was chiefly centred in the large radio-gramophone equipments which seem to be slowly taking the place of the individual gramophone. These big sets are chiefly of the "all-mains" type, and represent a considerable advance on last year's designs of a similar equipment. The convenience of the "portable" set has long been admitted, and the receiver has been made still more attractive by including in many of this year's models facilities for "all-mains" drive. The operation of loud speakers throughout the exhibition by means of a common supply of music gave to this year's show an atmosphere of liveliness that was sadly missing on earlier occasions. The provision of demonstration rooms was another improvement which the R.M.A. would be wise to extend next year, for, apart from the personal contact with the public which the rooms allowed, in circumstances more attractive than those obtaining on the stands, salesmanship in its most intensive form was made possible by permitting the prospective purchaser to concentrate on the goods offered, without the interruption of passers-by, the noise of the general exhibition and other distractions. The exhibition this year, including over 290 stands, taxed the space of the New Hall to such an extent that we would urge upon the R.M.A. the necessity for making the next show larger, both in overall and in stand area. For example, the stands this year, even the biggest of them, were so small as to give the impression that one was at a local traders' exhibition instead of the biggest annual show of the whole radio industry. There was about the exhibition an appearance of economy which conveyed the impression that the radio industry, though not prosperous was doing its best, and, though for all we know this may be the state of the industry, such an impression is far from desirable at an exhibition.

Radio Television.

A CEREMONY which may perhaps prove to be historical in the progress of television took place on Monday, when the first official tests of radio television were made through 2LO. For the time being similar tests will be made each day between 11.0 and 11.30 a.m., in order that the Baird Television Development Co. may improve and develop this system of transmission. The service is of a purely experimental nature, and at the moment is confined to one wavelength, so that speech and vision cannot be transmitted simultaneously; in the circumstances it is necessary for the speaker to speak first and then change over to television. On the completion of the Brookman's Park station two wavelengths will be allocated, when both television and speech will be transmitted simultaneously in much the same way as was done at the test before the Postmaster-General last March. On that occasion the standby station at Marconi House was used in conjunction with 2LO. For the transmission on Monday, televisors were installed at Savoy Hill, the G.P.O., Boxhill and elsewhere, though no receivers for public use will be available until the experimental period is passed and a satisfactory service can be guaranteed. The studio from which the artists are "televisied" is at the offices of the Baird Company, in London. From there the image is passed over land lines to Savoy Hill, where there is a check receiver, and then over the usual land lines to the transmitter at Oxford Street. The received images on the occasion of Monday's transmission were slightly less clear than those when we last saw television demonstrated over land lines, but since this was the first radio transmission, and neither the Baird Co. nor the B.B.C. had previous knowledge of the amount of distortion which might be introduced over the land lines and other circuits, such errors may be corrected.

British Trade in Argentina.

NO firm wishing to increase its business overseas can afford to overlook the markets of South America, and especially that of Argentina. That the present time is opportune for development of British trade in these Republics is clearly recognised by the appointment of the D'Abernon Mission, and also by the proposed British Empire Trade Exhibition. This project, which was initiated by the British Chamber of Commerce in Argentina, and which has already gained many influential supporters, including Sir CHARLES PARSONS and Mr. VICTOR WALLINGTON, chairman of the B.E.A.M.A., is to be held in Buenos Aires from February 18th to April 2nd, 1931. It should go far towards placing British trade with Argentina more on a par with British purchases and investments there, and if it is wholeheartedly backed by British manufacturers it should demonstrate, not only to Argentina, but also to all South America, that British initiative, British goods and British salesmanship, backed by British credit, are not declining but are preparing to reach higher levels.

Facilities for Visitors.

TAKING advantage of the facilities offered when THE ELECTRICIAN offices were moved to Bouverie House, many of our subscribers from the Provinces and from overseas make free use of our spacious and comfortably appointed reception hall whenever they happen to be in London. Several recent overseas visitors who have called on us had not heard that what is practically the accommodation of a London office was freely at their disposal, and, for the benefit of others who are unaware of this service, we repeat the invitation to use the accommodation specially provided for ELECTRICIAN subscribers.

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THE NEW I.E.E. PRESIDENT.

The Career of Sir T. F. Purves—Noteworthy Wartime Work on Special Types of Communication Apparatus—Extending the Employment of Long Distance Telephony—Important International Work.

COL. SIR THOMAS FORTUNE PURVES, who assumed office as President of the Institution of Electrical Engineers on Tuesday, has spent the whole of the forty years of his engineering career in the Post Office, of which he is now engineer-in-chief.

Born at Blackadder Mount, Berwickshire, on December 31st, 1871, and educated at Greenlaw and Duns Academy, he first joined the Post Office in 1889 as a telegraphist at Edinburgh. While there, he studied at the Heriot Watt College and at Edinburgh University to such purpose that, in 1892, he won the first medal of the Heriot Watt College in electricity and telegraphy, an achievement which led to his selection for transfer to a position in the Post Office Engineering Department in Edinburgh.

A departmental examination two years later brought further advancement, with the appointment of mechanical and electrical draughtsman in the Engineer-in-Chief's office in London, where further steps in the ladder of progress were rapidly negotiated.

Success in a further examination led to his appointment in 1900 as technical officer on the headquarters staff of the engineer-in-chief, and a further change in 1905 to the assistant superintending engineer-ship of the London district. A year later, a similar position in the Southern district—at that time staffed by "K" Company of the Royal Engineers, and including all country south of the Thames and Severn—claimed his services for twelve months, after which he reappeared at headquarters as staff engineer in charge of the designs section of the Engineering Department, a position which placed him in control of the technical development and of the supply of all classes of plant and apparatus required for the telegraph and telephone services.

THE NEW I.E.E. PRESIDENT.

A recent photographic study of Col. Sir Thomas Fortune Purves, who, on Tuesday, became President of the Institution of Electrical Engineers. As will be seen from the accompanying biographical notes, he has had a long and distinguished career in the Post Office, of which he has been engineer-in-chief since 1922.

On the outbreak of the war he directed his energies to the development of special types of communication apparatus suitable for trench warfare, and so noteworthy was his work in this direction that he was asked by the Director of Signals in France to investigate conditions at the front. This visit was so appreciated that the offer was made of a commission as major in the Royal Engineers, in order that he might continue his work, and also act as a liaison officer between the Army Signal services and the production side of the Post Office. During the war period he was constantly crossing between England and France, visiting every part of the British front, studying and discussing the constantly increasing needs of the Army Signal Service.

As the result of his observations in France, he was able to design a noteworthy series of new types of electrical signalling and detecting apparatus for the various military requirements. He was also responsible for the manufacture and supply of this apparatus. On the termination of hostilities his services were rewarded by the decoration of the Order of the British Empire and the appointment of Hon. Colonel of the 44th (London Home Counties) Division of the Royal Corps of Signals.

When the position of assistant engineer-in-chief was vacated by Sir William Noble in June, 1919, Col. Purves was given the appointment, and on Sir William's retirement from the post of engineer-in-chief Col. Purves again succeeded him. That such a position is an arduous one may well be imagined when it is remembered that, among other responsibilities, it involves the supervision of many different types of electrical engineering plant valued at well over £100 000 000, the responsibility of an annual expenditure of over £15 000 000 on new construction and maintenance, and also the control of a technical staff numbering over 30 000 men distributed throughout the country.

In the seven years during which Col. Purves has been engineer-in-chief, important developments have been made in the Post Office system of electrical communication, notably in the provision of a complete network of underground trunk telephone cables linking all the important towns of Great Britain.

Equally noteworthy has been the rapid extension of telephonic communication between Great Britain and the other European countries, and the provision of public radio telephone services between Great Britain and the U.S.A., and the extension of these radio links to the national telephone systems of most of the European countries, and to practically the whole of the American Continent. Other notable achievements have included the establishment of the Imperial radio-telegraph services to Canada, South Africa, Australia and India, the design and introduction of an automatic telephone system for London, and the rapid extension of automatic telephony throughout Great Britain.

Apart from his official activities, Col. Purves has rendered valuable services to Great Britain as a member of many important international conferences and special delegations.

It was largely due to him that the International Government Committee on long-distance telephony in Europe was inaugurated, and he has continuously presided over the conferences of that section of the committee which is concerned with the technical and engineering aspects of the subject.

Col. Purves's connection with the Institution of Electrical Engineers dates from 1902, when he became an associate. He was awarded the Fahie Premium, and in 1909 joined the ranks of the associate members, becoming full member in 1912, member of Council in 1923, and Vice-President in 1926.

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LIGHTING GENERATING PLANTS AND SUB-STATIONS.

The Choice of Fittings for Power Station Illumination—Formula for Turbine Hall Units—Methods of Lighting Outdoor Equipment.

By DAVIS H. TUCK, M.A.I.E.E.

MUCH attention has rightly been paid to domestic and industrial lighting, but the problem is rarely considered in relation to power stations, with the result that the lighting of some central stations is the reverse of scientific.

Turbine halls in generating stations usually have overhead cranes above which the lighting equipment must be suspended.

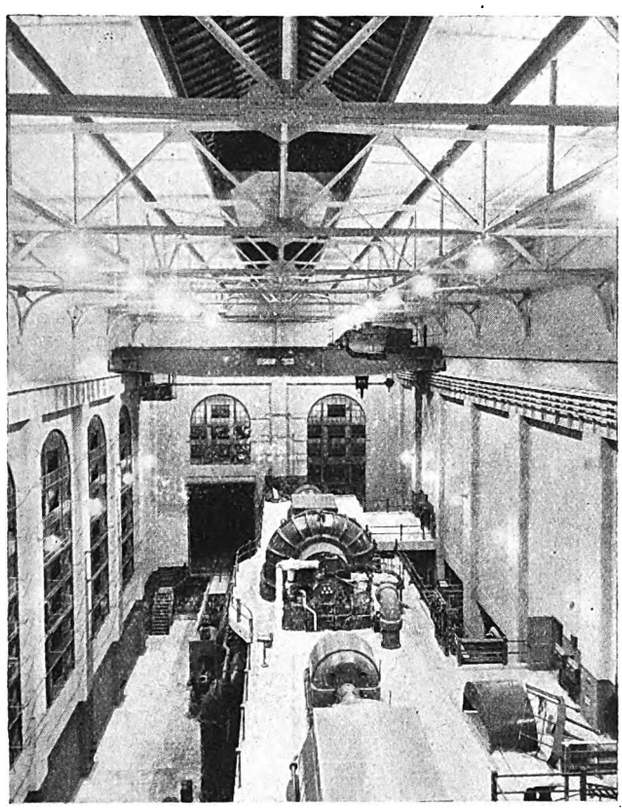

Fig. 1.—Lighting of the turbine hall of the Long Beach Station.

It is therefore necessary for the reflectors to be located at heights of 30 to 60 ft. above the floor. Open condenser wells further increase this distance between the work and the lighting unit. High intensity illumination (15 ft.-candles) is required for the turbine installation work and for repair work. A lower intensity of illumination (approximately 7½ ft.-candles) is required for operating conditions.

Inasmuch as the intensity of illumination varies inversely as the square of the distance from the light source, and directly as the cosine cubed of the angle of incidence, it follows that, for a reflector to be effective in producing illumination from great heights above the floor, the candlepower in the downward directions must be increased, and as great a percentage of the available flux of light from the lamp must be concentrated at angles of incidence whose cosine cubed values are near 1·0.

A reflector to meet these specifications has been developed, an example of which is seen in the lighting unit for suspending over the crane in a turbine hall, illustrated in Fig. 1. With this unit the candlepower of the bare lamp is increased approximately 13 times, and 43 per cent. of the available light flux is concentrated in the 0·30 deg. zone.

In some cases the turbine hall is designed to be a showplace with a visitors' balcony, where interested parties may inspect the machinery. In such stations the walls and steel trusses are often given a decorative treatment. The lighting unit shown in Fig. 3 may then be made decorative to suit the interior.

Fig. 1 shows the turbine hall of the Southern California Edison Co., Long Beach Station, Los Angeles, Cal., U.S.A., illuminated with the lighting units shown in Fig. 3.

For purposes of illumination calculations, the following formula should be used for the turbine hall lighting unit:

$$\text{Foot-candles} = \frac{340 - \text{mounting height in ft.}}{30} + \text{Watts per sq. ft. of floor area.}$$

Outdoor Sub-stations.

In the past, outdoor sub-stations have been lighted by two radically different methods. The first method is the general overhead type of lighting such as is employed extensively for the interior illumination of industrial plants. The second method employs the use of flood-lights focused on the most important parts of the structure. Both of these methods have decided drawbacks.

The general overhead method of illumination is used to light up apparatus in the structure, and the operator must look into the light to see the apparatus. The decrease in the ability to see when a light source against a black background is in the direct line of vision is too well known to comment upon. In short, the overhead method of lighting is incorrectly applied in the case of the outdoor sub-station. Not only is this method of lighting wrong from the illumination standpoint, but from a mechanical standpoint it is difficult and dangerous to maintain the lighting units when they are hung high above the ground close to the high tension parts.

In an effort to eliminate the glare and the danger attendant to maintenance, the flood-lighting system has been tried for illuminating sub-stations. This system of illumination is expensive, produces dense shadows, and does not eliminate glare. Past practice shows that while overhead lighting has the advantage of low cost, it has the disadvantages of glare, difficult and dangerous maintenance, and is deficient in vertical illumination and deficient in horizontal illumination on the

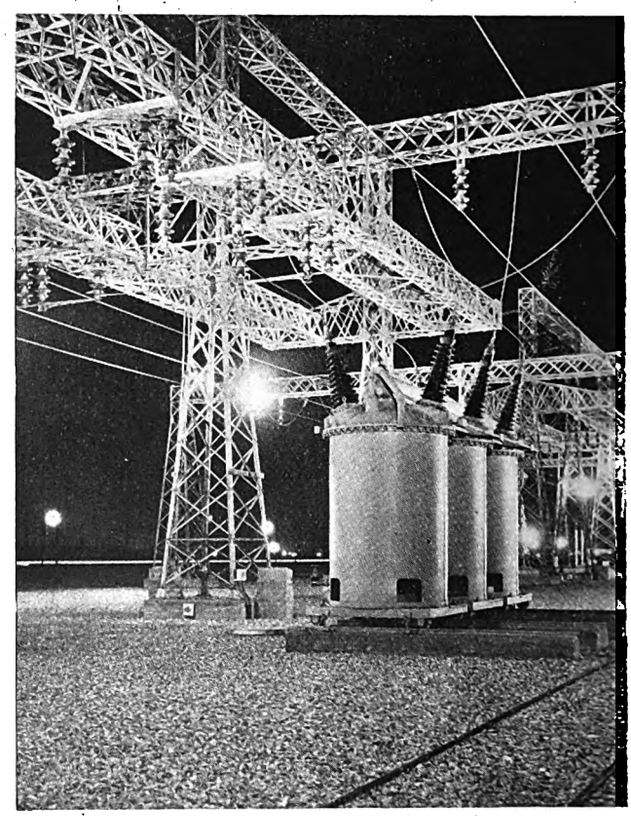

Fig. 2.—Showing even illumination produced by the special fittings for outdoor sub-station lighting.

underside of the apparatus. Flood-lighting, again, though easy to relamp, suffers from the disadvantages of rapid permanent depreciation; glare; and sharp shadows.

In order to combine the advantages of both the overhead and flood systems, and to eliminate the disadvantages of

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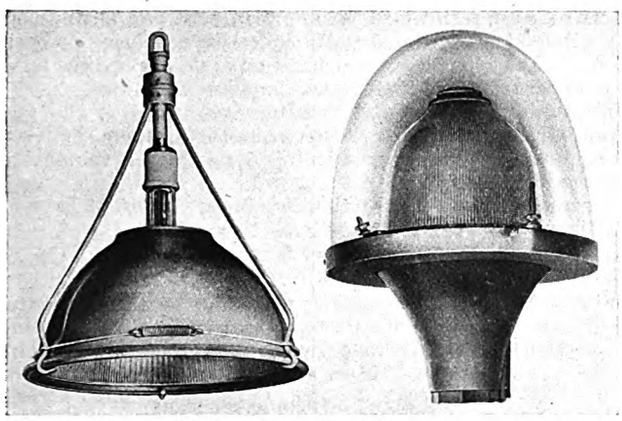
both in a new system of illuminating outdoor sub-stations, a list of the desirable qualities was drawn up in the relative order of their importance as follows :—

(1).—High vertical component of light.
(2).—High horizontal component of light on under-sides of surfaces.
(3).—Absence of glare.
(4).—Accessibility for relamping.
(5).—Absence of sharp shadows and dark pockets.
(6).—Adequate ground illumination.
(7).—Low permanent depreciation.
(8).—Low initial and maintenance cost.
(9).—Flexible light distribution to suit various conditions of station design.

Fig. 4 shows the lighting unit that has been designed to



Figs. 3 and 4.—The lighting units developed for use in power stations and at outdoor sub-stations respectively.

incorporate the above listed desiderata. The unit is made up of an aluminium alloy housing supporting an adjustable socket, a two-piece refractor and an outer enclosing globe. The socket is adjustable from the outside of the fixture so that the relative position of the lamp filament and refractor can be changed, which in turn varies the vertical angle of maximum candlepower from 10 to 20 deg. above the horizontal. The outer globe is employed to protect the hot refractor globe from the rain.

The units are mounted on brackets or posts at a height of approximately 8 ft. from the ground, and the light is directed up into the structure so that the operator looks along with the light instead of into the light. The exact mounting height above the ground is found by drawing a line from the part to be illuminated to the lighting unit. The height of the unit should be such that the angle formed by this line and the axis of the unit should be between 70 and 80.

Fig. 2 is reproduced from a photo showing how the outdoor sub-station lighting units shown in Fig. 4 illuminate both the under-sides, vertical sides and ground of the sub-station. The picture was taken at the sub-station of the Bureau of Power and Light, Los Angeles, Cal., U.S.A.

INCREASED GENERATING CAPACITY.

Growth of Power Plants in the U.S.A.

DURING the first seven months of 1929 the electric light and power industry of the U.S.A. added 1 150 000 kW to the capacity of its generating plants, according to a statement issued by the Statistical Research Department of the National Electric Light Association.

Of this total increase, 991 000 kW, or 86%, were in steam turbines, 142 000 kW, or 12½%, were in water wheels, and 17 000 kW, or 1½%, were in internal combustion engines. At the present rate of construction, approximately 2 000 000 kW of new electrical generating machinery will go into service during the present year, or substantially the same amount as was added in 1928.

A very marked decrease is noted in the capacity of new waterpower plants constructed this year. The total will probably not exceed 250 000 kW as compared with a figure of 619 000 kW installed during 1928. The bulk of the new construction is in steam generating stations, the first units of two very large new plants having been put into operation this summer. One of these—the State Line plant near Chicago—contains the largest individual turbo-generator so far put into service. This one unit of 208 000 kW accounts for nearly 20% of the year's increase in power plant capacity.

COOLING WATER.

Sterilisation Developments and British Power Station Practice.

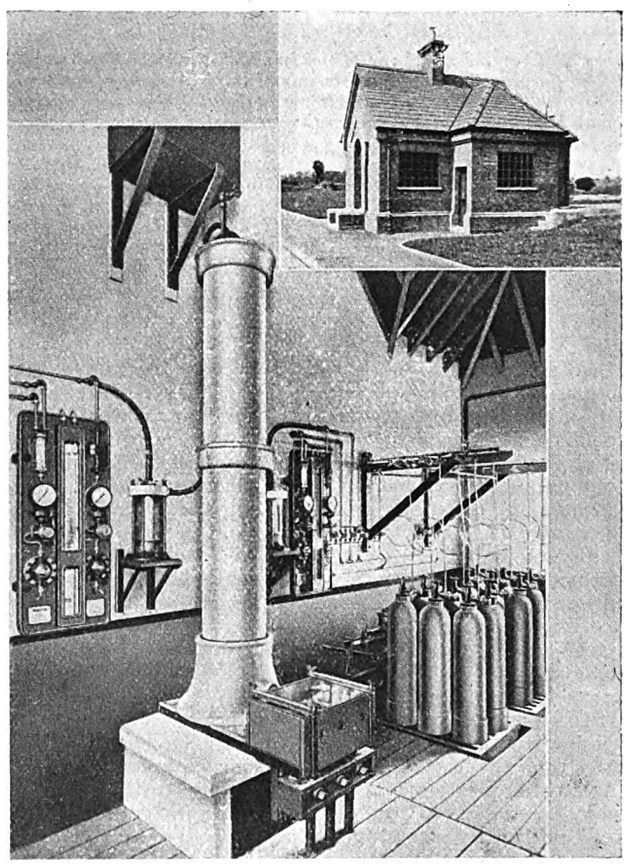
RAPID progress is now being made with the use in power stations of apparatus for sterilising the cooling water with a view to preventing all organic growths on the inside of the condenser tubes and allowing the highest vacuum in the turbines to be maintained continuously.

Generally about one part of chlorine per 2 000 000 parts of water is used for the purpose—that is a mere trace—which is accurately measured without difficulty, and the importance of the matter will be obvious when it is remembered that more or less organic growths take place with all cooling water, and that roughly 0·25 in. drop in the vacuum means an increase of 1% in the steam consumption.

Apart from this, however, there is the further important advantage that the troublesome and costly continual cleaning of the condensers and other plant is eliminated, so that a substantial net economy is obtained. Many sterilising installations are at work dealing with cooling water for power stations up to 100 000 000 gallons per 24 hours, although any amount could easily be treated.

In this connection it is interesting to note that an enlarged edition of the book, " Water Sterilisation by Gaseous Chlorine," has been issued by the Paterson Engineering Co., Ltd., in which is given a comprehensive description, with numerous illustrations and diagrams, of the whole principle of the use of chlorine gas for the sterilisation of cooling water for steam engines and turbines, town's water, swimming baths, sewage and sewage effluents, and many other applications.

The chief value of the use of 100% chlorine gas is that the latter is absolutely stable under all conditions of temperature, allowing of accurate regulation in a manner which is impossible



A typical installation of Chloronomes and (inset) the building in which it is housed.

with bleaching powder or sodium hypochlorite, quite apart from the question of convenience and simplicity. The supply valve on the " Chloronome " panel is merely adjusted to the desired amount, and then the whole arrangement proceeds automatically. A special device is included whereby the chlorine gas is first of all dissolved in a small portion of the water, and this resulting dilute solution then enters the bulk of the water, thus immediately ensuring uniform distribution.

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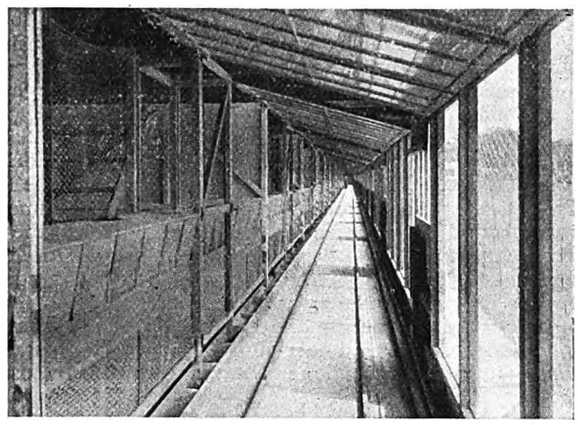
RURAL ELECTRIFICATION.

Value of Analytical Survey of Farm Equipment Market—Selling the Chief Problem—Preliminary Data Required for Sound Development—Calculating the Farmer's Purchasing Power.

By "AGELEC."

THE experience of supply authorities who are in a position to develop electrification in rural areas clearly shows that this new field calls for specialised attention, with specialists to handle it, and also that, though the problems fall under two headings—(1) rural service development; (2) the actual selling of farm electrical equipment—the last-named is the most difficult of solution.

Special interest therefore attaches to an analysis of the electric farm equipment market which was undertaken by a special committee of the National Electric Light Association, New York, the results of which are given in the Association's serial publication No. 289–92.



ELECTRIC POULTRY FARMING.

ONE of the rural industries in which electricity is already playing a useful part in this country is in the operation of poultry farms. This picture, taken at a modern farm at Dunsfold, Surrey, shows the interior of the main laying house, which is 480 ft. long and houses 3 000 birds. Egg production is stimulated by electric lighting. An electric railway runs along the lines shown in the picture, and is used for egg collection, food distribution and for transferring birds from house to house.

Dealing with the selling side the report recommends that the man chosen to make contact with the farmers should have sales ability beyond that of the ordinary salesman. He should be familiar with the company's rules, wiring policies and requirements, and he should understand the fundamentals of the public utility business, for the farmer is surely going to ask him many questions about the company. He should have a general understanding of farming and be able intelligently to discuss improved farm methods. He should be well informed on the practical uses of electricity on the farm, and he should keep up-to-date on this subject by reading the great mass of material that is available. He should remember that he is talking about a new kind of power to a group of people who are not familiar with it, and he should exercise a great deal of patience and diplomacy.

It is appreciated that these are the specifications for a rather high-grade man, but it is believed that such a man is necessary at this time in the selling of farm electric equipment.

As to the question: how many of these rural service men should be employed? the committee recommends that there should be at least one such man for every 500 farm customers. A larger number than this is necessary in the beginning of an intensive rural electrical development programme. It is recommended that eventually there should be such a man in each district office where the company does business in rural territory.

Necessary Information.

Intelligent merchandising of electrically-operated equipment in rural areas involves specific and detailed knowledge regarding types of agriculture, financial resources of the farmer, natural purchasing seasons and buying habits of the prospective customers. Fortunately, there is a large amount of statistical information available which, when digested, analysed and summarised, will yield important information for the merchandise manager and salesman. To be most effective this information should be worked up for the individual company's territory.

Detailed analyses are given for selected areas of distribution of population, number of farms and farm acreage, acreage and production of principal crops, livestock and livestock products on farms, and farm value, farm debt and farm income. With the aid of these analyses an index of purchasing power has been worked out for each county or area, depending on the income per farm and the value of land and buildings.

The index of land and buildings per farm is the ratio, expressed as a percentage, between the average value per farm in each county or area and £1 670, which is the national average in the U.S.A.

Expressed as a formula this becomes: Index of land and buildings

$$\text{Value} = \frac{\text{Value per farm}}{£1\,670} \times 100$$

Similarly the index of farm income is the percentage relationship between the average farm income of the county in question and the average for the nation as a whole, which in the case of the U.S.A. is set at the low figure of £470. Thus

$$\text{Index of income per farm} = \frac{\text{Income per farm}}{£470} \times 100.$$

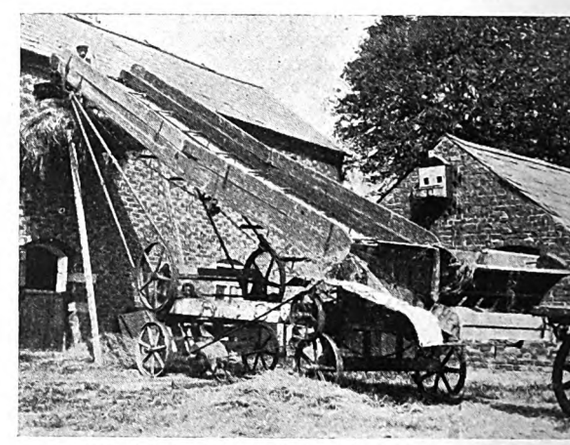
Index of Purchasing Power.

The index of purchasing power is a weighted average of these two index numbers. Since the value of land and buildings represents borrowing power, while the actual income may be more readily used for purchases, the index of farm income is arbitrarily made twice as important as the index of land and buildings value, and is counted twice in making the weighted average.

The formula is:

$$\text{Index of purchasing power} = \frac{(\text{Index of farm income} \times 2) + \text{Index of land and building.}}{3}$$

While the corresponding data permitting the compilation of such indices may be harder to obtain in this country, it seems evident that a considerable amount of investigational work along similar lines is desirable if sales possibilities in this potentially important field are to be thoroughly and soundly exploited.



ELECTRIC MOTORS ON THE FARM.

THIS picture, taken on an English farm, shows one of the many applications of electric motors in the various operations carried on in and around the farm buildings. Considerable savings in time and energy are obtained through the use of electrically-driven unloading equipment.

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PLANNING POWER SYSTEMS.*

How to Anticipate the Growth of a Supply Undertaking—Load Density in Residential Districts—Value of Long-Term Estimates.

By A. C. MARSHALL, A.A.I.E.E., and H. A. SNOW.

SYSTEM planning is the general preliminary process of providing for the growth of the system. It should be carefully done, with vision and imagination to foresee and appreciate the future, so as to avoid, if possible, scrapping equipment because of inadequacy before it has served its useful life. A system that grows up without an adequate appreciation of future conditions may reach a stage of development where further expansion cannot be had without tearing down and beginning over again.

The general process of system planning can be divided into two broad divisions, involving, in the first division, the development of a master plan for the arrangement of the system, and, in the second division, the determination of the rate at which construction will be undertaken in carrying out that plan. The master plan should be flexible, it should be capable of adaptation to meet shifting conditions, and it should provide for almost indefinite expansion. Master plans which do not avoid inherent limitations to the growth of a system, such as the presence of excessive short-circuit currents, the lack of adequate quantities of condensing water, or streets choked with conduit runs, etc., are not suitable. There must be a prearranged solution to such foreseen difficulties, which are bound to arise as the system grows, and investment made in accordance with the plan should remain useful for a normal period of life. It should not be rendered obsolete in a few years because an unexpectedly rapid growth has made necessary a complete rearrangement.

The second division of system planning involves the determination of the rate of expansion in accordance with the master plan, so as to avoid, on the one hand, the excessive costs of rush jobs and, on the other, burdensome fixed charges on idle equipment. The solution of the problems of the first division of planning tells the engineer what to do, and the solution of the problems of the second division tells him when to do it.

The engineer must understand the capacities and characteristics of the equipment which is available to his hand; he must foresee limitations and arrange to avoid them; he must dream of far-flung systems, of enormous power plants, of the standards and habits and methods of life twenty and thirty and fifty years from now. And then he must come back to earth and to the sober realisation that additional transformer and cable capacity is needed for next year; to the consideration of just how much and where, and to budgets, time schedules and bills of material.

The inner suburban districts of a great city furnish a concentrated load, which is more regular in its rate of growth and much more dependable as to location than the industrial power load. The business office district, once established, does not move to a new site without notice. Such auxiliary business centres as may develop in a large city are of minor importance, at least for many years. Occasionally, there arises a large and fairly sudden demand for service, such as that occasioned by the installation of air-conditioning equipment in a large departmental store. Transmission and sub-station facilities should be provided for in the master plan which will take care of very high load densities in the heart of the inner suburban district, shading off rapidly at the edges. The exact location of sub-stations is partly determined by the availability of sites. Continuity of service is of particular importance, and very large reserves of throwover capacity are maintained.

Planning in Residential Areas.

With plenty of potential sub-station sites for industrial service along the railway lines, and with the inner suburban sub-station sites tucked away in such odd places adjacent to the load as may be obtained, there remains the residential district to consider. Here planning is especially feasible and may be prettily done. Suitable sites are readily available and load densities per square mile may be determined upon with sufficient certainty that they will not be upset as soon as established. The Detroit Edison Co. is using a tentative figure of 5 000 kVA per square mile as a limit, which should be good for many years to come.

It is only necessary to take a map of the city and arrange the prospective sub-station sites in any symmetrical pattern that seems to make transmission arrangements simple. A diamond pattern permits the interpolation of additional sites at the centres of the diamonds if densities should exceed expectations. With residential sub-stations of 20 000 kVA capacity and a density of 5 000 kW per square mile, one sub-station would serve 4 square miles, and the distance between adjacent sub-stations would be 2 miles. It will be a long time before this load density will be reached.

Prospective Sub-station Sites.

The results of such studies crystallised into definitely located sub-station sites, both present and proposed, are plotted on a map. Such a map permits the purchase of sites well in advance, often at marked savings where land values are rising. It also permits the more intelligent planning of the distribution system, both overhead and underground, particularly when it is considered that this map is based upon load density studies.

The study of prospective sub-station sites makes necessary some ideas as to densities of load which may be planned for in years to come, and suggests a side line of study which is of considerable importance in system planning. This is the study of the performance, the consumption of current and the load characteristics of apparatus and appliances which are coming into use among customers.

In determining the figure of 5 000 kW per square mile for a load density to plan for in residence districts, extensive tests were conducted to determine load characteristics and consumptions in actual service of large current-consuming appliances for residence use, such as electric ranges, electric refrigerators and electrically-driven oil-burning furnaces, and certain assumptions were made as to the probability of the general adoption of these appliances by residence customers. Similar studies of the load characteristics and consumptions of air-conditioning apparatus, electric brass-melting furnaces, electrically heated japanning ovens, etc., furnish a background for the formation of opinions as to possible future industrial loads to be provided for in the master plan.

Almost imperceptibly the discussion of system planning has shifted from the first phase, which is the formulation of the master plan itself, to the second phase, which is the making of decisions as to the rate of building power plants, sub-stations and transmission lines in accordance with the plan. The second phase involves the making of estimates of the probable growth of load. Such estimates may, of course, be extended into the future for considerable periods, say ten years or so, and such long-term estimates are interesting as studies and stimulating to the imagination. But there exists no necessity for estimates of future loads that extend farther into the future than the time required to build the plants and procure the equipment which will be required to carry the estimated loads. Power plants must be planned three or four years ahead, sub-stations a year or two, while a year or even less may be sufficient for transmissions.

Each year the Detroit Co. prepares a general estimate of conditions for the next ten years, including studies of population, sales of current for the several classes of service, peak loads, output, coal consumption, earnings, expenses, investment in fixed capital and rates charged for service. This study is fundamentally an extrapolation, based on records of past performance, but modified by established ideas of probable future trends. The several items comprising the general estimate are very carefully correlated with each other to produce a balanced and uniform study.

In making the ten-year estimate, advantage is taken of the fact that it is easier to form a definite opinion of the probable future values of the ratio between two quantities than it is to estimate the quantities themselves in the abstract. Thus a question as to the total tonnage of coal which will be burned in 1938 meets with only a vague response, while an inquiry as to the probable number of pounds of coal which will be burned per kilowatt-hour of output in 1938 evokes a rather definite opinion. Similarly, ideas of load factors, transmission losses, average wages, cost per ton of coal, kilowatt-hour consumption per customer and customers per thousand

* Based on an address presented to the Power Systems Engineering Committee, Cleveland, Ohio.

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of population, which are all ratios, are well established, and there is a feeling of confidence in using estimates for such ratios that does not exist when dealing with abstract quantities such as tons of coal, total output, peak loads, total number of customers, etc.

Given a single starting point, which must be an abstract quantity, it is possible to develop the entire study by proceeding from item to item through the use of the ratio figures. The fundamental starting point for the ten-year estimate is the estimate of population; this is linked to the number of customers by a ratio, and this again to the total sales of current by ratios, and so on through the entire study. The last or closing factors in the chain are the rates charged for service.

At the end of each year's business actual figures are substituted for the estimates of that year, and in the light of this knowledge, and of other ideas and facts that have developed during the year, the estimates are reconsidered and revised where necessary, and a new year is added, carrying the estimate one year further ahead.

Estimating the System Peak.

One of the figures developed in the ten-year study is an estimate of the peak load on the system. The first use of the estimate of peak load is in connection with the schedule of additional generating capacity to be installed.

Following the consideration of power plant capacities is a study made of the load on each sub-station at the time of the system peak. The study is based on the load records taken from the sub-station meters. After the load on each sub-station at the time of system peak has been separately estimated, for a period running three years into the future, by extrapolation from the sub-station meter readings, and with corrections for known changes in sub-station areas, the sub-station loads for all sub-stations are added together and checked against the estimated system peaks from the ten-year report, less an allowance for transmission losses. There exists a certain diversity between the load on the sub-stations at the time of the system peak and the non-simultaneous individual peak loads on the several sub-stations, and if this difference is important, a proper correction is made; but in general thess peaks are used in planning transmissions. The ten-year report is used to unify and correlate the estimates arrived at independently for the several sub-stations, and to reveal large errors due to cut-overs and to other abnormal factors affecting sub-station readings.

The above method for studying future sub-station loadings is dependent upon extrapolation from past records of peak loads. Past records, say those which are three or four years old, are apt to have been for areas which are different from the areas now served by the several sub-stations because of cut-overs of distribution circuits to newly constructed sub-stations. Corrections for cut-overs which occurred three or four years ago may be omitted by mistake, and even if remembered, the cut-overs are difficult to evaluate. Besides this, the engineer is dealing with peak loads, which are themselves inherently erratic and poor bases for accurate extrapolation. Furthermore, peak loads cannot be added because they are usually non-simultaneous. Sub-station peak loads are inherently unsatisfactory to work with in estimating the future.

To remedy this unsatisfactory condition the study of the geographical distribution of future loads, for the purpose of planning sub-station sites and capacities, has been attacked from another angle. The metropolitan area has been divided into some 600 small elements of approximately equal size. In the heavily loaded inner suburban district the elemental areas are reduced in size to city blocks. These elements are plotted out on a map and assigned consecutive numbers.

The boundaries of the elements are defined by street and number, so that reference may be made to the customers' billing ledgers, which are so indexed, and statements prepared from the ledgers for each small area of the number of customers and of the kilowatt-hour sales. Customers and sales are divided in the usual way into the several classes of service, residential lighting, commercial lighting, small power, etc., so that there is a complete record of the requirements for electric service of each small area. The power requirements are stated in kilowatt-hours, which are not erratic, and which may be added together; at the proper stage in the calculations they are converted to peak-load figures by the use of normal load factors. Abnormal peaks are taken care of by overload and reserve capacity, and the planning is done for normal peaks.

A field survey is also made of each elemental area. Note is made of the extent to which the area is built up, of the rate at which building is progressing as evidenced by new buildings under construction, and of the character of the district, whether it be residential, commercial or industrial. If apartment houses and flats are beginning to make their appearance this is noted. Factories located in the area are separately studied, and by conference with the sales engineers of the company their future needs are individually considered. The general features of the district are recorded, railways, main thoroughfares, shopping districts, parks, etc. All of the data from the customers' ledgers and from the field survey are concisely recorded and preserved in a file, to be referred to later, when another estimate for the area is to be prepared, so that an idea of the rate of growth and of the character of changes which have occurred since the previous estimate is obtained to assist in making the next estimate.

The next step is to group together the elemental areas which together constitute, or approximately constitute, the territory which is served by the sub-station under consideration. If the result is not satisfactory, the areas may be regrouped to transfer a part of the area to an adjacent sub-station. If a new sub-station is to be built, it is only necessary to add the loads which exist in each of the areas which are to be assigned to the new sub-station to obtain a very accurate idea of the readings on the switchboard meters in the new sub-station when they are put into commission.

This method possesses a number of advantages. Sub-stations may come and sub-stations may go, but the elemental areas remain as they were; there is no confusion of regrouping. The elemental areas may be grouped and regrouped to study new districts and to determine the effect of proposed cut-overs. A third advantage is that the sub-division of the complex problem of load forecasting into 600 smaller problems does much to eliminate confusing complexity.

Having estimated sub-station loads (kilowatt and wattless) for the next three or four years to our satisfaction, the next step is to group the sub-stations into "power areas." The grouping of estimated sub-station loads gives the estimated loads on the source of power for the next three or four years. If the grouped loads exceed the power or the wattless capacity available from the source, the problem becomes interesting. Additional generating capacity may be provided, or sub-stations may be juggled from power area to power area, permanently by re-routing transmissions or temporarily by switching changes in the switching sub-stations. In extreme cases a power area may be split in two and the foundations of a new power plant started, destined to feed the nascent power area.

At times it becomes desirable to "unload" a power area to permit construction work at the power plant. To a limited extent this may be accomplished by switching changes, but at times it is necessary to instal additional transmissions. At other times the power plant men have ideas of their own as to what load they can or cannot carry on cer ain power plants, and they must be consulted before final dispositions are made. They are also inordinately interested in water rates and such like things, and upset otherwise satisfactory loading schedules to further their own ends.

Study of Emergency Conditions.

The next study is the final test of the plans for the next three or four years, which have been based on the assumption of normal operating conditions; it is the study of emergency conditions, especially at the power plants. Proceeding in turn from plant to plant, the assumption is made, one power plant at a time, that the biggest turbine in the power plant goes out of commission. It is a rule that switching changes shall be possible which will immediately care for such a situation if, indeed, any change at all is needed. Then more complex failures are investigated, various combinations of two turbines down, and then of three turbines down at once.

The designs which follow from the study of loads and the decisions as to what additional capacity is called for conform to the master plan. They are incorporated into projects and submitted to the management for executive approval. The collection of approved projects constitutes the construction budget.

To aid the management in the choice of projects for approval, the project sheets are divided into five classes, as follows: Class A, to care for increased load; class B, to increase reliability or safety; class C, to reduce operating costs; class D, to improve appearance of property; class E, miscellaneous.

The budget is the climax of the whole series of studies that began with the consideration of the progress of the art of

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central-station service and of changes in the habits and methods of living of the people who will be customers of the electrical utility undertaking ten or twenty years from now, and that terminated in the project sheets for new items to be added to the construction programme. Before the project suggested by the engineers is admitted to the budget it must have qualified as being, in the opinion of the management of the company, commercially feasible and advisable. The consideration of general commercial and financial advisability is the last test of the soundness of the proposed project.

A Flexible Budget.

While projects should be approved and added to the budget as early as possible, this cannot, and does not, force the company into rigid and unreasoning adherence to plans which newly arisen circumstances may have rendered inadvisable. The budget itself is flexible and may be changed at any time by adding new projects or deleting old ones. Furthermore, the execution of the projects may be accelerated or retarded as desired. The budget bureau reports to the management that approved plans on file will result in capital expenditures of so much in each month of the next six months or year. If this is not satisfactory the proper executive proceeds to change the plans, and the budget accordingly, and the control department revises the estimates of monthly expenditures. Further than this, the budget bureau of the control department sees to it that, after the executive has approved the plans and turned his attention elsewhere, they are carried out substantially in accordance with his recorded wishes.

THE BATTI-WALLAHS.

Mr. George Balfour Dispels Fallacies at Society's First Luncheon.

OVER 150 members of the Batti-Wallahs Society and their guests met at a luncheon at the Hotel Cecil, London, on Tuesday, when Mr. George Balfour, M.P., was the principal guest, with Mr. H. L. Howard, the president, in the chair.

Mr. Balfour said that constant repetition of the misconception that Great Britain was backward in the development of electricity had so taken hold of the public mind that it was time for the industry to controvert it in unequivocal terms. It was an estimate with which he was in profound disagreement.

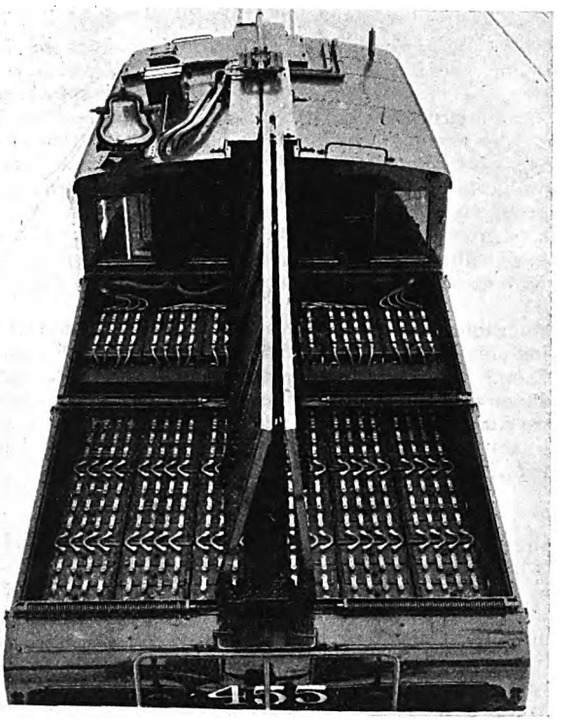
Right in the early days of electrical enterprise this country (Great Britain) led the world electrically, and this continued to be the case until the end of last century.

Efforts to find the basis of the popular idea that we " lagged behind " showed that it was due to a comparison made between countries in which the conditions were vitally different. In the case of the United States, for example, the population in 1880 was only about 50 millions and this comparatively small population not only had a vast territory in which to develop, but also practically an illimitable wealth of natural resources. In this country, on the other hand, we had a population rapidly approaching the saturation point, with its comparatively meagre natural resources largely developed and an old and matured civilisation provided with services which were in competition with electricity. Against this, electricity started in the new country of America without any real competition.

In view of these facts it was dishonest for those who knew them to pretend that we were lagging behind in electrical development.

The allegation that electrically we had no vision also called for denial, for no other country had displayed greater foresight. If only the British industry had been allowed to develop under the recommendations of the Cross Committee we should have gone right ahead. Following the report of this Committee a number of Power Acts were put on the statute book, mostly between 1900 and 1903. The reason why we did not develop rapidly from this point was that we were ahead of the times, and not behind. We were tied down by reciprocating sets and other technical disadvantages, and, in addition, endeavours were made to supply electricity over considerable distances at prices which were quite uneconomic. The three chief factors militating against electrical progress at that time were the use of small power units and reciprocating sets; the fact that nearly every big centre for the supply of electricity was taken over by a municipality and was cut right away from the individual methods of private enterprise; and the availability of cheap fuel, which favoured the use of individual power plants.

At the time of the outbreak of war nearly all the larger municipalities and companies were about to replace their reciprocating sets by turbine units. These projects were all swept aside and at the termination of the war the industry suffered the infliction of committees and officials inspired with all sorts of reforms designed to recondition the electrical industry. The consequence was that we had the crazy legislation that was introduced in 1919, founded on the theory of a cheap and abundant supply of electricity for all. Some of the most vicious principles of this Bill were killed on the spot, but efforts were still being made even now to obtain the cheap and abundant supply.



NOVEL ELECTRIC LOCOMOTIVE.

AN unusual view of a novel type of combined trolley-battery electric locomotive put into service on the Chicago North Shore and Milwaukee Railway. The picture shows the battery compartment and the top of the driver's cab.

It was obvious that the obstacle was not primarily the cost of production, but the cost of distribution and the small density of population in many of the supply areas.

Referring to our hydro-electric resources, Mr. Balfour said we had between 200 000 and 300 000 kW easily available. Considerable hydro-electric development was proceeding in North Wales, and in Lanark, and another interesting project was at Lochaber, where the final development would reach nearly 100 000 kW. This scheme employed the largest cubic content tunnel in the world to take water to Fort William for the manufacture of aluminium. This enterprise, which gave no public supply, would eventually be recorded as the biggest thing of its kind in the world.

If we went ahead and developed our hydro-electric resources so that large blocks of power would be readily available we could attract new electro-chemical and similar industries to this country.

On the proposition of Mr. F. Pooley, a hearty vote of thanks was accorded to Mr. Balfour. Mr. W. Whitgift, the hon. secretary, announced that the next luncheon would be held on November 7th, when Mr. Frank Hodges would give an address.

A photograph appears on page 413.

The Germans and Americans are already realising the possibilities offered by Ireland.—*Mr. William T. Cosgrave.*

* * *

We in this country think too much of what we are spending, without considering what revenue it will bring in.—*Mr. L. L. Robinson.*

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MARINE ELECTRICITY.

Four Big Electric Ships Building and Planned in this Country—Electric Propulsion for the Highest Powers—Electricity and its Uses in Navigation—The Supply and Control of Emergency Power.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types," etc.).

A RUMOUR is now afloat, which, in fact, is more than a rumour, because it has been substantiated on very good authority, that the P. & O. Company has issued specifications for the construction of two new large passenger liners of first-class type, and owing to the success with which the "Viceroy of India" has operated in service, it seems more than probable that if and when the contracts for these ships are placed, they will be electrically driven.

This is interesting as well as important, because it seems that there will then be building in this country four important ships with electric propulsion, two tankers and two passenger liners.

At the same time comes news from America that a Government loan has been granted to the Dollar Line for the construction of some fast liners, which are to be of the electrical type, in accordance with the details which I have previously discussed in these notes. Therefore it would seem that the era of the electric ship, which has been so consistently preached in the columns of THE ELECTRICIAN, is at last at hand.

An Italian View.

It should here be emphasised, however, that the electric ship is by no means the universal solution to the problem of marine propulsion. It is always a special case, and will have special applications, not the least important of which are passenger liners with high auxiliary power, and passenger liners of extremely high power. In this connection it is interesting to note that at the recent meeting of the Institution of Naval Architects in Italy, a prominent Italian ship constructor, General E. de Vito, devoted quite a considerable portion of an excellent paper which he gave on Atlantic liners, to the question of electric propulsion. He cited two cases in which plans had been prepared for large vessels of the 180 000 shaft horse power type with turbo-electric propulsion, and also mentioned a vessel of smaller type with Diesel-electric propulsion. These examples, coming from so eminent an authority, would appear to indicate that, while one cannot say definitely that either turbo- or Diesel-electricity is the one and only system of electric propulsion to be used in ships of this kind, there are great advantages in both ways of generating the current; and if Diesel-electric propulsion has occasionally been criticised on the grounds of multiplication of prime movers, and of super-multiplication of moving reciprocating parts, then it is also evident that at least there are compensations for these so-called disadvantages.

In particular it should always be remembered that Diesel-electricity gives a power flexibility which is unattainable to such a fine degree with any form of turbo-electricity, for the load can be so finely adjusted by starting up or stopping one, two, three or four generator sets at a time; whereas in the majority of turbo-electric sets so much power is locked up in each individual turbo-generator that a finely divided power gradation is impossible. It is disappointing to note that construction has been held up on the 1 000 ft. design for the White Star Line, which, according to a statement by Lord Kylsant, is to be propelled electrically. It would seem here that the builders and owners cannot arrive in their own minds at a satisfactory solution to this elementary problem of electric powering, and indeed the problem to be solved is no light one, when it comes to a matter of considering powers of 150 000 H.P. and over.

Olympia and Electricity.

Meanwhile, those of us who are interested in the furthering of electrical developments on shipboard have naturally been anxious to see in the recent Shipping and Machinery Exhibition at Olympia just what firms doing business with the marine industry would be showing, and, frankly, it must be said that from this point of view the Shipping Exhibition has been disappointing. One would have expected, with all the developments which have recently been taking place, at least on the part of big firms such as, for example, the British Thomson-Houston Co. and the Metropolitan-Vickers Electrical Co., a display of what they had done, could do, and were interested in doing, in the field of electric propulsion.

Such marine electrical developments as were shown were mainly of the auxiliary nature, and perhaps if we are to judge the trend of an industry by its exhibitions, we may assume that marine electrical firms reckon on obtaining a greater revenue from their auxiliary activities than from the main propulsion business.

Even in these auxiliary activities one did not sense any particular prominence given to the pushing of marine electricity, although, of course, such firms as Laurence Scott, Sunderland Forge, Metro-Vickers, and many others prominent in this trade were well represented.

As I have remarked elsewhere, a feature of development which struck me particularly, and which has not hitherto obtained the prominence it deserves, was the suggestion mooted on the stand of the Premier Gas Engine Co. for the driving of electric generators by means of horizontal airless injection 4-cycle Diesel engines; for here is an advance of such an important nature that it virtually tends to become revolutionary as far as electric propulsion, or even as far as electricity generation, on shipboard is concerned.

The idea of driving a generator by horizontal Diesel engines is not so strange on land as it is at sea, where, with the exception of refrigerating compressors, no horizontal prime movers of any importance are used. Here, however, is a company which is suggesting that generating sets on shipboard should not be driven by vertical prime movers, which take up valuable space, but by horizontal prime movers which absorb only tank top space.

Horizontal Generator Sets.

Assuming this applied to electrically-driven ships of, say, 10 000-15 000 H.P., it is easy to imagine what a revolutionary effect would result upon the interior design of the ship. Decks which formerly had to be broken into for high vertical reciprocating prime movers could now be extended, with the exception of a small escape-way trunk right across the ship, and even in auxiliary engine rooms considerable space saving could be effected.

It is known that at least one shipping company is very seriously interested in this form of generating electricity on shipboard, and while from the point of view of marine electricity one welcomes such development, it is questionable

THE HIGHEST-POWERED ELECTRIC PROPULSION LAYOUTS.

Total Power at Shafts	No. of Shafts.	Type of Drive.	No. of Generators.	Type of Engines.	Remarks.
100 000	4	Diesel	16	2-cycle opposed piston	Each generator develops 4 300 kW.
120 000	4	Diesel	20	2-cycle double-acting	Fuel consumption 0·5 per S.H.P. per hour.
180 000	4	Diesel	8	2-cycle double-acting	Two Diesel engines to each generator. Generators in separate watertight compartments. Weight 55 lb. per H.P.
200 000	4	Turbine	—	500 lb. steam pressure at turbine stop-valve superheat 750 deg. F.	R.p.m. of shafts, 250. Fuel oil consumption 0·65 – 0·7 per S.H.P. per hour.

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whether the ship-owner himself will be so enthusiatic, because it gives him one more problem to solve in his choice of a prime mover. As has been suggested, these horizontal prime movers can be used either for auxiliary drive or for main propulsion work. They are specially interesting from a point of view of auxiliary drive because it is here that so much development has taken place. This development is now proceeding along the lines of improvements in control.

Hitherto it has been the fashion to arrange heavy, clumsy control boxes near each electric motor. The advantages accruing from the use of push-button start and stop systems have hitherto remained largely untouched. This, after all, is natural, because it is only within recent months, one might almost say, that the electric auxiliary has come to be recognised as superior on all counts to the steam auxiliary for engine room work. And it is only within the last year or so that the electric motor has been recognised as part of the auxiliary which it drives. How otherwise can we explain the clumsy pumps with ungainly motors, operating from noisy spur-gears which have characterised, and still characterise, many so-called modern engine rooms?

To-day the pump maker recognises that the motor is as essential and integral a part of his complete product as was the steam cylinder in the old days, and thus, as too in the old days, he used the best and most compact type of valve to control the operation of his pump, so to-day he is beginning to seek the best and most compact type of switchgear to control his motor. Of particular interest, therefore, was the "Uni-Start" control system exhibited at the Shipping Exhibition by the Sunderland Forge Co., which permits of start and stop push-button control for constant or variable speed motors; the actual control boxes being built by Brookhirst Switchgear, Ltd., of Chester.

Push-Button Control.

While there is, as a matter of fact, nothing particularly novel in the idea of push-button controls for electric auxiliaries, this particular method is of sufficient interest to warrant further discussion. It pre-supposes control of each motor at the motor itself and not at the switchboard, as is becoming the practice in a number of ships—particularly in modern Dutch motor liners, where the standard and technique are said to surpass corresponding British practice. One starting resistance only is fitted for the whole of the equipment, except in cases where there is a big power difference between larger and smaller motor units. There is normally only one starting mechanism for the whole of the machinery. This is the starting resistance controlled by an automatic contactor type starter on the switchboard itself, and is operated by the start and stop pushes on or near to each machine. The push button controls are so interlocked that it is impossible to start more than one motor at a time, and each machine is protected by contactors on the main switchboard fitted with an overload relay, which takes the place of the usual switch and fuses or circuit breakers nominally required, and effects a material saving in space. For constant speed motors, an ordinary push button control is fitted, but on motors which run at variable speeds a suitable regulator for speed is fitted on the starting panel.

It is unquestionable that this system marks an important advance in marine electrical technique, as the advantage of being able to control each auxiliary from the auxiliary itself is no small one. The compactness of the equipment, too, is a point well worth emphasising. It has been mentioned that there is one school of thought (in Holland particularly) which prefers to control all the auxiliary motors from the switchboard itself, and this is quite feasible. Other people consider that it is a safer arrangement to make each unit separately controllable at the unit itself. The idea has hitherto been used very little in British ships, but it is interesting to note that in Henry Ford's big motorship "East Indian," control for individual electrically-driven pumps was arranged at the pumps themselves.

Another important section at the Shipping Exhibition was to be found in those stands which specially concentrated on the application of electricity to the science of controlling and navigating ships, and here of course the gyro-compass stands out as extremely prominent, although in this connection mention should be made of a particularly ingenious American invention marketed in this country by Henry Hughes and Son, of Fenchurch Street, whereby repeaters showing the exact course steered, or to be steered, can be arranged for ordinary standard compasses. Repeater compasses, of course, have long been a feature of gyro-compass navigation; in fact they are one of the great advantages of such navigation, in that master compasses can be tucked away conveniently down in the bowels of the ship, whereas repeaters, as many as are required, can be arranged in the pilot house; on top of the pilot house; and in the wings of the bridge. So far this has been impossible with the standard compass; in fact it is questionable whether anyone has even thought it necessary, but it represents an important little application of electricity which should do much to increase the scope and utility of an instrument which is already a well-tried friend of the ship master.

On two stands in the exhibition, all phases of gyro-electrical navigation were thoroughly exhibited. This has reached its most advanced stage in the Sperry gyro-automatic steering and motor control pedestals, specially designed for a complete fleet of electrically-propelled tankers of the Atlantic Refining Co. One has many times put these ships forward as the complete examples of the electrical era at sea, for in one pedestal about 4 ft. 6 in. high and 18 in. square in horizontal section are situated the control gears for steering (by hand or by gyro), the gyro-compass repeater (which has entirely replaced the ordinary binnacle) and the "throttles" for the main propelling motor. This all represents very advanced thought and I have heard it roundly and soundly condemned by people who have never seen the ships in action.

All-Electric Steering.

On the other hand, the proof of the pudding is in the eating, and it is believed that in no case has any of these "advanced" electric ships been seriously in the casualty list because of lack of manœuvrability or "steerability" at a critical time.

A look round the Sperry, S. G. Brown, Siemens, and Laurence Scott stands at the recent exhibition has really been worth while from the point of view of discovering what electricity is now doing for navigation. Of particular interest to all those who are genuinely concerned with the progress of electricity on shipboard is the fact that, for the first time in a European-built and owned ship, a true Sperry "metal-mike" is to be fitted to the Rotterdam Lloyd motor liners "Baloeran" and "Dempo." Hitherto a gyro-compass repeater and automatic steering gear have been arranged in one pedestal, but placed alongside and directly connected up with the ordinary telemotor steering wheel. The more advanced type cuts out the telemotor link altogether, and does everything electrically. The steering wheel is incorporated in the pedestal, and, by means of a hand lever on the left-hand side, control of the rudder may be switched from "hand" to "gyro" as required. This type of pedestal is practically standard in all American ships with any pretentions to modernity, and has been so for a number of years in cargo ships and liners alike. It was fitted, for example, to every unit in the U.S. Shipping Board's Diesel conversion programme, and in the chart rooms of the majority of these vessels the pedestal is the only piece of navigational apparatus present, with the exception of the engine room telegraphs, which, curiously enough, are of the old chain type.

In Europe the natural field for this type of pedestal has been held closed to a great extent by the suspicion with which seamen still seem to regard all-electric steering. The electrically-operated oil ram steering gear is practically standard in modern European ships to-day, but in this case the pumps, and therefore the motors, are of constant speed and of unidirectional type. The delivery is the only variant, and this is controlled by the reliable old telemotor gear.

The Marine Storage Battery.

A further feature of the Shipping Exhibition was the prominence which was being given to the question of storage batteries. Firms which have hitherto not regarded shipping, beside the submarine field, as anything worth bothering about, are now definitely coming out into the open with the avowed intention of persuading shipping people to use batteries, not only as mere standby devices for wireless telegraphy, but also for use in conjunction with auxiliary Diesel generator sets, to work cargo handling appliances, to run steering gears should the current fail completely, and to operate the whole of the deck lighting and boat control system, assuming that the main engine room, for some reason or other, goes out of control.

There is a growing tendency now on modern ships to arrange for a complete power plant on some upper deck, away from and separate from the whole of the power arrangements in the engine room; and this again seems wise. It would have been entirely impossible in the old days of steam, because electricity can be led and used where steam could never be

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used. The difference between a carefully insulated cable, and a carefully lagged steam pipe is too obvious to need any elaboration here.

We have suggested before in these notes what might have been possible in the case of the stranded "Celtic," had that vessel been fitted with an auxiliary deck electrical power plant. It is to be hoped that ship-owners will learn something from the fate of the "Celtic," and that underwriters may even insist that legislation should be brought into force whereby complete electrical installation is necessary, not only for emergency purposes, but for general control purposes of all deck gear. It is first and last the extreme flexibility of electricity, combined of course with its economy, that makes it so obviously desirable for marine duties.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"The Economic Choice of Engineering Plant."

[TO THE EDITOR.]

SIR,—I regret that in my article on the above subject, published in your issue of September 20th, there are two omissions.

The expression for the sum of the geometrical progression near the top of the second column on page 323 requires another bracket, and should read as follows:—

$$\text{Amount at the end of } n \text{ years } = \frac{A\{(1+r)^n - 1\}}{r}.$$

In the list of symbols a little lower down no explanation was given of the symbol G. This is defined as follows:—

G = output of the plant in kW.—I am, etc.,

A. S. FENEMORE.

Stafford.

September 24th.

"Concrete Pole Designs and Costs."

[TO THE EDITOR.]

SIR,—All your readers will, like myself, be pleased to see, from the photos published last week, that Mr. Taylor or some friends of his have made at least one pole in situ; even the men at the top appear to be pleased. We would like to see the cost sheets for the job.

With regard to Mr. Taylor's challenge, he has a ringside manner which is overwhelming. My complete belief in Mr. Taylor's veracity is not to be shaken by an offer of even £1 000 plus 6%, plus £250, plus the usual tolerances for the estimated railway and steamboat fares and subsistence allowances from England to "Dead Man's Gulch" or other obviously distant site of this pole, to confirm Mr. Taylor's rectitude. Besides, as Mr. Taylor declares, I have to stay here to look after Mid-Cheshire, while he "scopes the whole world." Moreover, it would be cheaper to put up a few poles here, and I think it possible that, if Mr. Taylor is willing, a sample line could be arranged for by one or other of the members of the Overhead Lines Association.

For the rest, Mr. Taylor and I are in agreement to this extent:—(1) He scopes the whole world; (2) I cannot; (3) wood lasts well in some places and particularly well in England; (4) ferro-concrete resists white ants, but we have none here.

We do not agree that ferro-concrete deserves a less factor of safety than wood, in England at any rate. In both cases I claim that there is a doubtful quality factor—one due to *nature* and the other to *human nature* which calls for a fairly high "factor of ignorance."

Take that man on the pole on the right—he may be careless when tipping in his concrete, he may forget to ram it or may drop his ramrod and think it too far to go down for it before dinner, and he may start work one day without wetting the surface of yesterday's finish. If, therefore, a factor of safety of 2½ on the elastic limit basis is correct for steel construction, I think 3½ is warranted for wood and ferro-concrete. A pole, whether of wood, concrete or steel, can be made to comply with the Regulations for any span—even 500 yards—and Mr. Taylor's insistence that wood shall be restricted to short span work is ridiculous.

While it is very clear that ferro-concrete and steel are both impossible on short span rural work solely on account of cost, it is clear that wood is as safe as either steel or ferro-concrete for long span work if constructed to the Regulations, and it may be considerably cheaper, which is what we need. Its safety is taken care of by the high factor of safety required by the Electricity Commissioners.

While I am just as pleased to construct a long span wood "A" pole rural line, as I was to try out the long span lattice pole rural line, I am not ready yet to put forward a similar ferro-concrete pole line, because so far I have no real idea as to where to buy or how to construct the poles to comply with Regulations. If Mr. Taylor knows, it is up to him to tell us.

It is his air of mystery which makes us cautious. If he can induce one or two of the well-known construction companies to offer to construct ferro-concrete poles of guaranteed strengths in situ, at competitive prices, to the Regulations and to his designs, we would feel more satisfied that the scheme is practicable in England.—I am, etc.,

W. FENNELL,
General Manager and Engineer,
The Mid-Cheshire Electricity Supply Co., Ltd.

Northwich, Cheshire.
September 30th.

"Where *Is* That Battery?"

[TO THE EDITOR.]

SIR,—"Cynicus" justifies his name by the little joke he makes upon lowering by 10 m.p.h. the average speed of petrol-driven vehicular traffic in large cities. But do not let us confuse the vehicle with the battery; it is the battery which must be kept in mind. I want to assist the discussion by clearing some of the ground.

Let me first remark upon the patent fact that the entire electrical industry is to-day paying heavily for its early technical mistakes. Happily these have been recognised, and their ill-effects are steadily being removed. For instance, vast sums were spent upon the improvement of the reciprocating engine in order to connect it to the high speed dynamo, but the steam turbine has completely clouded the pioneer efforts of Willans, Raworth, Peache, Belliss, Howden and Ferranti. Single-phase supply has given place to three-phase. The baneful influences of bumbledon, which gave us a multitude of voltages, are in process of elimination, and even the railways are becoming resigned to the prospects of a standard system of electrification. These are a few of the chief sections of the industry which have decided to make up for the errors of the past.

Now, I make bold to submit that *in the field of battery traction* the lead-acid accumulator belongs to the failures of the industry, and that this fact calls for immediate recognition and action. Faure and Plante never intended that huge masses of their pet inventions should be moved about; they would perhaps have tolerated their use on petrol cars and for radio sets, but on battery-driven commercial vehicles never!

The battery situation to-day can be summed up in one sentence: "The right battery for the right job."

And this brings me to the next bold statement, namely, let the industry concentrate on the steel alkaline storage battery for all traction services! This type of storage battery has proved its case in a score of years from the construction point of view. Compared with the lead cell which is cast in a foundry it is the product of precision machine tools, and its constituent parts are nickel-plated steel, with an electrolyte which is actually the preservative, rather than the destroyer, of the positive and negative elements. It has a good record in traction service, but it has not had a fair chance to prove its merit in a very wide field. The reasons for this I will not discuss here, because they do not alter one primary fact, which is that the steel alkaline storage battery to-day is an engineering product worthy of the closest attention of the electrical industry.

Now, "Cynicus," it's your turn!—I am, etc.,

"BATTERY ELECTRIC."

October 1st.

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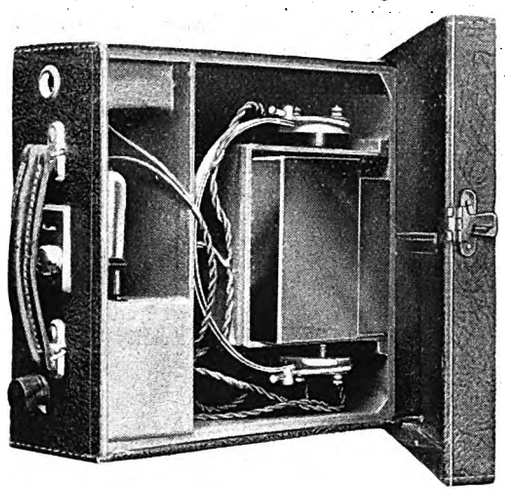
THE NATIONAL RADIO EXHIBITION.

Further Particulars of Some of the Outstanding Exhibits at the Olympia Show—Many Interesting Receiver Designs.

(*Concluded from page* 369.)

THE National Radio Exhibition which closed yesterday, Thursday, was one of the most successful and no less than 297 stands were staged. Although the new scheme of decoration made Olympia's New Hall seem unusually large, even when viewed in comparison with the Shipping, Engineering and Machinery Exhibition in the main building, the site of the Radio Exhibition was only just big enough, and it appears likely that extended quarters will have to be arranged for it next year.



One of the new "Adey" portable sets shown for the first time at Olympia.

The first exhibit to catch the eye was the double stand of GRAHAM AMPLION, LTD. This firm, which will always be remembered best by pioneer radio enthusiasts for their loud speakers, has entered the field of set production this year for the first time, and various models were exhibited. Among these may be mentioned the standard receiver, available for all-mains or for battery operation. The cabinet is of pressed metal with a dull gold finish. The circuit comprises screened grid h.f., detector and two l.f. stages (last stage two super-power valves in parallel). The last stand—by number—in the Exhibition, number 297, contained what was probably the newest production in the show. This stand was occupied by ADEY RADIO, LTD., of 99, Mortimer Street, Regent Street, London, W.1, whose 2-valve portable receiver was recently demonstrated to our representative in the showrooms of the company. This receiver brought in Brookman's Park with excellent volume during the forenoon transmission on the cone speaker incorporated in the set—this despite the fact that there are only two (ordinary) valves, and no aerial outside the set. These results are made possible by the Adey "contact appliance," the design of which has not been disclosed. It appears, however, to consist of a removable key—similar in appearance to a telephone plug—with a "handle" comprising (in its present form) a ring-shaped device, about two inches in diameter, which presumably contains one or more coils. In future models this handle will, we are told, be made square, so that in appearance it will resemble a miniature frame aerial with enclosed wiring. The set will not operate until this switch-key is inserted into its socket, so that the most obvious use of the key is to prevent tampering with the receiver by unauthorised persons. As soon, however, as the key is in place, and its application as a master switch temporarily completed, it fulfils another purpose. The slightest rotation of the key has a marked effect on the volume and sensitivity of the receiver—indeed the key and a tuning dial of the normal pattern appear to be the only controls necessary. We understand that patents for this device are either in existence or pending in almost all countries. All that is stated concerning the key is that "it has an induction effect transmitted to the aerial by the least movement one way or the other." These methods, it is stated, enable the set "to receive stations under almost any wave length." The models about to be put on the market do not appear to be suitable for reception of stations on long waves, but we understand they are shortly to be adopted.

An advantage of the "Adey" portable is its light weight. The model demonstrated (two valves), not only has its weight markedly reduced by the small size of the batteries employed, but also is able to be constructed with overall dimensions giving a cubic content much less than that of the average 3-valve portable. As regards current consumption, the firm states that the 2-valve portable "can be regulated . . . to be of clear tone and quality, with little more tax on the h.t. battery than the average shelf life."

The most interesting exhibit on the stand of S. G. BROWN, LTD., Western Avenue, North Acton, London, W.3, was the "Vee" loud speaker unit. An extra large permanent magnet is used, in connection with a V-shaped reed. There was also a new "Brown" set for home construction, employing a "screened-grid three" circuit. This receiver can be purchased for batteries or all-mains drive, and with or without a built-in speaker. The control panel is ready mounted, and the scheme of assembling is quite simple.

THE RADIO-GRAMOPHONE DEVELOPMENT CO., 7, St. Peter's Place, Broad Street, Birmingham, was one of the few exhibitors showing radio-gramophones only. The set we examined had a particularly good appearance, and is available in oak or mahogany. A diode rectifier is used on the radio side. The firm's electrical pick-up is sold separately, under the name of "R.G.D."

The Chinese lacquering used for some of the cabinet receivers of the GRAMO-RADIO AMPLIFIERS, LTD., of 1A, New London Street, London, E.C.3, attracted considerable attention. One 5-valve instrument has a.c. valves for all-mains drive while an automatic stopping device is fitted to the turntable, which is driven by a G.E.C. electric motor. The speaker is a "Magnavox" moving coil and provision is made for feeding external speakers. This model, which is known by the title of "Olympic" radio-gramophone de-luxe is also available for battery drive, and with a hand-wound motor. In all sets the circuit comprises one-stage screened-grid, h.f., detector and a three-stage l.f. amplifier. A B.T.H. pick-up and "Celestion" loud speaker are standard. There are also "Hercules" models suitable either for batteries or mains, with 4- or 5-valve circuits. Cabinets can be had in oak, walnut or mahogany, with Chinese lacquer if desired.

A novel feature which attracted many visitors to the stand of TRUPHONIC RADIO, LTD., Truphonic House, Hanover Park, Peckham, London, S.E.15, and 137, Regent Street, W., was the control of a 4-valve receiver by means of a Post Office line switch. An ordinary automatic telephone type dial was used to select any one of six broadcasting stations. In the model on view, whose action was demonstrated on the stand by illuminating different points on a glass panel bearing the names of the stations which would ordinarily be brought in, operating the figures 1, 2, 3, 4, 5 and 6 respectively, set the receiver for the following stations: 2LO, 5GB, Manchester, Paris (CFR), Hilversum and 5XX. Dialling "O" switched off the set. The receiver with this system of control is known as the "Truphonic-Pearson-Rendell" automatic receiver. Tuning can, of course, be effected in the ordinary way, if desired.

The "Vee" loud speaker unit of S. G. Brown & Co., Ltd.

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Among the radio-gramophones at the Exhibition should be mentioned that of the ROYAL RADIO CO., 4-5, Dorset Mews North, Upper Gloucester Place, London, N.W.1. This instrument has an S.G.3 circuit, an "air chrome" loud speaker, and a pilot lamp to give warning when the set is inadvertently left "on." Mains drive is provided for, while a battery model, with a pentode in the output stage, is also available. The Royal Radio Co. also produces portable sets, and one of the most interesting of these is the "straight five" which has drum-control tuning and a built-in wave-trap. There is a choice of materials—including leather, leather cloth and "fabripoid."

An excellent feature of this year's Exhibition was the large number of sound-proof demonstration rooms, and in room "O" were shown the "super-radio"—gramophones of M.P.A. WIRELESS, LTD. (62, Conduit Street, London, W.1.) The "Ethatrope Radio Exchange," as it is called, has two turntables, so that gramophone reproduction may be uninterrupted. The term "radio exchange" is due to the arrangement by which four programmes (British and Continental) may be brought in by simply depressing switches. Illuminated indicators automatically show which station is being received or which gramophone turntable is operating. A separate moving coil speaker can be fitted, in which case an additional amplifier, incorporated in the cabinet, is brought into operation. The frame aerial is within the cabinet, but mounted on a turntable.

Another striking set was that manufactured by BOWYER-LOWE AND CO., LTD., of Letchworth, available for either a.c. or d.c. mains operation. Another cabinet model was the "A.C. Screened Seven" of BURNDEPT WIRELESS (1928), LTD., whose London address is Eastnor House, Blackheath, S.E.3. This set is equipped with two screened-grid h.f. valves, an anode bend detector, one l.f. and two push-pull super-power valves. The "Ethogram" of the same firm is similar on its radio side to the model above described, but has an electric gramophone added.

LEGAL INTELLIGENCE.

Edison Storage Batteries and the Shipping, Engineering and Machinery Exhibition.

IN the Vacation Court, on Wednesday, Mr. Justice Macnaghten heard a motion by Edison Accumulators, Ltd., for a writ of sequestration of the property of New Distributors of Edison Storage Batteries, Ltd., for alleged breach of an order made by Mr. Justice Clauson last July, restraining the defendants from carrying on business in the name of Edison Storage Batteries, Ltd., or any name so resembling that of the plaintiffs as to cause confusion between the two companies.

Mr. Croom Johnson, K.C., for the plaintiffs, stated that in compliance with the order the defendants changed their name to "New Distributors of Edison Storage Batteries, Ltd.," but it was now complained that in breach of the injunction they had advertised their goods at the Shipping, Engineering and Machinery Exhibition, Olympia, under the name "Edison Storage Batteries," without the word "Ltd.," but with the addition of their address, Victoria House, Southampton Row.

Mr. Bray, for the defendants, said that what happened was done without their knowledge or approval. The exhibition authorities, in accordance with the usual custom, asked for their name and address to put over their stall, but were told that this could not be done, as litigation was then pending over the name. Mr. Perrin, the exhibition manager, said that in that case they would put up words indicating the goods to be sold, "Edison Storage Batteries," and without defendants' knowledge added their address.

Mr. Croom Johnson stated that since the motion was launched the address of the defendants was removed from the advertisement, and the exhibition having come to a close, he did not ask for sequestration, but did ask for costs.

Mr. Bray contended that the plaintiffs were not entitled to costs, as there had been no wilful disobedience of the order. The defendants did not put up the advertisement and had no control over the exhibition authorities.

Mr. Justice Macnaghten said that in his view there had been a clear breach of the injunction. It must be understood that when the Court made an order it must be obeyed, but as the address had been removed and the exhibition had come to an end, he would make no order on the motion except that the defendants pay the costs.

Leave to appeal was given.

BRIGHTON EXHIBITION.

Preliminary Details of the Electrical Exhibition to be Opened Next Week.

THE Brighton Electrical Exhibition, organised jointly by the Brighton Electricity Department and the E.D.A., will be opened by the Mayor (Ald. H. J. Galliers) on October 10th. The exhibition will be open to the public from 5 p.m.

THE "Mullard" stand attendants arriving at the National Radio Exhibition by omnibus. In contrast to last year's uniform this year's colour scheme was blue, white, and "sunburn brown."

to 10 p.m. on the first day, and 11 a.m. to 10 p.m. daily from October 11th to 19th inclusive. The exhibition is being held in the Corn Exchange and Dome Buildings. The Corn Exchange is divided into three main sections:—(1) water heating; (2) cooking and heavy appliances; and (3) a fully equipped hotel and restaurant kitchen. The water heating exhibit will be the most comprehensive in electric water heating display yet seen in this country, and the firms exhibiting will be the Credenda Conduits Co., Ltd., Drake and Gorham Wholesale, Ltd., Electric Fires (Norwich), Ltd.; Messrs. E. E. Fellingham, Ferranti, Ltd., the General Electric Co., Ltd., the Hotpoint Electric Appliance Co, Sadia, Ltd., Stott (Engineers) and Co., Ltd., Santon, Ltd., Reyrolle and Co., Ltd., Electrolux, Ltd. Firms exhibiting and demonstrating in the cooking section will be Belling and Co., Berry's Electric, Ltd., Carron Company, the Credenda Conduits Co., Ltd., Electric Fires (Norwich), Ltd., the General Electric Co., Ltd., the Jackson Electric Stove Co., Ltd., Metro-Vick Supplies, Moffats, Ltd., the Hotpoint Electric Appliance Co., the Revo Electric Co., Ltd., Siemens Electric Lamps and Supplies, Ltd., and the Edison Swan Electric Co., Ltd.

The exhibits in the Dome, comprising fittings, fires, refrigerators and miscellaneous appliances, will be provided by Berry's Electric, Ltd., Messrs. E. E. Fellingham, Ferranti, Ltd., Koldah Cooling Machines, Ltd., Messrs. H. J. Galliers, the General Electric Co., Ltd., Metro-Vick Supplies, Page and Miles, Ltd., the Revo Electric Co., Ltd., Siemens Electric Lamps and Supplies, Ltd., Young, Osmond and Young, Ltd., the Brighton Corporation Electricity Department, the E.L.M.A., and the E.D.A.

E.D.A. SALES CONFERENCES.

We give below the programme of the E.D.A. Sales Conferences in the London area for the coming season. Meetings will be held at the Royal Society of Arts, John Street, Adelphi, London, W.C.2, on the third Friday of each month and will commence at 7.30 p.m.

October 18th—"Personal Salesmanship in the Electrical Industry," by Miss G. Burlton, with Sir Andrew R. Duncan in the chair. November 15th—"Selling Time Switches," by Mr. E. E. Sharp; chairman, Sir John R. Brooke. December 20th—Display of electrical cinematograph films. January 17th, 1930—"Domestic Hot Water," by Mr. C. H. Smith, with Sir Hugo Hirst as chairman. February 21st—"The Electrical Industry and the Architect," by Mr. C. H. Flower; chairman, Mr. Ll. B. Atkinson. A meeting will also be held on March 2nd on a subject to be decided by the Conference.

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NEWS IN BRIEF.

Poland's Electrical Trade—E.P.E.A. Whist Drive and Dance—Electrical Women in Wales—Annual General Meeting of the Overhead Lines Association—Wolverhampton's Engineer.

MR. J. R. CLYNES, the Home Secretary, will open the Manchester wireless exhibition on October 16th.

An all electric exhibition, arranged by the Northern Counties Electricity Supply Co., was held last week in the Parochial Hall, Saltburn.

Dr. C. C. Garrard lectured to members of the Birmingham Electric Club on September 27th on "Development in Electric Power Control."

A proposal to floodlight the Church of Scotland Assembly Hall and the United Free Church Assembly Hall on the occasion of the union of the churches, at an estimated cost of £200, has been adopted by Edinburgh T.C.

Falmouth T.C. is considering a proposal to light the town electrically.

Princess Mary Viscountess Lascelles is to open the new wing of the Battersea Polytechnic on November 6th.

During July last Poland imported "apparatus, conductors and other electro-technical materials" valued at 8 638 000 zloty (£199 676) and exports of the same classes of goods were valued at 86 000 zloty (£1 987).

The first electrically controlled bridge on the Cheshire side of the Birkenhead Dock Board's estate is expected to be opened early in next summer. It is to be of the bascule type, a single span of 100 ft. being raised and lowered by two 45 H.P. electric motors.

At the Glasgow Housing and Health Exhibition, which was opened on September 26th, there are some interesting electrical exhibits. The Corporation has on view "Magicoal" fires, vacuum cleaners, electric cookers, etc., and an electric kitchen in which daily demonstrations are given of electric cooking, the use of electric washers and wringers, etc., the Falkirk Iron Co., Ltd., shows electric fires and cookers, and Archibald Low and Sons, Ltd., electric hot water storage tanks.

The electric light installation in the Bodleian Library, Oxford, is expected to be completed in readiness for the beginning of the Michaelmas term, on October 12th. The supply is to be cut off when the staff leave in the evenings.

The transfer to Imperial and International Communications, Ltd., of the overseas wireless and cable services of the Post Office, the Pacific Cable Board, the Eastern and Associated Telegraph Companies and Marconi's Wireless Telegraph Co., Ltd., was carried out over the week-end.

A whist drive and dance will be held by the Manchester Section of the Electrical Power Engineers' Association on October 12th in the Cheetham Town Hall. Tickets are 2s. 6d. each and may be obtained from Sectional T.R.'s, members of the Section Committee, and the E.P.E.A., 196, Deansgate, Manchester, and Mr. F. Killeen, "Roche Vale," 269, Rochdale Road, Bury.

The autumn session of the South Wales and Monmouthshire branch of the Electrical Association for Women began on September 24th with a visit to the power station of the South Wales Electrical Power Distribution Co. at Upper Boat. The fixtures include a visit to the City Lodge, Cardiff, where electrical apparatus for treating patients will be inspected, on November 5th; a lecture by Mr. T. Catten, of the E.L.M.A., on "Furnishing your Home with Light," at the South Wales Institute of Engineers, Cardiff, on November 20th; and a cookery demonstration at the G.E.C. showrooms, Womanby Street, Cardiff, on December 3rd.

The annual general meeting of the Institute of Wireless Technology will be held on October 9th at the Engineers Club, London, at 7 p.m.

The annual general meeting of the Overhead Lines Association will be held at the Institution of Electrical Engineers on October 16th, at 5.30 p.m.

Wolverhampton T.C. has received 44 applications for the position of borough electrical engineer, but the Electricity Committee does not consider any of the applicants suitable. The post has been advertised at a salary of £850, and the Council adopted on Monday the Committee's proposal to re-advertise it at £1 000.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN *of October 4th, 1879, recorded that a demonstration was given in London of an electric miners' lamp.*

The running expenses for one light for one hour with the Gramme A and the Siemens' medium machines were given respectively at 1s. 6d., and 1s. 7½d.

Blackpool was experimenting with the decorative use of electric lighting to attract holiday visitors.

* * *

TWENTY-FIVE years ago, according to, THE ELECTRICIAN *dated October 7th, 1904:—*

An electric lift was to be fitted in the Statue of Liberty in New York Harbour.

Mr. W. Dalby proposed to establish an Electric Club for Birmingham and district.

* * *

FIFTEEN years ago THE ELECTRICIAN *dated October 2nd, 1914, recorded that:—*

"The Point Fives" had twenty members.

Electric taxicabs were in common use in Berlin.

One of the special constable stories then current concerned the sudden emergence from the fog of a cyclist. Having no time to challenge him verbally, the "special" knocked the rider from the machine, knelt on his chest, and asked him where he was going. A censored abstract of the reply disclosed that the cyclist had come to relieve his fellow "special." The operator was the first shift engineer and the victim the chairman of the Electricity Committee.

The new buildings of the Polytechnic in Great Portland Street, London, will be opened by the Queen on October 10th.

The Post Office has decided to make dial telephoning easier for blind persons by making small cuts opposite the figures 4 and seven. The figures 1 and 0 are easy to find, and the new notches will facilitate the finding of the intervening figures.

The Council of the British Engineers' Association has passed a resolution supporting a demand for an inquiry into the national financial policy, the banking system, and the control of credit and currency, with the object of ascertaining what changes are necessary to meet the national and international requirements and conditions of the present day.

Smethwick Education Committee has decided to have the proposed new school at the Uplands heated electrically. Coun. Perry, chairman of the General Purposes Committee, recently informed the Education Committee that the cost of the electrical system was estimated at £4 000, a saving of £1 000 to £1 600 compared with a hot water system apart from a saving in redecoration costs.

The first ordinary meeting of the 1929–1930 session of the Institute of Transport will take place at the Institution of Electrical Engineers, London, on October 14th, at 5.30 p.m., when Sir Josiah C. Stamp will deliver his presidential address Amongst the medals awarded by the Council in respect of the 1928–1929 session is the Institute Graduate Silver Medal, awarded to Mr. A. H. Jackson for his essay on "The Sphere of the Railless Trolley Vehicle System."

The sub-committee appointed by the National Federated Electrical Association and the Electrical Trades Union to give effect to the National wages agreements entered into by those societies on August 7th, 1920, and September 22nd, 1921, declared on September 26th that the variation in cost of living justifies a 29% reduction in the basic rates of wages (April, 1921) and that the hourly rates of pay applicable to the respective grades of the agreements are:—Grade B, 1s. 7¼d.; grade C, 1s. 5¾d.; grade D, 1s. 4¼d.; a reduction of ¼d. in each case.

Applications are invited for the following appointments:—Assistant professor of electrical engineering at the City and Guilds (Engineering) College, London; wireless engineer, for Nigerian Posts and Telegraphs (Crown Agents for the Colonies; ref. M. 1267); assistant electrical engineer for Federated Malay States Government Service (Crown Agents for the Colonies; ref. M. 1734); borough electrical engineer and manager for Loughborough electricity department; electrical engineer to Louth Corporation.

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PERSONAL.

MR. P. J. Pybus, a director of the English Electric Co., Ltd., is among those appointed to form a Royal Commission to inquire into and report on the conditions of service in the Civil Service.

Mr. G. J. Hollyer, borough electrical engineer of Loughborough, has been appointed electrical engineer and manager to the Torquay T.C.

Col. T. W. Pragnell has been appointed a director of the Westminster Electric Supply Corporation, Ltd., in place of the late Sir Henry O. Bax-Ironside.

Mr. Alan Kirk has been released from his engagement with Troughton and Young, Ltd., in order that he may accept the post of electrical engineer to the headquarters staff of Northcliffe Newspapers, Ltd.

Mr. F. E. Smith, F.R.S., Director of Scientific Research at the Admiralty, has been appointed Secretary to the Committee of the Privy Council for Scientific and Industrial Research, with effect from October 1st, on the resignation of Mr. H. T. Tizard, F.R.S.

Mr. J. W. J. Townley took over the duties of the engineer and manager of the West Ham Electricity Department on October 1st, and the address of Mr. F. W. Purse is now London and Home Counties Joint Electricity Authority, 5, Millbank, Westminster, S.W.1.

The marriage of Mr. E. E. Hoadley, borough electrical engineer, Maidstone, and Miss Helena Nora Smith, was solemnised at St. Paul's Church, Maidstone, on September 17th. The presents included a silver teapot from the Corporation Electricity Committee, and a silver sugar bowl and cream jug to match from the staff of the Electricity Department.

Mr. C. C. Rattey, chairman of the Alton Battery Co., Ltd., left in the "Berengaria" on September 28th en route for the United States, Canada, and the Far East. He will return to this country about the end of February next, via the Straits Settlements, Ceylon and India. Mr. W. R. Montgomery, a director and manager, will be in control of the company's interests during Mr. Rattey's absence.

Sir Ernest Benn, Bt., chairman of Benn Brothers, Ltd., proprietors of THE ELECTRICIAN and allied publications, left London on September 20th, for a trip through Northern Europe. He arrived at Hamburg on September 21st, reaching Copenhagen on the following day. On Monday, Sir Ernest visited Gothenburg, where he addressed the Anglo-Swedish Society on "Politics and Economics," afterwards proceeding to Oslo to address the Anglo-Norse Society on "The Case for Capitalism." Stockholm, Helsingfors, Riga, and Warsaw will be visited in turn, and the return journey will be made via Berlin. In all of these places Chambers of Commerce, trade federations and various economic societies have arranged to entertain him.

An interesting ceremony which took place on September 20th at the London offices of Metro-Vick Supplies, at which Mr. C. McKinlay, who recently resigned his position in the company, was officially presented by Mr. P. F. Crinks, the general manager, with a gold watch suitably engraved, which had been subscribed for by his many friends throughout the organisation. Mr. Crinks, previous to making the actual presentation, paid suitable tribute to the service which Mr. McKinlay had rendered to the company during the eight years he was associated with the foundation and development of the electrical light fittings department, which tribute Mr. McKinlay, in expressing his thanks, acknowledged in appropriate terms. It will be remembered that Mr. McKinlay left Metro-Vick Supplies to join the electrical department of Lane and Girvan, Ltd., as representative for the sale of cooking and heating appliances in England, Wales and Ireland.

Obituary.

MR. HERBERT COLLINSON, on September 27th, aged 47 years. He was a partner in Collinson Bros., electrical engineers and contractors, Aldermanbury, Bradford, a prominent local member of the E.C.A., and a delegate to the Northern Section. For many years he was a teacher of electrical subjects at the technical college evening classes and took a prominent part locally in the question of apprenticeship training.

MR. GEORGE JAMES ALDERMAN, on September 25th, aged 73 years. Mr. Alderman was for many years in business as an electrician in Minster Street, Winchester. Since his retirement about five years ago the business has been conducted by Messrs. Shiner and Cooper.

A HATRY FUSE.

Novel Device for Indicating by Sight when a Fuse has Blown.

IN connection with the publicity given to the name of Clarence C. Hatry, it is interesting to note that Mr. Hatry was the managing director of the one-time Clarence Engineering Co., Ltd., electrical and general engineers, of 3, Cherry Tree Court, Aldersgate Street, London, E.C., while two electrical patents were lodged in his name and accepted. The specifications contained the following information:—

Patent Specification No. 2 353 of 1909 relates to fuses in circuits for lighting and power purposes. The bridge of the fuse is of porcelain or other non-conductive material, and is a hollow box with a lid attached and having at each end a lug carrying the ordinary contact plates and terminals. Inside the bridge is an arm of suitable metal or material hinged at one end and acted upon by a spring underneath, or the arm may be in itself a spring of any suitable shape or design. The other end of the hinge has a hook attached pointing downwards, so that when this end of the arm is depressed the hook protrudes through a hole in the base of the bridge, and the hook is engaged, and thus keeps the arm depressed and the spring in compression. To this depressed end of the arm is attached an indicator of any suitable or attractive design or colour (or the indicator may be in one piece with the arm), which indicator is not visible while the arm is depressed and the wire is intact. When the fuse wire breaks the hook is released and the compressed spring, coming into play, forces the arm and the indicator upwards.

Mr. Hatry also secured a patent (specification No. 11 954 of 1909) for an improved construction whereby a blown fuse may be immediately and automatically replaced. A drum carrying a supply of fuse wire makes a partial revolution as the result of the action of a spring, and the next wire is brought into working position.

BRITISH INDUSTRIES FAIR.

Extensive Additions to the Heavy Industries Section, Birmingham.

THE growth of the Heavy Section of the British Industries Fair which will be opened at Castle Bromwich, Birmingham, on February 17th next continues, and among the developments is an entirely new building, now in course of construction, on the north side of the present 11 acre fair building. This will comprise a dining-room for exhibitors, another for trade buyers, a large conference hall, and a series of private dining-rooms for the use of the numerous trade and professional societies and institutions which have made it their practice for many years to foregather at the Birmingham Fair. Two spacious passages, each 72 ft. by 40 ft., connecting the new block with the main building, will be arranged and furnished as lounges for exhibitors and their visitors, the whole occupying over an acre. The plan of rearrangement has the further advantage of solving—for the present, at any rate—the problem of the ever-increasing demands for space made by exhibitors in the engineering section. The Electrical Section, too, whose rapid growth since its inauguration as a comprehensive display a few years ago has severely taxed the resources of the management, will share the benefit of the general extension scheme.

Negotiations are practically completed for the acquisition of a further 15 acres of land immediately adjoining the present site—an enterprise which will permit of expansions year by year, as circumstances demand, to an aggregate of nearly one-and-a-half times the present size.

Stand lettings in Birmingham for 1930 already beat all previous records, nearly the whole of the accommodation, including the year's extensions, having been booked six months in advance of the opening date.

TRADE INFORMATION.

Many manufacturers are desirous of ascertaining the number of firms engaged in the various trades and professions of the United Kingdom, and electrical contractors and others frequently require information as to the number of the residential classes in different counties. Messrs. SMITH DALBY-WELCH, LTD., of Gresham House, Old Broad Street, London, E.C.2, offer to send a copy of their house organ containing this information to any reader mentioning THE ELECTRICIAN when making application.

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BUSINESS ITEMS.

MESSRS. PHILIPS LAMPS, LTD., have opened premises at 62, Union Street Plymouth.

MESSRS. G. ELLAM, electrical wholesalers, have removed to 49, Gartside Street, Bridge Street, Manchester.

The stand of the New Distributors of Edison Storage Batteries, Ltd., at the Shipping, Engineering and Machinery Exhibition which concluded at Olympia, on September 28th.

The LISENIN WIRELESS CO. has removed to 5, Central Buildings, High Street, Slough. The new telephone number is Slough 652.

Mr. A. R. Munday has been appointed the Scotch agent for wood electric fittings of WOODFYT SALES, LTD., and a display of goods will be shown at 190, West Regent Street, Glasgow.

A French firm of agents in Paris desires to secure the representation of British manufacturers of electrical machinery, small tools, etc. Further details from the Department of Overseas Trade. (Reference No. 333.)

A firm in Helsingfors desires to secure the representation for Finland of British manufacturers of cables, wires and open and ironclad h.t. switchgear. The Department of Overseas Trade has further particulars. (Reference No. 332.)

To signalise the opening of new premises at 106, Tavistock Road, Plymouth, W. H. AXWORTHY AND CO., electrical engineers, recently gave an electric lamp free to each purchaser of shades and fittings to the value of ten shillings or more.

Owing to a dissolution of partnership, the business of CONNAL, HODGSON AND CO., electrical and wireless engineers, of the Smelt, Port St. Mary, Isle of Man, will in future be carried on by Mr. Cyril Hodgson, who has purchased the goodwill.

Mr. Austin Tarrant has severed his connection with GRIFFIN, HARDING AND BRYANT, LTD., electrical engineers, of Park Lane, Swindon, Wilts, and has commenced business as an electrical and radio engineer at 125, Rodbourne Road, at that town.

PETTERS, LTD., of Yeovil, have received an order for two 120 B.H.P. Atomic Diesel engines from the Holden Co., Ltd. Montreal. These engines are required for the Canadian National Railways at Nakina, Ontario, for direct coupling to alternators.

A radio and electrical exhibition was held at the Corn Exchange, Spalding, on September 26th, 27th, and 28th, by Mr. W. H. STANGER, electrical and radio engineer, 18, New Road. There were demonstrations with electric cookers, washers, cleaners, and irons, in addition to a display of the latest wireless products.

R. A. LISTER AND CO., LTD., of Dursley, in Gloucestershire, have decided to erect a new foundry on the latest mass-production lines to supplement their existing production. Several new machine shops are also to be built. The new works, which are to cost over £100 000, will cover an area of 100 000 sq. ft., and will enable the firm to double its output.

GABRIEL, WADE AND ENGLISH, LTD., announce that while they have transferred their wholesale sawn wood business in Hull and West Hartlepool to RICHD. WADE, SONS AND CO., LTD., they will continue their business in creosoted poles for overhead transmission lines, etc., without any alteration, at Staddlethorpe (Hull) and Ellesmere Port, under the same management as heretofore.

Messrs. SPOONERS, of Plymouth, on September 16th, signalised the opening of a new and enlarged electrical department by special displays and demonstrations of electrical labour-saving devices, radiators, irons, etc. Throughout the week a representative of Metro-Vick Supplies demonstrated electric cooking, and Hoover, Ltd., demonstrated vacuum cleaners. Electric irons were offered on 14 days' free trial at special exhibition prices.

At a Trades Exhibition held at the Dewsbury Town Hall from September 28th to October 5th, stands were displayed by WARD AND CO., LTD., electrical engineers, of Northgate, Dewsbury, and BEAUMONT AND BLACKBURN, electrical engineers, of 2, Tithe Barn Street, Dewsbury. The former showed a large variety of domestic electric fittings and utensils, and the latter made a special display of "Sandon" electric water heaters and "Oldham" wireless batteries.

H.M. Trade Commissioner at Wellington has forwarded to the Department of Overseas Trade reprints of (1) the schedule of amendments of the New Zealand Government Electrical Supply Regulations, 1927; and (2) the schedule of amendments of the Electrical Wiring Regulations, 1927, which were published in the New Zealand Gazette July 4th, 1929. These reprints are available for loan to British firms on application to the Department. (Reference B. 5 701.)

Mr. T. M. Ainscough, H.M. Senior Trade Commissioner in India, is in this country on an official visit. He will be available at the offices of the Department of Overseas Trade until October 11th to interview manufacturers and merchants interested in the export of British goods to India and will later visit a number of industrial centres in the provinces. Firms desiring interviews with Mr. Ainscough should apply at once to the Comptroller-General, of the Department, quoting reference 832/1/29.

The MARCONI'S WIRELESS TELEGRAPH CO., LTD., has obtained from the Iceland Government a contract for the erection of a broadcasting station. This will be situated at Reykjavic, and is to be completed in time for the thousand years' anniversary of the discovery of the island which will be celebrated in June next year. The transmitter, which will be of a new design, will have a power of 15 kW in the aerial and will work on a wavelength of about 1 200 metres. Special circuits will be incorporated to enable it to be used for telegraphic transmission as well as broadcasting. This will enable the station to be used for meteorological services.

The MARCONI'S WIRELESS TELEGRAPH CO., LTD., has also obtained an order for an extension of the Polish broadcasting organisation which, following the English example, is to be remodelled so as to provide alternative programmes for the greater part of the country. The new equipment will comprise one 120 kW aerial-input broadcasting transmitter with full modulation, two high-power regional stations with 16 kW aerial-input, and three local relay stations. The 120 kW station will be situated near Warsaw and will be used in addition to the 12 kW station which has been in operation there since 1927. The new station will take the wavelength of the present 12 kW station, which is 1 111 metres, and the 12 kW station will work on a lower wavelength. The two stations will be employed simultaneously for the transmission of alternative programmes. The two new 16 kW stations will be situated at Lemberg and Vilna to provide programmes for the areas outside the range of the lower powered station at Warsaw. Of the three local relay stations one will be situated at Lodz, for the definite purpose of providing an alternative "crystal set" programme for the working class district around Warsaw.

THE INDIVIDUALIST MOVEMENT.

The directors of the Individualist Movement call attention to the change of address of the Individualist Bookshop, Ltd., to 53, Victoria Street, London, S.W.1, and ask for help in the formation of Local Study Groups in connection with the Reading Circle. The list of distinguished speakers for the monthly luncheons from October to June next includes Coun. Miss Bright Ashford, the Rt. Hon. Sir J. Tudor Walters, the Marquis of Zetland, the Rt. Hon. Sir Donald Maclean, Sir Charles Grant Robertson, Lord Brentford, the Duchess of Atholl, Dr. E. Graham Little, and the Bishop of Durham. A new feature is a series of Monday lectures on the first and third Mondays of each month at Caxton Hall, Westminster. A leaflet containing particulars of the Reading Circle and Study Group organisations, books of requisition forms for monthly luncheon tickets, and any further information regarding the movement can be obtained from the Secretary, at the Individualist Bookshop.

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NEW PREPAYMENT METER.

THE fixed charge automatic collector and prepayment meter put on the market by Messrs. Thomson and Co., 1-3, Old Swan Lane, London, E.C., has been designed and introduced to meet the needs of the small consumer.

The new meter provides for the automatic collection of fixed or basic charges by instalments in addition to the payment for current consumption. Apparatus designed to automatically collect the fixed charge in such a way that the supply is not available until the full amount of the fixed charge has been inserted, possesses the drawback that the consumer has to find the full amount of the fixed charge before he can use any current, and small though these amounts usually are, they are even then an appreciable amount to the person of very modest means and weekly budget.

The fixed charge indicator claims to meet the difficulty, and the amount to be collected as fixed charge can be varied from time to time without the necessity of fitting any change wheels or such-like. This provides a very simple means of collecting any payment that has to be made. In the same way, should it happen that the amount to be collected during the light quarter is not reached, it can be dealt with in one of three ways: (1) The balance due can be carried forward and added to the amount to be collected in the next quarter. (2) The system which has already been adopted by some supply authorities could be utilised, i.e., the fixed charge for the whole year to be divided into two amounts, and these be collected in the winter quarters. (3) In cases where the consumer might be a doubtful payer, the collector could trip the switch and ask for the payment of the balance of fixed charge in cash.

The general operation is that the fixed charge indicator dial (15, Fig. 1) is set to the figure representing the amount to be collected. This is done by means of a small screw key which is inserted into an aperture (17) in the cover, which is opened when the coin box (19) is removed from the meter. Thus the rest of the meter mechanism is still inside the sealed cover, and cannot be tampered with. The dial (16) having been rotated by means of the key in a backward direction until the figure required is opposite the pointer (28), the coin box is then replaced, which automatically closes the aperture (29 and 25). The figure and pointer indicating the amount owing on fixed charge account at any time is visible through a small window in the cover. So long as the fixed charge indicator shows a figure, each coin inserted advances the differential gearing (5) only half the full value, consequently the consumer gets half the value of the coin in current and the other half goes as an instalment off the fixed charge. When the fixed charge is completely liquidated, the meter automatically disengages the half and half gearing (7, 8, 9, 10), and for each subsequent coin inserted the full value of units is given. The actual kWh consumed are registered on the meter dials, and there is a reserve coin counter showing coins unconsumed (27), and up to thirty coins may be inserted at any one time.

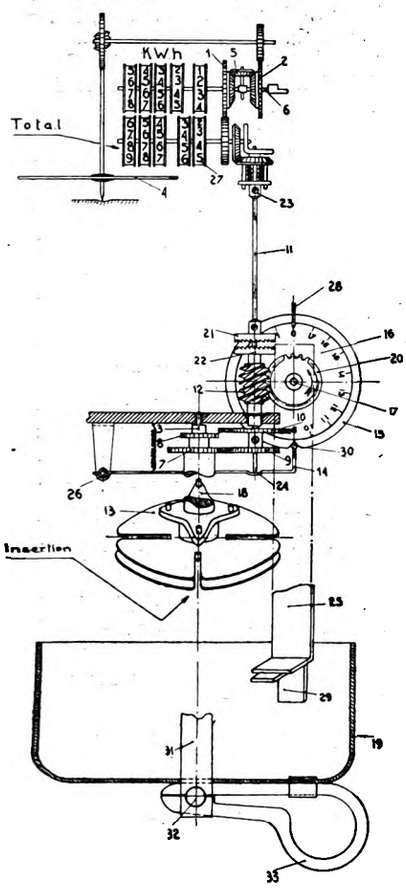

Fig. 1.—The theoretical arrangement of the new meter.

In principle the apparatus operates the two sets of gears marked (7, 8, 9 and 10), these are so arranged that the differential gears (1 and 5) advance only a proportion of the value of the inserted coin, the remainder being arranged to automatically go towards liquidating the amount of the fixed charge. The price per unit is decided by the two change wheels of which a wide range of combinations are standardised.

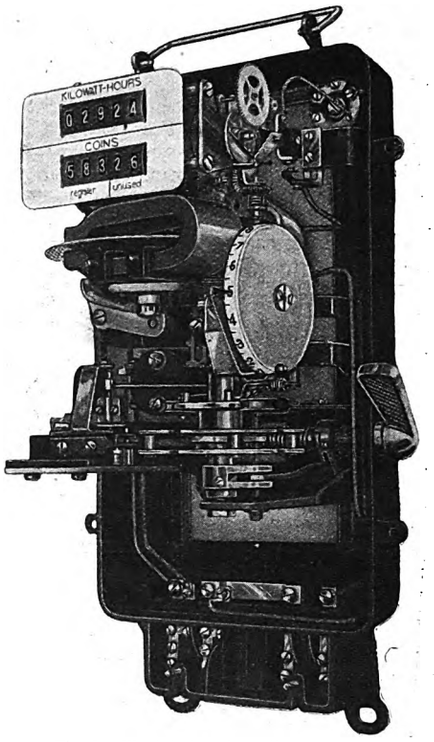

Fig. 2.—The interior of the "Rex" meter.

The prepayment and switching and tripping mechanisms are also interesting. The coin when inserted passes through a guiding channel and takes its position in the radial groove of the insertion discs, the spindle of which is vertical; a curved sector acts as a guide for the coin, and should it not be of correct value the coin drops into a separate compartment of the till without operating the meter. By pushing a handle two special cams are set in motion, and a quadrant carrier placed between the insertion discs is made to rotate, thus moving the coin one-eighth of a revolution and the two rollers engaging with a four-limbed star brings into action a strong spring which carries the coin a further eighth of a revolution. The coin, guided by the curved sector, falls into the coin box. A vertical spindle geared to the insertion disc spindle makes a quarter of a revolution, and acts on a differential gear, and moves the coin register and the reserve coin counter forward one in each case. A small auxiliary contact is lifted by a cam fitted to the end of the differential gear; this opens the auxiliary circuit and the end of the lever rests on the slope of the cam. After eight revolutions of the cam, the lever falls again into the notch of the first cam if the second cam, which revolves four times slower, does not prevent it. This provides a high standard of accuracy for the opening of the switch, so that the impossibility of the current value per coin being exceeded is made quite certain. A switch is tripped into position by the action of one of the four pins on the four-limbed star piece acting on the long switch arm or lever, which is held in the on-position by the edge of a pawl mounted on the relay spindle, and this remains in position until the current circuit of the relay is energised and the switch tripped. On the insertion of further coins, the insertion disc moves a quarter of a revolution; the coins fall into the till or coin box, and their number is registered on both counter dials, and as the current is used the kWh register at the top advances accordingly. A reserve coin counter working through the differential counts off in proportion to the rate per unit, which value can be adjusted by the change wheels. These wheels act on the differential gear, thus moving the small cam until it reaches the position which corresponds with the zero of the coin register, the lever of the contact falls, makes contact, energises the relay and trips the pawl and releases the main switch.

In addition to the fixed charge collector attachment there are other attachments which can be supplied on this meter if required. The first is a "fraud proof" device, by which any fraudulent manipulation of the coin mechanism by the insertion of a piece of wire, thin strips of metal or cardboard, is prevented. This device is most effective in operation, switching off the current and preventing the person getting a supply even though a coin be inserted afterwards. The second is a small tripping arrangement brought outside the case, by which means the reserve coin dials can be re-set to zero. The special use for this is in hotels, etc., where a supply of current is available to temporary residents for heating, ironing, etc.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

DEAL CORPORATION.—Electric light installation at Town Hall. Particulars from the Borough Surveyor.

SOUTHEND-ON-SEA CORPORATION.—Supply of 2 000 pairs of house service fuse boxes. Full particulars from Mr. A. C. Johnson, acting borough electrical engineer, Electricity Works, London Road, Southend-on-Sea.

WEST RIDING EDUCATION AUTHORITY.—Electric light installation in Silkstone Common School. Specifications from Mr. J. H. Crabtree, Town Hall, Penistone.

Annual Supply of Cables.

GRIMSBY CORPORATION, October 4th.—One year's supply (about 25 000 yds.) of paper insulated, lead covered, low pressure cables. Specification (No. 269) from Mr. S. R. Windle, borough electrical engineer, Electricity Works, Grimsby.

LEEDS GUARDIANS, October 4th.—Electric lighting installation at the two children's homes, Roundhay. Particulars from the clerk, Mr. J. H. Ford, 11, South Parade, Leeds.

CLEETHORPES URBAN DISTRICT COUNCIL, October 5th.—Six months' supply of four-core cable and twin service cable, to B.E.S.A. specification No. 7 (revised), and suitable for working pressures up to 660 V. Further particulars from the clerk, Mr. A. S. Barter.

EDINBURGH EDUCATION AUTHORITY, October 7th.—Electric lighting and heating installations, in connection with Portobello Secondary School enlargement. Specifications, etc., from Mr. J. A. Carfrae, 3, Queen Street, Edinburgh.

HALIFAX CORPORATION, October 7th.—Electrician's work in connection with erection of filter house, etc., for the waterworks department. Specifications, etc., from the Borough Engineer; deposit £2 2s.

SIDMOUTH URBAN DISTRICT COUNCIL, October 7th.—Supply, laying and erection of (*a*) 0·2, 0·2, 0·2, 0·1 sq. in., l.t., paper insulated feeder and additional overhead l.t. mains; (*b*) 0·12 sq. in., four core, l.t., paper insulated feeder and additional overhead mains. Specifications, etc., from Mr. P. C. Tracy, Electricity Works, Sidmouth.

GLASGOW CORPORATION, October 8th.—(1) Water-tube boiler plant; (2) 10 000 kW steam turbo-alternator, with condensing plant and auxiliaries; and (3) e.h.t. switchgear and control gear, for Pinkston generating station (separate tenders for each contract). Specifications, etc., from Mr. L. Mackinnon, general manager, Tramways Department, 46, Bath Street, Glasgow.

GREAT WESTERN RAILWAY CO., October 8th.—October 25th.—Supply of telegraph instruments (list 18); electrical apparatus (insulators, etc.) (19); electric wires and cables (20); electric lamps (24), etc. Samples and patterns may be seen from September 23rd to 27th at the office of the Stores Superintendent, Swindon, where specifications and forms of tender can be obtained. Forms of tender for list 20 will be issued on October 17th. Tenders for list 20 by October 25th and for other above-mentioned lists by October 8th.

PONTEFRACT JOINT HOSPITAL BOARD, October 8th.—Electric light, heating and power installation, at Baghill Hospital. Particulars from Mr. W. H. Newton, Municipal Offices, Pontefract.

WEST RIDING EDUCATION COMMITTEE, October 8th.—15th.—Electric light installation at Thurlstone New School. Specifications, etc., from the Education Officer, County Hall, Wakefield, until October 8th. Tenders by October 15th.

WEST RIDING EDUCATION COMMITTEE, October 8th–15th.—Electric light installation in Featherstone New Middle School and caretaker's house. Specification, etc., until October 8th, from the Education Officer, County Hall, Wakefield.

DUNDEE CORPORATION, October 9th.—Supply of l.t. paper, insulated, lead covered and double steel tape armoured cable, to B.E.S.A. specification for working pressure up to 660 V. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—One 30 000 kW C.M.R. turbo-alternator and exciter, etc., Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £30.

HACKNEY (LONDON) BOROUGH COUNCIL, October 9th.—Fourteen 6 600 V, three-phase, metal clad, oil circuit breaker equipments, each not less than 1 000 000 V rupturing capacity; remote electrically-controlled duplicate busbars; cabling and auxiliary gear controlling one 30 000 kW turbo-alternator, two 30 000 kVA transformers, two 15 000 kW reactance links, one 30 000 kVA busbar coupler equipment, with and without reactance, and six 8 000 kW feeders. Specifications from the Borough Electrical Engineer, 18-24, Lower Clapton Road, E.5; deposit £3.

STANDING JOINT COMMITTEE OF GLAMORGAN QUARTER SESSIONS AND COUNTY COUNCIL, October 9th.—Electric light installation at Cowbridge police station. Specifications from the Police Station or the office of the Deputy Clerk of the Peace, County Hall, Cardiff.

MANCHESTER EDUCATION COMMITTEE, October 10th.—Electric lighting installations at Birchfields Municipal School, Rusholme, and North Manchester High School for Boys, Moston. Specification from Education Offices, Deansgate, Manchester; deposit, £1 1s.

SLEAFORD URBAN DISTRICT COUNCIL, October 10th.—Supply and erection of slate control panel, 4 ft. by 2 ft. 6 in. by 2 in., with s.p. breaker, switch, etc. Full particulars from Mr. W. H. Wilson, Electricity Works, Sleaford, Lincs.

CLUTTON GUARDIANS, October 14th.—Electric light installation at the Institution. Specification, etc., from Mr. J. Wayne Morgan, 9, Mount Stuart Square, Cardiff; deposit £2 2s.

BELFAST CORPORATION, October 21st.—Supply of circulating water pipes. Specification (W.97), etc., from Mr. F. H. Whysall, city electrical engineer and general manager, East Bridge Street, Belfast; deposit £2 2s.

STAINES RURAL DISTRICT COUNCIL, October 21st.—Contruction of sewers and electrical and other equipment for pumping stations. Specification, etc., from the Engineer, Council Offices, London Road, Ashford, Middlesex.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 22nd.—Twelve months' supply of electric cables. Further particulars from the Electrical Engineer, Penrose Street, Walworth Road, London, S.E.17.

MANCHESTER CORPORATION, October 23rd.—Supply and erection of four 33 000 V, 500 000 kVA rupturing capacity, metal-clad, compound filled switch units, &c. (specification No. 256); and two 10 000 kVA, 33 000/6 600 V, self-cooled, oil immersed, indoor type transformers (specification No. 257). Specifications from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s. for each.

STAFFORDSHIRE EDUCATION COMMITTEE, October 31st.—Electric light installation in two new elementary day schools in Brettell Lane, Brierley Hill. Specification from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

CENTRAL ELECTRICITY BOARD, November 9th.—Supply and erection of overhead 33 000 V transmission lines in South Lincolnshire, in connection with Mid-East England scheme. Specification (No. M.E.E.—S.L.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

EAST RETFORD CORPORATION, November 19th.—Electrically driven, centrifugal, borehole pump (60 000 gall. per hour). Specification from Mr. S. O. Pacey, Gas and Water Electricity Offices, East Retford; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

BULAWAYO MUNICIPALITY, October 4th (extension of time).—High-tension overhead lines, with appurtenant gear and step-down transformers; pumps and motors with starters, etc. (contract No. 6/29). (Reference A. 8 462.)

SOUTH INDIAN RAILWAY CO., LTD., October 4th.—Supply of convertor equipment for sub-stations (specification No. 6); transformer switchgear and accessories (No. 7); and overhead transmission line (No. 8). Specifications, etc., from the company's offices, 91, Petty France, Westminster, S.W.1.

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A charge of £1 (not returnable) will be made for each specification.

MONTEVIDEO PORT ADMINISTRATION, October 7th.—Electric trucks, for load of 1 500 to 2 000 kilos, with generating sets for charging batteries, etc. (Reference A.X. 8 353.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 7th.—Supply of 70 000 small galvanised steel insulator bolts (tender No. 151/1 806). (Reference B.X. 5 681.)

VICTORIAN ELECTRICITY COMMISSION, October 7th.—Supply and delivery of 11 000 V three-core cable. (Reference B.X. 5 539.)

MENTAL HOSPITAL, PORTLAOIGHISE (IRELAND), October 8th.—Re-wiring hospital, for the Committee of Management. Specification, etc., from Dr. P. Grace, at the Hospital.

NEW ZEALAND POSTS AND TELEGRAPHS, October 8th.—Indicator alarm fuses (P. and T. No. 151/1802.) (Reference B.X. 5 714).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 8th.—Electric ranges, radiators and water heaters, for Waitaki power scheme (section 38). (Reference B.X. 5 642.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 8th.—Telephone relays (schedule C. 478). (Reference B.X. 5 655.)

ANTWERP MUNICIPALITY, October 10th.—Supply of 32 portal type electric travelling cranes (cahier des charge No. 800). (Reference A.X. 8 447.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 10th.—Supply and erection of electric generating station for Tala. (Reference B.X. 5 647.)

MOROCCO PUBLIC TELEGRAPH SERVICE, October 10th.—Telegraph posts, insulated copper wire, insulators, g.i. supports and copper binding wire. (Reference B.X. 5 706.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 15th.—Switchboard instruments, test plugs and sleeves (schedule C. 472). (Reference B.X. 5 541.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE.—October 15th.—Telephone jacks (schedule No. C. 488). (Reference B.X. 5 695.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 21st.—Supply of switchboard cords (P. and T. No. 151/1813). (Reference B.X. 5 715.)

WELLINGTON CORPORATION, October 21st.—High and low tension switchgear (contract No. 449). (Reference B.X. 5 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Telephone transformers (schedule C. 474). (Reference B.X. 5 581.)

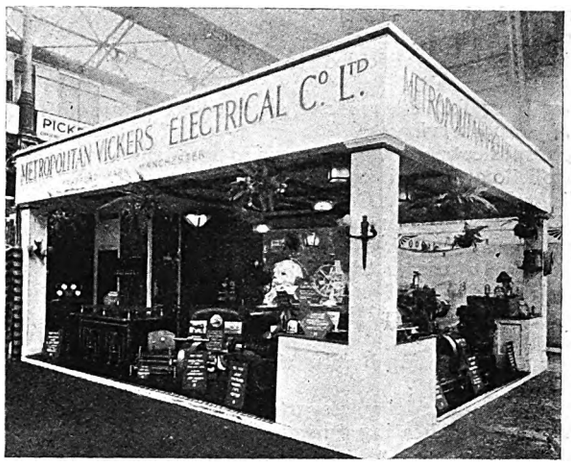
THE stand of The Chloride Electric l Storage Co., Ltd., at the National Radio Show, Olympia, September 23rd-October 3rd.

VICTORIAN RAILWAY COMMISSION, October 23rd.—Dry-core telephone cable (contract No. 43 384). (Reference B.X. 5 638.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, October 29th.—Railway traction motor testing equipment, comprising electric motor, booster, main field excitation generator and short field exciter (quotation No. B.E. 508). (Reference B.X. 5 693.)

JOHANNESBURG MUNICIPALITY, October 31st.—Steel tramway rails, fishplates, manganese points, etc. (contract No. 257). (Reference A.X. 8 523.)

ARGENTINE STATE RAILWAYS, November 4th.—Turbo-generator sets, and headlights for locomotives. (Reference B.X. 5 657.)



THE stand of the Metropolitan-Vickers Electrical Co., Ltd., at the Shipping, Engineering and Machinery Exhibition at Olympia, London, which attracted considerable notice.

VICTORIAN ELECTRICITY COMMISSION, November 4th.—Circuit breakers and operation recorders. (Reference B.X. 5 677.)

VICTORIAN ELECTRICITY COMMISSION, November 4th.—Supply of 6 600 V automatic voltage regulators and spares (specification 29/83). (Reference B.X. 5 637.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 12th.—Four-conductor telephone operators' cords. (Reference B.X. 5 685.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 12th.—Supply of 15 kW generating set for installation on the "Maui Pomare" (tender No. 369). (Reference B.X. 5 683.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Transmitters and associated parts (schedule C. 477). (Reference B.X. 5 653.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Receivers and associated parts (schedule C. 477). (Reference B.X. 5 656.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 14th.—Supply of 400 000 lb. of hard drawn copper wire, 2 000 lb. of soft drawn copper wire and 2 000 lb. of soft drawn, tinned copper wire (tender No. 173). (Reference A.X. 8 510.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Supply of telephone generators and motor generators (schedule No. C. 479). (Reference B.X. 5 662.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Motor generators (schedule C. 486). (Reference B.X. 5 694.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92). (Reference B.X. 5 614.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Vitreous resistances, each consisting of wire element wound in vitreous spool, for telegraph battery feeds (schedule C. 489). (Reference B.X. 5 696.)

MELBOURNE CITY COUNCIL, November 27th.—Totally-enclosed, metal-clad, 6 000 V, three-phase switchgear (specification No. 1 000). (Reference B.X. 5 708.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General for Western Australia, Savoy House, Strand, London, W.C.2.

INDIAN STORES DEPARTMENT, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

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ELECTRICITY SUPPLY.

Wivenhoe Public Lighting—Loan for Hammersmith Mains, etc.—New Agreement for Carnarvon Lighting—Sussex Downs Proposals to be Reconsidered—Domestic Apparatus at Oldham—Durham Sanatorium Supply.

COVENTRY Electricity Committee is to extend mains at a cost of £4 846.

Porthcawl U.D.C. has accepted an offer for the electric lighting of the town.

Redcar T.C. has decided to light the new promenade extension electrically.

Shrewsbury T.C. has received sanction to a loan of £10 000 for mains and services.

Brighton Electricity Committee is to proceed with extensions to Portobello at a total cost of £7 250.

Guildford Electricity Committee is to seek sanction for a loan of £20 000 for mains and services.

Kingswood U.D.C. has applied to Bristol Corporation for the extension of cables to parts of the district.

Oswestry T.C. decided on Monday to take over at once the undertaking of the Oswestry Electric Lighting and Power Co., Ltd.

Easington-with-Thorpe P.C. has decided to extend and improve public lighting by electricity at an estimated cost of £500.

Wimbledon electricity department proposes to supply current for water heating during certain hours at 0.33d. per kWh.

Belfast R.D.C. has asked Belfast Corporation to consider the question of supplying electricity throughout the rural district.

A tablet to commemorate the beginning of the erection of the new Kirkstall power station was unveiled on September 23rd.

The Electricity Commissioners have sanctioned the borrowing of £36 400 by Yarmouth T.C. for mains, domestic appliances, etc.

Scarborough Electricity Committee is to apply to the Commissioners for permission to borrow £40 000 for mains, services and meters.

Naas U.D.C. has accepted the offer of the Irish Free State Electricity Supply Board to light 67 lamps for the winter months, at £200.

The Cleveland and Durham County Electric Power Co. is erecting overhead lines for the purpose of providing supplies in the Wear Valley.

Bermondsey (London) B.C. has obtained sanction to borrow £20 000 for mains and services, £2 500 for meters and £7 500 for installations.

Battersea (London) Electricity Committee has received sanction to the borrowing of £30 650 for buildings at the electricity works and £8 970 for plant.

Epsom R.D.C. objects to a proposal by the Central Electricity Board to erect a 33 000 V overhead cable between Harefield Bridge and Windmill Bridge.

The West Kilbride Electric and Lighting Co. has withdrawn its objection to the Ayrshire Electricity Board's proposal to supply to the West Kilbride portion of Airlie.

Barnstaple R.D.C. declines to support the Bideford and District Electric Supply Co.'s application for a Special Order to supply in certain parishes in the Council's area.

Wivenhoe U.D.C. has accepted the offer of Colchester Corporation for public lighting with 96 lamps at £193 5s. for a year, with £4 4s. for an all-night lamp on the quay.

At a public meeting in Killaloe last week it was decided to request the Irish Free State Electricity Supply Board to supply electricity in Killaloe and Ballina at an early date.

Swansea Electricity Committee is to erect a new sub-station at Townhill, and to lay an e.h.t. main from the existing sub-station to the proposed new sub-station at a cost of £1 650.

Electrical Supplies, Ltd., Dromore (co. Down) intends to apply to the Northern Ireland Electricity Commissioners for a Special Order for the urban district and parts of the rural district of Dungannon.

Cuckfield U.D.C. has decided to raise no objection to the application of Central Sussex Electricity, Ltd., in regard to placing overhead lines in the Council's area, provided an underground system is put down in certain thoroughfares.

The Electricity Commissioners have sanctioned the borrowing by Hammersmith (London) B.C. of £64 368 for mains, services, meters, and plant. It is proposed to seek sanction to borrow £12 672 for the replacement of existing h.t. mains by mains of a larger capacity.

Swansea Electricity Committee has decided that the charge for electricity for bakers' ovens will be at the rate of ¾d. per kWh, taken at off-peak periods. A low tension main is to be laid from Pell Street sub-station to Dillwyn Street, at an estimated cost of £1 215.

Cannock U.D.C. has decided to carry out mains extensions to the Pye Green district, and to the new coal distillation plant at the Cannock and Leacroft Colliery. It is also proposed to give a supply of electricity to Wimblebury, and a loan for carrying out the work has been applied for.

With a view to providing work Carlisle Electricity Committee is to seek a grant for a scheme for accelerating the laying of mains at a cost of £13 000 within the next 12 months. —The City Council has applied for a Special Order for supplying electricity to certain parishes in the Brampton and Longtown rural districts.

Carnarvon T.C. has under consideration a proposed agreement with the National Electric Construction Co. for a renewal, for 10 years, of the agreement for the supply of electricity to the town, the charges to be for lighting 6d. per kWh; heating and cooking and other domestic purposes, 2d.; and small power consumers 2½d.

The mid-year review of hydro-electric development in Canada issued by the Minister of the Interior states that during the first six months of 1929 new developments completed and additions to existing plants during the period totalled almost 20 000 H.P. Undertakings now under way, when completed to their designed capacity, will aggregate over 2 000 000 H.P.

The opposition to the proposed erection of overhead lines over the Sussex Downs has led to a re-examination of the South-East England scheme by the Ministry of Transport and the Central Electricity Board. There is some possibility that the demand for underground cables may be conceded, though a decision, which rests with the Minister of Transport, will not be taken for several days.

Oldham Electricity Committee is to make arrangements for the hiring of cookers, wash boilers and fires, hire-purchase of domestic appliances, and fitting up and furnishing showrooms.—The price for energy supplied for electric tube heating systems is to be ¾d. per kWh except between 3.30 p.m. and 5.30 p.m.—The Borough Electrical Engineer is to submit an estimate of the cost of heating the market hall by electricity.

In view of the fact that extensive repairs to the electrical plant at the sanatorium are necessary, Durham County Council proposes to enter into an agreement with the Cleveland and Durham County Electric Power Co. for the supply of electricity for a fixed charge of £60 for each winter quarter and £30 for each summer quarter, plus 2½d. per kWh for lighting and power purposes; and 1d. per kWh for heating and cooking purposes.

Lowestoft Electricity Committee has received sanction to borrow £5 000 for the purchase of meters.—To supply current for driving additional plant at the premises of C. and E. Morton, Ltd., the electricity department is to lay a new cable at a cost of £700.—Mutford and Lothingland R.D.C. has agreed to the suggested route for the overhead line proposed to be used in connection with Lowestoft Council's scheme for affording a supply to Kessingland.

Mr. F. E. Spencer, borough electrical engineer, Birkenhead, has consulted the Electricity Committee in reference to the urgency for the early installation by the Central Electricity Board of the four 10 000 kVA transformers in connection with the new Birkenhead-Wallasey trunk feeders, and has been authorised to wait upon the Board and discuss the matter. —The T.C. has applied for a loan of £3 875 excess expenditure incurred in connection with the scheme for the erection of h.t. transmission lines under the Wirral Special Order, 1925.

The proprietors of the new County Theatre, Castle Street, Dover, are installing their own plant to deal with the bulk of their evening load. The Electricity Committee has approved the proposal of the Borough Electrical Engineer to supply current for the remainder of the company's requirements, under which the company will bear one-half the cost of the extension up to a maximum of £75, and take a minimum consumption to the value of £250 per annum for five years, the maximum demand not to exceed 30 kW from either the d.c. or a.c. supplies.

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COMPANY NEWS.

Depression in Electrical Securities—Offer to Purchase Folkestone Electricity Co.'s Shares—Assents to Transfer of Shares to Cables & Wireless, Ltd.—Electricity in Burma Mines—Reports and Dividend Announcements—New Companies.

IN common with other share markets, that for electrical descriptions has shown weakness this week, the only exception to the slight general depression shown by our table of prices being a rise of 1s. 3d. in British Insulated Cables, notwithstanding a deduction of dividend. General Electrics have lost a further 3s. 9d., and Ever Ready are back at 18s. 9d. British Electric Traction ordinary and 6% preference stocks are 5 points lower at 122½, and Undergrounds have fallen 1s. to 22s. Cables and wireless stocks have all shed a couple of points, as also has Western Telegraph 4% debenture stock. Marconi's Marine shares are again 2s. 6d. lower.

Last Annl. Divd.	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
%	**Electricity Supply.**				
(g)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/6.	17/6	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	,, ,, ,, ,, ,, 6% C.P...	23/-	23/-	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	57/6	57/6	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	22/6	23/-	24/-	21/3
(e)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/6	27/6	37/6	23/-
1/9½	Metro. Elec. Sup. Ord.	46/3	46/3	53/-	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	26/3*	26/10½	30/3	19/3
6	N. Metro. Elec. 6% C.P. ..	22/6	23/-	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(c)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	21/-*	22/6	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/-
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord. ..	36/6	36/6	38/9	24/6
6	,, ,, ,, 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	127½	152	117
7'67	,, ,, ,, ,, 6% Pf. Stk.	122½	127½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4	,, ,, ,, 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	77½	77½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	,, ,, ,, ,, 4% Pf. Stk.	71	71	77	68
4	,, ,, ,, ,, 4% Deb. ..	76	76½	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	,, ,, ,, 5% Deb. ..	70½	70½	70½	65½
3½	Met. Ry. Cons. Ord. Stk. ..	58½	59½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	61	61	76	60½
3½	,, ,, ,, 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk. ..	71½	72	77½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	79½	79½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	112½	114½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
7	Underground Electric Rlys. Ord.	22/-	23/-	28/2	11/-
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	,, ,, ,, 1st Deb...	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.—	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	81/3*	80/-	86/3	56/-
6	,, ,, ,, 6% C.P.	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref...	22/6	22/6	24/9	19/7
7	,, ,, ,, ,, 7% Deb. ..	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	130½	153½	120
15	Callender's Cable Ord.	80/-	80/-	91/3	66/-
6½	,, ,, ,, 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	,, ,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/-
8	Crompton-Parkinson 8% Cum. Pf.	25/-*	25/-	27/-	14/-
6	,, ,, ,, 6% Cum. 2nd Pf.	16/10½*	17/9	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	,, ,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	,, ,, ,, 7% C.P. ..	21/3	21/3	22/9	21/-
—	English Elec. Ord.	8/1½	8/1½	15/9	5/-
—	,, ,, ,, 6% C.P.	8/9	8/9	18/9	7/-
7	Ericsson Telephones 7% Pref. ..	20/-	20/-*	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord...	18/9	20/6	92/3	18/1
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	52/6	56/3	46/6	26/6
25	W. T. Henley's Ord.	132/6	133/9	120/-	69/3
10	Johnson & Phillips Ord... ..	40/-	40/-	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref.	23/9	23/9	25/-	22/3
7½	Siemens Bros. & Co. Ord. ..	28/9	28/9	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	82½	84½	—	—
	"B" Ord. Stk.	57½	60	—	—
	5½% Cum. Pref. Stk. ..	92½*	94½	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	,, 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Great Northern Telegraph (£10)	31	31	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	55/-	57/6	90/-	16/6
4	Western Tel. 4% Deb. Stk. ..	75½	77½	82	76

(a) 19.8d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share.
(d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. * Ex dividend.

NORTH-EASTERN POWER CO.—Extra div. of 75 cents is announced.

LIVERPOOL ELECTRIC CABLE CO., LTD.—Cap. has been increased from £200 000 to £300 000.

BABCOCK AND WILCOX, LTD.—Intm. div. of 7%, tax free, for half-year ended June 30, 1929 (same rate as last year), is announced.

FALKIRK IRON CO., LTD.—Pft. for past year, £972 (agst. £16 701), after provisn. for deb. int., £7 170, and int. on employees' sh. deposits, £3 243.

WEST LONDON AND PROVINCIAL ELECTRIC AND GENERAL TRUST, LTD.—Intm. div. of 4½%, actual, on ord. shs. (same rate as last year) is now payable.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—A mtg. will be held on Oct. 16 to consider resolutns. increasg. the number of directors and determing. the directors' remuneratn.

MADRAS ELECTRIC TRAMWAYS (1904). LTD.—Intm. div. at 4s. in £ in respect of pfts. for year endg. Dec. 31, 1929, will be paid to holdrs. of pref. sh. warrts. to bearer, at the Royal Bank of Scotland, 3, Bishopsgate, London, E.C.2.

FOLKESTONE ELECTRICITY SUPPLY CO., LTD.—An offer has been made by the County of London Electric Supply Co., Ltd., to take over the ord. shs. of the Folkestone Co., five County of London shs. being offered for every four Folkestone shs. held.

AMERICAN COMMONWEALTH POWER CORPORATION.—Gross earngs. for year ended Aug. 31st, 1929, $20 953 803; net earngs. $8 954 052, exclusive of National Gas and Power Co.'s rev. Blce. available for common stk., $2 483 682, increase $1 412 235.

RIO DE JANEIRO CITY IMPROVEMENTS CO., LTD.—Sh. trnsfer books are closed until Oct. 15 inclusive, for preparatn. and issue of warrts. for paymt. of intm. div. of 9d. p. sh., being at rate of 7½% p.a., tax free, in respect of rev. for half-year ended June 30.

SUBMARINE CABLES TRUST.—It is announced that the hldrs. of certn. coupons of reversn. have not yet claimed paymt. of the sum which became due to them on the distributn. of the trust funds, that the hldrs. of certn. of the certificates have not yet claimed paymt. of certn. half-yearly int. which became payable on such certificates, and that at the expiratn. of two months from Oct. 1, 1929, the trustees will pay into Court such of the said moneys as have not been claimed within that period.

HASTINGS AND DISTRICT ELECTRIC TRAMWAYS CO., LTD.—The directors propose that paymt. of the half-yearly deb. int. due Oct. 1 and Apl. 1 next be postponed until Oct. 1, 1930, and Apl. 1, 1931, respectively, paymts. postponed to carry int. at rate of 7% p.a. It has been decided to convene mtgs. of the deb. stkhldrs. and notehldrs., and to put before them a scheme which it is hoped will enable the company to carry on until the advantages to be derived from the new trolley vehicle system are fully reaped.

CABLES AND WIRELESS, LTD.—The certificates of "assents" deposited at the close of business on Sept. 25th were as follows: Eastern Telegraph Co., Ltd., percentage of total, 97·86; Eastern Extension, Australasia and China Telegraph Co., Ltd., 98·02; Western Telegraph Co., Ltd., 98·15; Marconi's Wireless Telegraph Co., Ltd., 92·14. The 92·14% of the shs. in Marconi's Wireless Telegraph Co., Ltd., assented represents 89·5 of its nom. issued cap. Assents are still coming in. The company points out that to secure the benefit provided under the Act for relief from cap. duty amtg. to approximately £40 000, it is necessary to obtain assents for 90% of the issued cap. For this purpose, only an additnl. £10 962 in Marconi shs. is now required to be assented.

Company Meeting.

ELECTRICITY FOR MINES IN BURMA.—At the general meeting of Mawchi Mines, Ltd., last week, the chairman, Mr. W. M. McDermott, announced that Mr. W. H. Randall recommended two schemes for the provision of hydro-electric power for the mine and the mill. He advised that the smaller of these schemes should be put in hand first, and that the second and larger scheme should follow at a later date. All the plant and

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machinery required for the first scheme had been sent out, also additional air compressors and equipment, and the first power station was in operation and reported to be running smoothly. The plant for the second station had been ordered, and it was hoped, would be delivered on the property by about the end of next March. The second power station should be completed in about three months after the arrival of the plant.

New Companies.

CRADNITT, LTD.—Cap., £1 000. Electrical and mechanical engineers, etc. Reg. Office: 5, Brunswick Street, Hackney Road, London, E.2.

CONCERTON RADIO AND ELECTRICAL CO., LTD.—Cap., £5 000. To carry on business as indicated by title. Office: 41, Bedford Square, London, W.C.1.

LITTLEWOOD AND CO. (LONDON), LTD.—Cap., £1 000. Electrical and wireless dealers and engineers, etc. A first director: F. S. Hince, 25, Bathurst Road, Ilford.

A.P.G., LTD.—Cap., £550. Manufacturers of and dealers in wireless, radio gramophones, etc. Reg. office: 515, Salisbury House, London Wall, London, E.C.

IRISH AUTOMOBILE STATIONS, LTD.—Cap., £5 000. Automobile, electrical or general engineers, etc. A first director: W. A. Richards, 20, St. James's Square, London, S.W.1.

AERO DEVELOPMENT AND EQUIPMENT, LTD.—Cap., £100. Aeronautical, mechanical, and electrical engineers, inventors and designers, etc. Reg. Office: 112, Windmill Road, Brentford.

ROWMAL RADIO AND TRADING CO., LTD.—Cap., £2 000. Manufacturers of and dealers in wireless receiving sets, component parts and accessories, etc. Reg. Office: 36, Cannon Street, Birmingham.

WHITEHEAD'S ELECTRICAL INVENTIONS, LTD.—Cap., £1 000. To acquire patents, concessions to manufacture and deal in machinery, plant, etc. Solicitor: C. J. Hardwicke, 109, Queen Street, Cardiff.

MACFARLANE MANUFACTURING CO., LTD.—Cap., £20 000. Enamelled hollow ware manufacturers, electrical and general engineers, etc. Solicitors: Jennings, Son and Ash, 69, Leadenhall Street, London, E.C.3.

A. DEAN AND CO. (NORBURY), LTD.—Cap., £1 000. Electricians, electrical and mechanical engineers, etc. A director: A. Dean, 12, Pollards Hill North, Norbury. Reg. Office: 9, Coleman Street, London, E.C.2.

HARCOURT AND CO. (WIGAN), LTD.—Cap., £5 000. Manufacturers of and dealers in fuse heads or electric fuses for blasting purposes, etc. Reg. Office: Commercial Chambers, Market Street, Wigan.

ASSOCIATED WIRELESS CO., LTD.—Cap., £500. Wholesale and retail wireless instrument makers, electrical engineers and contractors, etc.—Solicitors: C. Butcher and Simon Burns, 32, Gresham Street, London, E.C.

MURPHY RADIO, LTD.—Cap., £6 000. To acquire business of radio manufacturer now carried on by F. Murphy at Hyde Way, Welwyn Garden City, Herts, as "Murphy Radio." Reg. Office: 62/4, Brook Street, London, W.1.

METAL AND CHEMICAL PRICES.

TUESDAY, October 1st.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£78 5 0	—	10s. 0d
Electro Wirebars .. .. „	£84 15 0	—	—
H.C. Wires, basis .. .. per lb.	11½d.	—	—
Sheet .. .. „	11½d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2½d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet „ .. .. .. „	10½d.	—	—
Wire „ .. .. .. „	11½d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£25 0 0	—	—
Foreign or Colonial .. .. „	£23 12 6	—	—
Tin—			
Ingot .. .. per ton	£203 5 0	—	£2 12 6
Wire, basis .. .. .. per lb.	2s. 8½d.	—	—
Aluminium Ingots .. .. per ton	£95 0 0	—	—
Spelter .. .. „	£23 10 0	—	10s. 0d
Mercury .. .. per bottle	£22 5 0	—	5s. 0d.

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
Sodium Bichromate—Per lb. 3½d.
Rubber—Para fine, 10d.; plantation, 1st latex, 10½d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

There is no feature of interest to report this week, and according to James Forster and Co. demand from consumers is quiet. Closing prices on September 27th were £23 12s. 6d. for September, £23 8s. 9d. for October, £23 10s. for November, and £23 11s. 3d. for December, or practically unchanged on the week.

COMMERCIAL INFORMATION

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ELLIOTT, W. G., MR., 142, Brighton Road, Birmingham, radio engineer. £34 16s. 4d. July 31st.

GROSVENOR ELECTRICAL SERVICES, 16A, Broadway, Hatch End, electrical engineers. £14 4s. 9d. August 9th.

HEATH ELECTRICAL CO., 9, South End Road, Hampstead Heath, wireless dealers. £18 14s. 8d. July 24th.

MAYERS, A., MR., Herbert Road, Gardiffaith, wireless dealer. £18 13s. 6d. July 26th.

RUDD, MR. A. E., Long Ashton, electrical engineer. £15 0s. 6d. July 24th.

SOUTH ESSEX ELECTRICAL CO., 30, London Road, Romford, electrical engineers. £37 9s. 9d. August 23.

SPENCER, G. J., MR., 36, Maidstone Road, Grays, electrical engineer. £17 19s. 10d. August 22nd.

THICK, MR. G. F., Church Steps, Frome, radio engineer. £20 6s. 3d. July 22nd.

WARDLEWORTH, L. AND V., 355, Bury Old Road, Heaton Park, Manchester, wireless dealers. £20 16s. 8d. July 30th.

Deed of Arrangement.

ROWBOTTOM, Leonard, 20A, High Street, and 19, Beale Street, Stourbridge, wireless and electrical engineer. Dated September 21st, filed September 27th. Trustee, F. E. Bendall, Midland Chambers, Warwick Passage, Corporation Street, Birmingham, accountant. Liabilities unsecured, £352; assets, less secured claims, £110.

Receivership.

PIRIE (J. M.) AND CO., LTD. (R., 4/10/29.) F. H. C. Christmas, of 46/47, London Wall, E.C.2, was appointed Receiver and Manager on September 10th, 1929, under powers contained in debentures dated December 1, 1928.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

CARK AND DISTRICT ELECTRICITY CO., LTD.—Registered September 23rd, £1 000 debentures; general charge. *£2 000 debentures. March 5th, 1928.

QUEENSWAY, LTD., London, W.C., electric light engineers. Registered September 19th, £1 020 debentures part of £3 000; general charge. *£1 980. October 2nd, 1928.

WRIGHT (ELECTRIC POWER SPECIALTIES), LTD., Halifax. Registered September 10th, mortgage, to Bank; charged on Century Works, Halifax, etc.

Satisfactions.

LLANGOLLEN AND DISTRICT ELECTRIC LIGHT AND POWER CO., LTD.—Satisfaction registered September 20th, £300, registered March 20th, 1911.

PREMIER WHOLESALE ELECTRIC CO. (STOCKPORT), LTD. (late PREMIER PRIVATE TELEPHONE CO., LTD.).—Satisfaction registered September 24th, £330, registered October 13th, 1923.

London Gazette, etc.

Bankruptcy Information.

HOBSON, Joseph, electrical engineer, 1A, Thorncliffe Grove, Whitworth Park, Manchester, and at Cross Street, Pendleton, Salford. Receiving order, September 26th. Debtor's petition.

Notice of Dividend.

RICHARDS, Stanley Wyndham, the Blackwood Radio and Electrical Supply Depot, High Street, Blackwood, radio engineer and electrical contractor. First and final dividend, 7½d. per £, payable October 8th, Official Receiver's Office, 34, Park Place, Cardiff.

Notice of Intended Dividend.

COHEN, Harry (commonly known as KENNETH COWEN), trading as E. COWEN, 41 and 43, The Village, Lower Bebington, Chester, electrical engineer. Last day for receiving proofs, October 16th. Trustee, J. Allcorn, Government Buildings, Victoria Street, Liverpool, Official Receiver.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

302 909 British Thomson-Houston Co., Ltd. Alternating current commutator motors. (22/12/27.)
315 687 J. E. Allan. Control of the air supply for electric motors and generators. (15/3/28.)
306 932 Felten und Guilleaume Carlswerke Akt.-Ges. Electric hollow conductor. (29/2/28).
316 232 G. H. Scholes, F. J. Pearce and G. H. Scholes and Co., Ltd. Electrical junction-boxes and the like. (26/1/28.)
284 698 W. J. Polydoroff. Radio-frequency amplifying circuits. (5/2/27.)
315 738 T. Teasdale-Kay and H. E. P. Jones. Clockwork-controlled electric time switches. (1/5/28.)
299 354 Magnetic Gauge Co. Apparatus for measuring the difference in current in two circuits. (24/10/27.)
286 200 Telefunken Ges. Fur Drahtlose Telegraphie. Transmission of high-frequency signal currents over electric power lines. (25/2/27.)
287 557 British Thomson-Houston Co., Ltd. Regulating systems for thermionic devices. (24/3/27.)
316 111 J. E. Allan. Control of electric motors for driving winches and the like ship's deck machinery. (15/3/28.)
316 328 H. Leitner. Electric accumulators. (27/3/28.)
316 330 H. Andrewes, D. M. MacDonald and Dubilier Condenser Co. (1925), Ltd. Electrolytic condenser. (28/3/28.)
295 005 Dubilier Condenser Co. (1925), Ltd. Electric condensers. (4/8/27.)
316 332 Burndept Wireless, Ltd. (in liquidation), and J. H. D. Ridley. Microphones. (28/3/28.)
292 550 Landis and Gyr Soc. Anon. Current magnet core for induction meters. (22/6/27.)
290 218 Etablissements E. Jaeger. Magnetic-action speedometers. (10/5/27.)
316 163 S. Tschusoff. Superheater elements. (20/4/28.)
316 336 Y. Mercier. Electric arc treatment of liquid hydrocarbons. (20/4/28.)
316 115 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Radio antenna. (21/4/28.)
316 121 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Method of influencing an electric current by means of radiation. (23/4/28.)
292 970 Electrical Research Products, Inc. Attenuation devices for acoustic wave transmission systems. (28/6/27.)
316 171 W. E. Beatty (Bell Telephone Laboratories, Inc.). Sound-recording systems. (24/4/28.)
289 385 Siemens and Halske Akt.-Ges. Long-distance transmission systems with Pupin lines. (25/4/27.)
316 340 Dr. C. Ruzicka. Method of and means for the electrical transmission and reception of visual images. (25/4/28.)
289 474 Associated Electrical Industries, Ltd. Circuit interrupters. (29/4/27.)
316 246 H. M. Clarke. Electromagnetic instruments of the moving-coil type, particularly microphone transmitters and loud-speaking telephones. (26/4/28.)
307 866 G. F. Johnstone. Electrolytic etching-machines. (15/3/28.)
289 880 Associated Telephone and Telegraph Co. Telephone systems. (6/5/27.)
302 881 I.G. Farbenindustrie Akt.-Ges. Partitions for separating the electrolytic products in the fusion electrolysis of chlorides, particularly of magnesium. (23/12/27.)
292 498 Associated Telephone and Telegraph Co. Telephone systems. (20/6/27.)
316 350 G. M. Wright. Transformers and circuit arrangements for use therewith. (28/4/28.)
289 489 Soc. Francaise Radio-Electrique. Acoustic instruments. (29/4/27.)

Applications for Patents.

July 5th.

20 709 General Electric Co., Ltd. Luminous electric discharge tubes. (1/8/28, Germany.)
20 710 General Electric Co., Ltd. Incandescent lamps. (1/8/28, Germany.)
20 628 Hoover, Ltd. (Hoover Co.) Protectors for flexible conductors.
20 706 R. J. Kaula. Electric coupling elements.
20 623 S. W. Marlow. Couplings for thermionic valves.
20 749 Maschinenfabrik Oerlikon. Connecting armature windings to electrical machines. (29/8/28, Switzerland.)
20 719 R. S. Miller and Oldham and Sons, Ltd. Apparatus for charging galvanic batteries, etc.
20 715 N. V. Philips' Gloeilampenfabrieken. Apparatus containing Kerr cells. (2/8/28, Holland.)
20 752 Nippon Densen Seizo Kabushiki-Kaisha. Trolley wires.
20 747 Pathe Cinema Anciens Etab. Pathe Freres. Electric lamps in kinematograph apparatus. (23/7/28, France.)
20 671 M. Paul and P. Wangemann. Interrupters for electric currents.
20 699 S. B. Smith. Picture, etc., telegraph systems.
20 705 Symphony Gramophone and Radio Co., Ltd., and H. C. Willson. Vibratory members for telephone reproducers, etc.
20 724 Vereinigte Gluhlampen und Electricitats A.G. Photo-electric cells. (2/1/29, Austria.)

July 6th.

20 810 C. P. Allinson. High frequency thermionic amplifiers.
20 851 Associated Electrical Industries, Ltd., and G. H. Fletcher. Electric vehicles.
20 835 J. L. Baird. Reproduction by telegraphy of pictures, etc.
20 773 British Thomson-Houston Co., Ltd. (General Electric Co. of New York). Manufacture of electric condensers.
20 831 M. A. Bontch-Brouewitch and V. V. Tatarinov. Short wave antennæ.
20 837 W. M. Cranston, and General Electric Co., Ltd. Electrically driven gramophone motors.
20 785 B. Deason. Apparatus for amplifying, etc., electric currents.
20 803, 20,821 A. E. Knowles. Electrolytic apparatus.
20 772 H. A. P. Littledale. Inductances.
20 775 E. B. M. Lochner. Transformers.
20 779 W. Rogers, and Wingrove and Rogers, Ltd. Radio switches.
20 852 Telefunken Ges fur Drahtlose Telegraphie. Radio receivers. (3/8/28, Germany.)
20 853 Telefunken Ges fur Drahtlose Telegraphie. Apparatus actuated by predetermined signals. (19/7/28, Germany.)
20 835 Television, Ltd. Reproduction by telegraphy of pictures, etc.
20 824 Westinghouse Brake and Saxby Signal Co., Ltd. Mechanism for operating railway signals, etc.
20 826 Westinghouse Brake and Saxby Signal Co., Ltd. Electrical control of railway points. (9/7/28, U.S.).

July 8th.

20 965 Associated Electrical Industries, Ltd., and A. Tustin. Electrically-propelled vehicles.
20 966 Associated Electrical Industries, Ltd., and A. Rudman. Electric switches.
20 953 Berry, Wiggins and Co., Ltd., and H. H. Holmes. Containers for electrical apparatus.
20 876 R. Deason. Wireless receiving apparatus, etc.
20 957 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Wireless receiving system.
20 958 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
20 959 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Installations for rectifying alternating current.
20 913 Felten and Guilleaume Carlswerk A.G. Submarine cables.
20 911 Friemann and Wolf Ges. Pasting grid strips for accumulators. (16/3/29, Germany.)
20 928 Graham-Amplion, Ltd., and A. D'A. Hodgson. Wireless systems.
20 952 M. J. de Groot. Galvanometers. (9/7/28, Holland.)
20 923 P. Muller. Apparatus for regulating electric bells. (11/7/28, France.)
20 956 N. V. Philips' Gloeilampenfabrieken. Electrical contact pins. (19/10/28, Holland.)
20 962 J. E. Pollak (M. Greiner). Electric sounding horns.
21 000 H. Pyle and W. M. Willox. Electrode holder for electric welding.
20 973 S. Ruppel. Electric switches.
20 924 Siemens Bros. and Co., Ltd. (General Dry Batteries, Inc.). Dry cells.
20 947 Siemens and Halske A.G. Printing telegraph transmitters. (25/10/28, Germany.)
20 989 O. N. Tevander. Circuit controlling switches.
20 986 Victor Talking Machine Co. Thermionic valve systems. (1/12/28, U.S.)

July 9th.

21 086, 21 087 Associated Electrical Industries, Ltd., and D. R. Davies. Electrical switchgear.
21 088 Associated Electrical Industries, Ltd. Transformer tap-changing systems. (21/7/28, U.S.)
21 014 F. C. Russon-Bayliss, and Baylis, March and Newey, Ltd. Electric light projectors.
21 101 British Thomson-Houston Co., Ltd. Totalisators.
21 076 Electrical Research Products, Inc. Electro-optical systems. (13/7/28, U.S.)
21 063 R. Eyre. Device for spraying telephone mouthpieces.
21 136 Ferrand Inductor Corporation. Loud speakers. (9/7/28, U.S.)
21 036 A. C. Hyde. Manufacture of thermionic valves.
21 100 International General Electric Co., Inc. Power plants. (10/7/28, Germany.)
21 091 E. F. Northrup. Electric furnaces.
21 119 Siemens-Schuckertwerke A.G. Absorption refrigerating machines. (27/7/28, Germany.)
21 118 Siemens and Halske A.G. Protecting measuring instruments against short circuits. (25/7/28, Germany.)
21 073 Soc. Française Radio-Electrique. Printing telegraphs. (28/7/28, France.)
21 110 Vereinigte Eisenbahn-Signalwerke Ges. Electrical train-influencing systems. (4/8/28, Germany.)
21 081 Wired Radio, Inc. High frequency generator circuit. (31/7/28, U.S.)
21 082 Wired Radio, Inc. Multi-electrode tube oscillator circuits. (31/7/28, U.S.)
21 092 Siemens-Schuckertwerke A.G. Lead cables. (10/10/28, Germany.)

July 10th.

21 234 British Thomson-Houston Co., Ltd., and E. H. B. Martin. Protective devices for electric circuits.
21 235 British Thomson-Houston Co., Ltd., and C. G. Gartin. Thermionic valves.
21 236 British Thomson-Houston Co., Ltd., and C. G. Gartin. Transformers. (10/7/28, U.S.)
21 264 Carborundum Co. Electric furnaces. (7/12/28, U.S.)
21 250 T. K. Cordes. Electric cable connectors.
21 194 Electrolux, Ltd. (Platen-Munters Refrigerating System Aktiebolag). Evaporator units for refrigerating. (28/2/29.)
21 216 J. E. Ferguson and J. Ferguson and Sons, Ltd. Electric battery boxes, etc.
21 256 General Electric Co., Ltd., C. W. Stopford, and E. C. Walton. Electric switches.
21 197 Hirsch Kupfer-und Messingwerke A.G. Electrolysis of fused electrolytes. (7/8/28, Germany.)
21 173 L. Levy. Electrotherapeutic treatment apparatus.
21 268 Pioneer Instrument Co., Inc. Illuminated panel arrangements. (26/3/29, U.S.)
21 255 A. L. Reimann. Electron discharge tubes.
21 179 A. R. A. Rendall, E. K. Sandeman and Standard Telephones and Cables, Ltd. Telephone systems.
21 222 J. Sinclair-Ross and J. Zetsche. Apparatus for control of electric motors.
21 161 S. Ruppel. Electric switches.
21 230 F. A. Thomassin. Talking picture apparatus.
21 231 F. A. Thomassin. Reproduction of sound from photo-electric records.
21 200 K. Tihanyi. Television apparatus. (12/7/28, Hungary.)

COMING EVENTS.

Tuesday, October 8th.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Electrical Contractors' Association (Leicester Branch).—Corridor Chambers, Ordinary meeting. 2.30 *p.m.*

Illuminating Engineering Society.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Opening meeting. 6.30 *p.m.*

Wednesday, October 9th.

Electrical Contractors' Association (Eastbourne Sub-Branch).—South Street. Ordinary meeting.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting. 5.30 *p.m.*

Institute of Wireless Technology.—Engineers' Club, Coventry Street, London. Annual meeting. 7 *p.m.*

Thursday, October 10th.

Electrical Association for Women.—Visit to Messrs. Kelvinator, Ltd., Alexandra House, 29, Kingsway, London. Lecture by Mr. F. E. Kewley on "Electrical Cold that Keeps." 3 *p.m.*

Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Saturday, October 12th.

Association of Mining Electrical Engineers (Western Sub-Branch).—Chairman's address.

27th A.A. Battalion. R.E. (T.A.)—Battalion Dance. Headquarters, Rochester Row, London, S.W.1. 7.30 *p.m.*

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THE ELECTRICIAN

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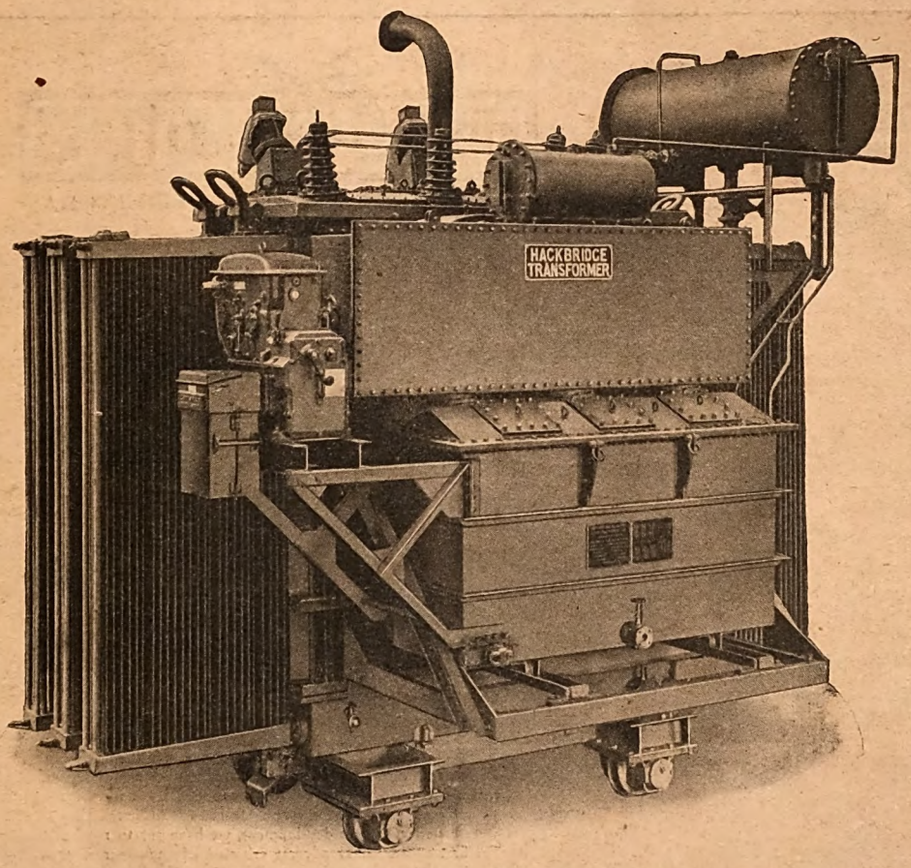

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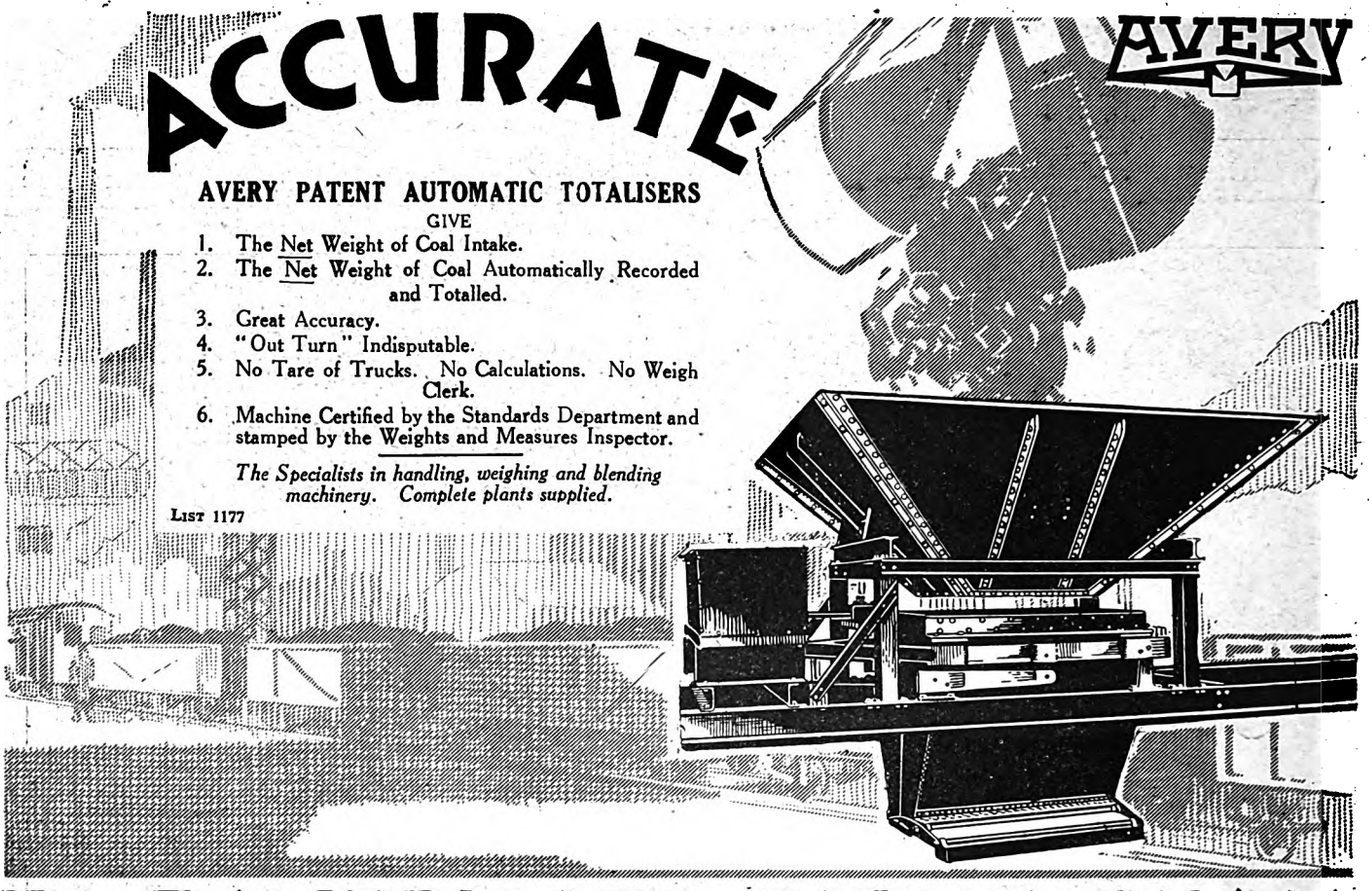

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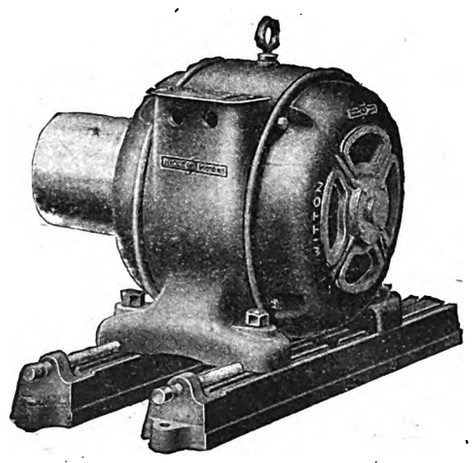

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THE ELECTRICIAN

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Current Topics.

The Sussex Downs Farce.

THE opposition to the erection of the Central Electricity Board's overhead lines on certain parts of the Sussex Downs is rapidly degenerating into a farce, the actors in which are for the most part more remarkable for the intensity of their enthusiasm for a reactionary cause than for an exhibition of knowledge of what is and what is not possible in a scheme of this kind, or even of the quality commonly known as horse-sense. The star item of this farce, which many electrical engineers have thoroughly enjoyed, was the publication in a daily paper noted for its care for the amenities of the countryside of a large picture of ROBERT LOUIS STEVENSON'S home at Swanston, together with a statement that a proposal is afoot to acquire the cottage and the valley in which it stands as a public park. The lay reader saw in this picture nothing more than a delightful rural panorama, but electrical engineers, ever on the look out for evidences of their handiwork, were able to discover, in the corner of a field in close proximity to the R.L.S. home, what was unmistakably one of the double circuit 132 kV towers erected for the purposes of the Scottish grid scheme. While the opposition was devoting its energies to side-tracking matters of fact which were put forward by individuals from the electrical point of view, they failed to notice the "soaring pylon" or "Eiffel Tower," which had reared itself up in yet another beauty spot, until Mr. J. F. SHIPLEY very rightly directed public attention to it. Obviously, after an example of this kind, people who continue to maintain the attitude that the "grid" lines will gravely disfigure the landscape will never let themselves be convinced by anything, and must be regarded as opponents of progress in any shape or form. The delaying effect of this agitation on the progress of the Central Board's work cannot be regarded as good from the electrical point of view, and the Board's position of being unable, even if it had so desired, to indulge in public altercation over a matter that was *sub judice*, was one of some difficulty. In our opinion the Board has throughout shown the greatest possible consideration for the expressed wishes of those likely to be affected by the operation of its schemes, and has generally taken care not to cause offence to anybody. This policy, of converting opposition, both real and potential, to co-operation is one that we consider to be essential to the ultimate success of public utility enterprise, but its results to-date in the South-East England scheme are not too encouraging.

More Misrepresentation.

THE propaganda against the erection of the London Power Co.'s new power station at Battersea—progress at the site of which is depicted elsewhere is this issue—has broken out again in intensified form, and the popular Press is full of glaring headlines, of which "Power Station Menace to London" is a modest example. So long as honest doubt existed as to the possibility of preventing the emission of sulphurous fumes from this station the agitation was justifiable, though we think it might have been avoided if the Power Co. had made an earlier decision to give to the public an unequivocal assurance that the anticipated nuisance would not occur. Their very definite assurance that a commercial solution of the fume problem had been found, and would be employed, allayed the fears of many people, and those who are not prepared to take the company's word had the additional safeguards of an inquiry and a report by the Government Chemist and the Government's promise to withhold consent to the full development of the site should the initial part—only one-third of that projected—give offence. Apparently even this threefold check is considered insufficient by the opponents of the scheme, if a picture in Wednesday's "Daily Mail" is intended to be taken seriously. The art of superimposition, which achieved such startling results in the Sussex Downs case, is again employed, and upon a picture of the Thames is grafted, on the actual site of the new station, a picture of an existing power station. This transport feat has been undertaken "to show how poisonous fumes, unless means are discovered to eliminate them, would spread over a large area of London." The invisible sulphur emissions are represented in the picture by huge clouds of smoke coming from the chimney stacks, and the smoke is blowing in a direction almost exactly opposed to that which it might normally be expected to take under the direction of the prevailing wind. Such trivial matters can hardly

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be expected to worry the popular daily papers, but it is unfortunate for the electrical industry that a considerable body of public opinion is formed on such misleading information.

Lighting Fittings Design.

As the first journal in this country to describe and illustrate the modernist trend in lighting fittings design, we have followed its development with particular interest, as representing the first real and practicable attempt to design a proper setting for an essentially modern illuminant. For the first time since electricity was used for lighting, a conscious effort was made to evolve fittings possessing some æsthetic value and novelty of form, and it was only natural that the new movement should attract wide and imitative interest. The new styles were essentially Continental in conception and manufacture. Considerable quantities of these productions found their way to the British market, and, as these were favourably received, certain British manufacturers turned their attention towards the production of fittings designed to harmonise with modern architectural forms. Unfortunately, with but few exceptions, these efforts have not been æsthetically satisfying, for while no fault can be found with the quality of materials used or with the actual manufacture, the bulk of the British production to date has lacked the fine sense of design which was so delightfully apparent in the work of some of the eminent French and German craftsmen in glass and metal. This disability is, we believe, but a temporary one, and entirely due to the failure of many of those responsible for the production to realise that the designer of heavy engineering plant is not necessarily the best man to be entrusted with the creation of delicate lighting fittings. In fact, the average engineering designer is hopelessly out of his depth in a matter of this kind, and it is obvious that the few firms who have left this work to men endowed with the necessary artistic ability are the only ones who have been successful in producing fittings that appeal to the really discriminating purchaser. A praiseworthy attempt is being made by the General Electric Company, in co-operation with the organisers of the Ideal Homes Exhibition, to discover native talent which is capable of application to this interesting problem. Prizes to the value of £1 000 will be offered in a competition based on the lighting and decoration of a suite of six rooms. The interest which this competition will arouse among British decorative artists and designers will undoubtedly assist in the development of British lighting equipment suitable for employment in modern interiors.

Electrical Equipment for Manufacturers.

THE varied descriptions of electrical equipment for manufacturers which we publish each month are further evidence of the progress of electrical development. The fact that such equipment is designed to cover so many fields is indicative of the wide uses to which such plant is applied, and substantiation of this fact, if any is required, is given by the descriptions, published elsewhere in this issue, of apparatus so widely different in its uses as industrial lighting and mine prospecting. Manufacturers of industrial electrical equipment should bear in mind that considerable opportunities await them in the overseas markets. Italy, for instance, imported last year carbons for electric furnaces valued at 11 230 600 lire, which suggests that the use of such furnaces is well established. Importations of electrical equipment not specially specified were valued at 72 339 200 lire, while earthenware and glass insulators were valued at 1 377 400 lire and 194 200 lire respectively. At the moment Germany is the most important source from which Italy draws foreign material and supplies, as in the case of most other industrial or technical equipments. This is not only true with regard to total quantities imported, but also as applied to almost every class or group of items. The growing activity of the electrical industry and of industries using electrical equipment in Italy is not only indicated by increased imports of appropriate machinery and material, but also by the amount of power generated and used in the country. The kilowatt hours generated by 200 to 300 private and public undertakings in 1928 furnished about 84% of the country's supply of energy, and showed in comparison with 1927 an increase of 947 865 000 kWh. This in itself should indicate to manufacturers that the Italian market is worthy of attention, even in competition with Germany, the nearer neighbour.

Electrical Inventions.

THE inventions shown at the Exhibition of Inventions which closes to-morrow, Saturday, emanate not only from various parts of this country but also from China, New Zealand, Yugoslavia, the U.S.A., Norway, East Africa, Australia, South Africa, India and Germany. These exhibitions, of which this is the fifth, always contain something of electrical interest, and this year is no exception. The domestic field appears to be the more prolific, for no less than two domestic irons are shown, portable telephones which can be used in the house bell wiring system, cigar and cigarette lighters, electric door bolts and egg testers are also among the exhibits. We give elsewhere in this issue particulars of some of the inventions, together with details of some of the items shown by manufacturers. These latter include a new type of vacuum cleaner which, though of the "non-bag" variety, is also a departure from the "enclosed dust collector" type, the whole machine resembling somewhat an inverted pail. Wireless inventions are few this year, the most interesting perhaps relating to a seamless vulcanite core for loud speaker diaphragms. The exhibition is well worth a visit, if only to reveal the lines of thought taken by inventive genius.

"Electrificatzia."

STUDENTS of conditions in Russia following the Bolshevik revolution will have noted how many Russian parents named their children "Revolutzia" to signify their faith in the great social upheaval that was to provide a new life for millions of people. Now, however, a writer in the "Review of Reviews" points out that a new name is being given to Russian infants. "Electrificatzia" is the name, which, being translated, simply means electrification. The change is not without significance, and some may see in it an indication that, whereas it was at one time the revolution that seemed to be the harbinger of hope for Russia, it is now electricity that occupies that position. More mysterious and incalculable than the forces of revolt, electricity also differs in its capacity for being controlled and put to work. The Soviet leaders themselves seem to recognise this. They have an elaborate hydro-electric programme in preparation, including the great Dnieper project, and expect by the end of the year to have increased the national generating capacity to a figure approximately 800 per cent. above that of 1923.

The Cable Competition.

As readers will see on a later page of this issue, the solutions of the Cable Competition, organised in aid of the funds of the Electrical Trades' Benevolent Institution, have now been issued. The clues to the names of the towns through which the mythical cable was to pass will probably have puzzled few of the competitors for long, but we shall be surprised if many entrants were successful in arriving at 1 496½ miles, the exact length of cable required to link up the places concerned. Whether or not they win or lose, those who have competed will have combined the working out of an interesting problem with a direct financial contribution to the funds of a very deserving charity. Those who did not take part in the competition can also help, and in a still more effective way, by becoming annual subscribers under an appropriate membership grade, or, if they are already members, by persuading at least one other member of the electrical industry to follow their example.

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INSULATING PAPERS.

Non-ageing Grades for Electrical Applications—Advantages of a Cotton Base—Improvements in Chemical Wood Pulp Papers for Cable Manufacture.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR, D.S.O., M.C., B.Sc.

PAPER is an outstanding example of a material developed for other purposes, but adopted, improved and extensively used as an insulator. It is interesting to note, moreover, that, generally speaking, the principles on which it has been developed and improved for other uses have been effective, in conjunction with special blending and the elimination of impurities, in its development for electrical purposes. Just as "rag" papers, of cotton or linen fibre, are used for the best work in the printing trade, so they are definitely the best for insulating work in which good ageing properties are essential. Further, just as substitute materials, especially wood pulp, have been developed to a satisfactory quality for lower grade printing and general uses, so these materials have been made satisfactory for some electrical applications.

The method of making Egyptian papyrus, the forerunner of paper, dating back to about 3 500 B.C., represents in crude form the modern methods of paper production. The pith of the marsh-growing papyrus plant was cut into thin, long strips, which were laid side by side, gummed over with a bonding medium, and reinforced by a second layer of strips, laid across the first, the sheet so formed being finally pressed, dried and polished. A remarkable example of this early

Fig. 1.—Microphotograph of cotton fibres : magnification 1/92.

material is the "Theban Book of the Dead," preserved in the British Museum, a roll 122 ft. long by 21½ in. wide.

The first production of paper from the finely divided fibres of plants is credited to the Chinese, dating back to about 100 A.D. or possibly earlier, but the method was kept a close secret for several centuries, until the knowledge was wrested from Chinese captives by the Arabs and the Moors. In the eleventh century, the Moors brought the process to Spain, whence it spread over Europe. Notable among early English mills are Tate's Sele Mill, of 1495 A.D., at Stevenage, Hertford, and Whatman's Mill, of 1760 A.D., at Maidstone, Kent. It was not until the years 1803 and 1821 that paper-making machines were developed in England, by Gamble, the Fourdrinier brothers, and John Dickinson. Since that time, however, very great refinements have been introduced, resulting in the selection, blending and treatment of fibres to give papers for as many as about 130 different uses recognised by the trade.

The best non-ageing papers for electrical applications are made from rags of cotton and linen, and to a less extent from ropes, jute, hemp, etc., and are prepared by the alkali boiling process. The materials are carefully selected for particular purposes, the rags, for instance, being chosen from about thirty different grades, and are picked with a view to freedom from undesirable foreign materials such as pins, buttons and metal fasteners, wool, elastic and dirt. The selected material is first cut into small pieces and subjected, if necessary, to a dusting process and to a preliminary boiling in alkali to cleanse it. The boiling process proper is carried out in large boilers usually of cylindrical rotary type, with alkali maintained at a temperature of about 145 deg. C. at 40 to 50 lb. per sq. in. pressure for several hours. The material, known at this stage as "half stuff," is then conveyed to a beating machine which may be of the open trough collander type or of the modern high-speed, closed, cylindrical

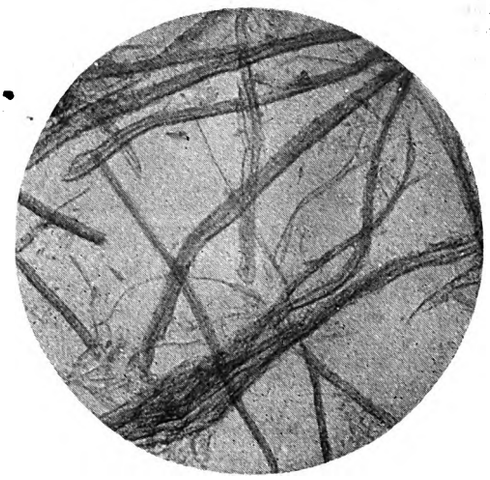

Fig. 2.—Microphotograph of jute fibres.

type similar to those shown in Fig. 4, invented by Mr. H. Jackson, of Garstang. The time of beating influences the length of the fibres, which are allowed to become more and more hydrated according to the nature of the paper desired. Figs. 1, 2 and 3 show micro-photographs of cotton, jute and chemical wood pulp fibres during the beating treatment. The Jackson process effects very complete disintegration and hydration of the fibres, and the resultant pulps produce high density papers of considerably improved electric strength.

The prepared pulp, or "stuff" is conveyed in a stream of water to travelling felts, on which it is carried to the cylinders of the paper-making machines, the surplus liquid being drawn off from the pulp by drainage and suction. At this stage precautions are taken by the introduction of "sand-traps" in the path over which the pulp passes, to eliminate any foreign particles which may have been introduced during the beating process. It is interesting to note, also, that means

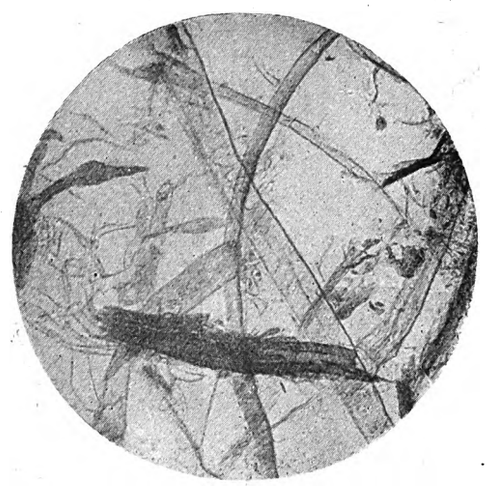

Fig. 3.—Microphotograph of chemical wood pulp fibres.

are used to shake the pulp transversely on the felts in order to cross the fibres; and so bind the structure somewhat on the principle of the ancient papyrus sheets. Notwithstanding this, the drawing action of the felts inevitably produces a lie or grain in the finished paper. This is indicated by tearing test results. Fig. 5 shows two specimens of the same material tested longitudinally and transversely according to the method suggested by the E.R.A., and it will be noted that in the tear

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corresponding with the lie of the grain the torn tongue is considerably elongated.

For wood-pulp papers, known generally as krafts, sulphates and sulphites, the fibres are reduced either by a mechanical grinding process or by chemical disintegration with soda,

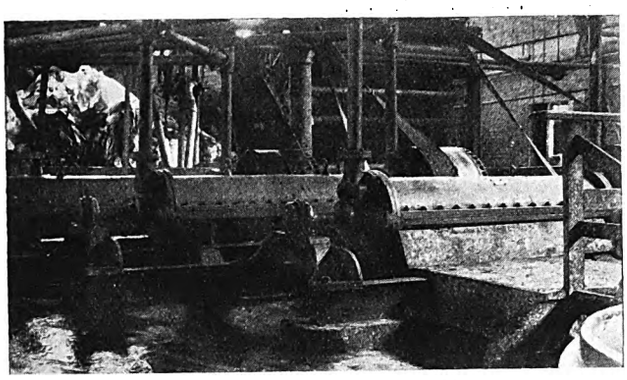

Fig. 4.—Jackson high speed beating machines.

sodium, sulphate or sodium sulphite. Most of the material used for wood-pulp paper making in this country is received from abroad in the state of cakes of half-stuff. Mechanical wood-pulp paper is unsuited for insulation purposes, owing to its very poor ageing qualities. Chemical wood-pulp papers can be successfully used for some electrical work, as the process lends itself to the elimination of impurities and gives a much more refined product.

For asbestos papers the fibres are mechanically torn from the natural substance, a small proportion of cotton pulp usually being added to give mechanical strength.

Papers which are required primarily for their insulating properties should only be made from either cotton, manilla or chemical wood pulp or a mixture thereof. There is a tendency at present to concentrate on chemical wood pulp papers owing to their advantage in price, but, as indicated later, where maintenance of mechanical properties under comparatively high temperatures is important, the use of a cotton base is essential.

Typical electrical breakdown values for various papers are given in Table I in order of electrical merit based on the electric strength in volts per mil. The tests, as is usual, were made between cylindrical electrodes of 3 in. and 1½ in. diameter in air at 90 deg. C. so as to eliminate the influence of moisture. It should be noted that the results shown are average values, and that better values are obtainable on special refined papers

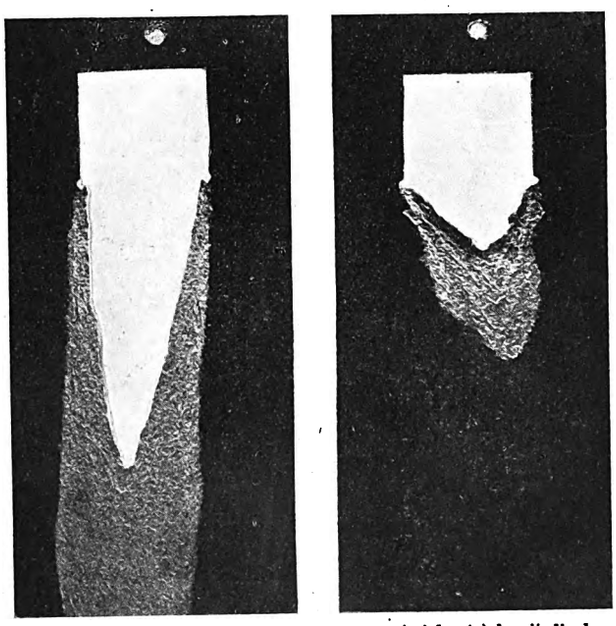

Fig. 5.—Tearing test specimens of same material: (a) longitudinal, (b) transverse.

of the various types. The actual breakdown values are, of course, given by multiplying the thickness by the volts per mil. The variation in electric strength with thickness is indicated by Fig. 6, which is reproduced from "Electrical Insulating Materials," by Monkhouse.

Fig. 7 shows the results of ageing tests on various papers, and indicates the superiority of cotton in this respect. Chemical wood pulp papers have, however, now been produced which are little, if at all, inferior to the manilla papers extensively used in cable manufacture. The curves indicate clearly that rapid deterioration of the materials commences about the temperature of 140 deg. C., and a similar indication with regard to wood pulp cable paper is given by test results published in the July 1929 serial report of the Underground Systems Committee of America, from which Fig. 8 is reproduced. The curves given in this report for lower temperatures show little deterioration, even over a period of twice the length of time.

Other qualities than electrical strength are often of importance in papers for electrical purposes. For instance, where the severe mechanical pressure of one conductor passing over another has to be resisted, a hard material such as pressboard or leatheroid is required, while, on the other hand, the manufacture of synthetic resin varnish laminated products calls for an absorbent paper, the degree of absorbency governing the quality of the finished product. Most electrical

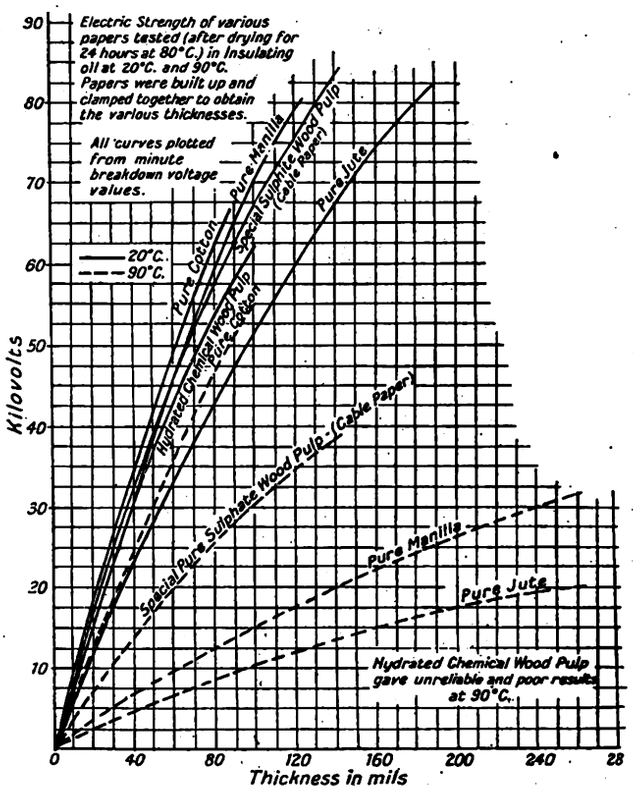

Fig. 6.—Electric strengths of papers showing variation with thickness.

manufacturers, therefore, utilise a number of preferred types of paper which they standardise for their own requirements. This very fact leads to difficulties in the standardisation of papers, but considerable assistance in the preparation of specifications is given by the recommendations on methods of test issued by the British Electrical Research Association.

The following notes indicate some of the features to be considered in selecting a paper for any specific purpose.

Thickness.—Thin papers are generally better made than thick, and have superior electric strength. Thin papers are necessary where thorough impregnation is desired in preference to the merely surface treatment obtained with thick papers. Similarly, thin papers, due to their higher varnish content when treated, make better quality varnished papers.

Density.—The density of a paper is closely related inversely to its porosity, and, directly to its electrical strength. Moderately dense papers have excellent mechanical properties, but with excessive density there is a tendency to brittleness which is increased when the materials are aged at high temperatures.

Tensile strength.—This feature is of particular importance where papers are required for ribbon applications such as the paper insulation of cables and conductors, or the strengthening of mica cell material for wrapping on the slot portions of coils. It is also of importance where it is necessary to varnish long lengths of papers, since low tensile strength

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limits the permissible length of unsupported span, and therefore the choice of process.

Porosity.—The importance of porosity is chiefly in connection with paper which has to be impregnated, the more porous paper producing a material with a higher resin content, and therefore a higher electric strength and greater resistance to moisture.

Bursting strength.—The difference in bursting strength as measured by the Ashcroft tester before and after periods of heat treatment, is usually taken as an indication of ageing properties. This characteristic is more clearly indicated if the ageing is carried out at 160 deg. C. instead of the usually adopted temperature of 105 deg. C.

Tearing.—Tearing tests are often employed where it is desired to examine the length of fibres, as it is clear that longer fibres will present greater resistance to tearing. The results of a typical tearing test have been referred to (see Fig. 5).

Alkalinity or Acidity.—Good papers should be neutral.

TABLE I.—TYPICAL ELECTRIC STRENGTH VALUES OF VARIOUS PAPERS.

Thickness (inch)	Kind of Paper	Electric strength Minute value in air at 90 deg.C. volts/mil.	Electrical use.
0·0004	Flax condenser tissue	780	Condenser dielectric.
0·0005	Rag condenser tissue	580	Condenser dielectric.
0·007	Leatheroid	400	To resist mech. pressure in coils.
0·015	British presspaper	372	High voltage transformers.
0·002	Swiss greaseproof	317	Extra high voltage tubes.
0·002	Sulphite	260	Bakelite boards and tubes.
0·018	Continental presspaper	250	Slot linings and cells.
0·005	Mixed manilla	246	As substitute for manilla.
0·003	Norwegian Kraft	245	Mechanical backing for mica slot cells.
0·003	British Kraft	240	
0·003	Cotton	237	Tropical bakelite boards and tubes.
0·005	Manilla	236	Power cables.
0·004	Rope	225	Coils, layer insulation.
0·003	Sulphite	225	Bakelite boards and tubes.
0·002	Pure manilla	217	Power cables.
0·003	Cable	210	Bakelite boards and tubes.
0·007	Asbestos	200	Field coils, turn insulation.
0·0032	Japanese Vellum	200	Experimental.
0·007	Presspaper	200	Transformer coils, turn separators.
0·005	Vegetable Kraft	200	Experimental.
0·004	Kraft	178	Mech. backing for mica slot cells.
0·010	Presspaper	175	Transformer coils, turn separators.
0·010	Asbestos	165	Field coils, turn insulation.
0·015	Presspaper	154	Transformer coils, turn separators.
0·005	Cable	147	Power cables and bakelite boards and tubes.
0·015	Asbestos paper	125	Field coil turn insulation.
0·020	Asbestos paper	105	Field coil turn insulation.
0·025	Asbestos paper	95	Field coil turn insulation.

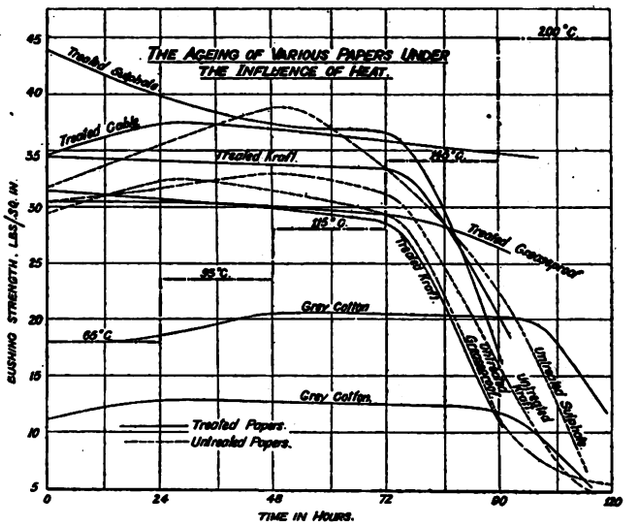

Fig. 7.—Results of ageing tests on various papers.

Any appreciable alkalinity or acidity reduces the electrical strength and accelerates deterioration.

Ash.—Good papers should have a low ash content, preferably not exceeding 0·7 or 0·8%, but this is governed to a large extent by the base from which the paper is made. It will be obvious that these figures will not hold for asbestos papers.

TABLE II.—INFLUENCE OF TREATMENT ON THE ELECTRIC STRENGTH OF PAPERS.

Thickness (inch)	Kind of Paper.	Treatment.	Electric strength minute values in air at 90 deg. C. Before. volts/mil.	After. volts/mil.
0·003	Kraft	Synthetic resin	140	247
0·003	,,	Shellac varnish	140	226
0·005	,,	Transformer oil	136	700
0·005	Cable	Shellac varnish	147	174
0·003	,,	Shellac varnish	210	247
0·005	,,	Transformer oil	163	1 700
0·002	Greaseproof	Shellac varnish	317	410
0·002	,,	Synthetic resin	317	488
0·004	,,	Transformer oil	275	1 400
0·003	,,	Transformer oil	317	2 000
0·015	Presspaper	Transformer oil	372	1 140
0·002	Cotton	Baking varnish	150	2 000

Electrical Strength.—The importance of electrical strength is probably greatest in the applications of high voltage cable

TABLE III.—TEST RESULTS ON TYPICAL PAPERS SUBMITTED FOR DEFINITE PURPOSES.

Characteristics.		Cable papers as used for insulating E.H.T. cables.		Cotton paper as used for synthetic resin varnish paper products.	Rag condenser paper for condenser dielectric.	Greaseproof paper for E.H.T. tubes.
Thickness (inch)		0·005	0·0034	0·0048	0·0005	0·0048
Density (grams/cc.)		0·854	0·814	0·489	1·094	0·944
Porosity (secs. per 15 cc.)	Max.	33	74	102·5	18	2·0
	Min.	31	70·5	100·5	5·5	1·5
	Aver.	32	72	101·2	9·5	1·56
Bursting (Ashcroft)						
As received	Max.	85	47	14	10	64
	Min.	66	26	10	6	53
	Aver.	74·7	41	11·6	7·1	59·8
After ageing for 24 hours at 105° C.	Max.	92	52	14	12	61
	Min.	67	46	10	9	49
	Aver.	79·7	46·5	12·2	10	56·2
Effect of ageing (%)		Increase 6·7	Increase 13·4	Decrease 12·07	Decrease 40·8	Decrease 12·4
Tensile strength (lb./inch width)						
Longitudinal		45	30	7·25	6	38
Transverse		25	13	3·75	—	29
Tearing strength (O3)						
Longitudinal		12	6	2·5	0·5	5
Transverse		10	5	3·5	—	7·25
Alkalinity (% Na2O)		0·043	0·012	0·0012	0·26	0·0025
Ash (%)		0·97	1·58	0·41	1·1	0·44
Electric strength (volts/mil)		170	168	153	580	274

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and conductor insulation, but this is largely governed by the process of impregnation adopted. High electric strength values are important for the paper insulation between layers of fine wire wound coils. The extent to which electric strength

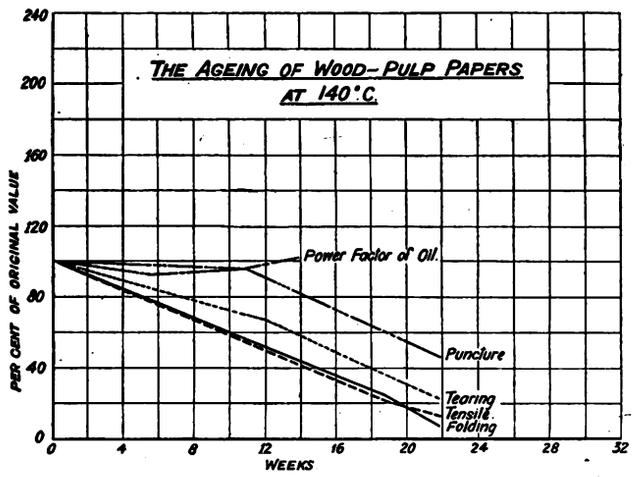

Fig. 8.—Results of ageing tests on chemical wood.

is influenced by subsequent treatment of the paper is shown by Table II, which gives typical results of tests with regard to this feature.

The values which should be obtained in tests on various properties are difficult to state in the absence of standard specifications, but the values given in Table III, showing the results of tests on typical papers submitted for various definite uses, may serve as an indication.

The authors' acknowledgments are due to Mr. H. Jackson for Fig. 4, to Sir Isaac Pitman and Co., Ltd., for Fig. 6, and to the Metropolitan-Vickers Electrical Co. for permission to use the other illustrations and information.

VITREOUS PRODUCTS.

The Properties and Applications of a New Insulating Medium.

INSULATION engineers will need no introduction to Mycalex, a comparatively new electrical insulating medium, which is regarded by some as representing one of the most revolutionary advances in applied electro-chemistry since the introduction of synthetic resins.

Mycalex is not a synthetic resin, but is a vitreous product composed of pure electrical mica (or other base) intimately associated with a vitreous flux resulting essentially in a new medium (not merely a new material) which is claimed to be perfectly stable and inert under all conditions likely to be met with in service.

Mechanical Strength.

It can be produced in sheets, rods or tubes, and can be extruded in any section, and moulded in conjunction with metal inserts. The finished product, although of the consistency of porcelain, can be drilled, tapped, sawn or machined in the lathe, and its mechanical strength is said to surpass that of any other insulating material.

Hitherto Mycalex has been manufactured in America and Germany under licence from the patentees. Now, however, it is to be produced in England, under the personal supervision of the inventor, Mr. P. B. Crossley, who has designed the special plant for that purpose. The works are at Harlesden, near Willesden, Middlesex, and the registered offices of the Mycalex (Parent) Co., Ltd. are at Abbey House, Westminster, where we understand that specimens of the product can be seen by those interested.

Noteworthy among the specimens inspected by a representative of THE ELECTRICIAN was a model high-tension stator-bar with the insulation moulded on, in intimate contact with the metal, leaving no air-spaces.

Mycalex can also be made in different grades to suit special requirements. These range from the ordinary grade, which is refractory at 450 deg. C. up to a special arc-resisting quality which is formed of an alternative base composition. The material can be produced in a variety of colours, and with glazed surfaces.

The following physical properties are claimed for the ordinary quality Mycalex (unglazed) :—

Dielectric Strength	24—15 kV/mm (according to thickness).
Volume Resistivity	80 x 106 megohms cm. cube.
Permittivity (" K ")	5 to 7.
Power Factor (tan.d.)	0.002 (0.2%).
Power Loss (K x tan.d.)	0.01 to 0.014 (1.0 to 1.4%).
Thermal Conductivity	23.8 Watts per cm. cube per °C.
Linear Expansion	0.00000881—25° to 50°
	0.00001140—150° to 175° C.
Specific Gravity	3.0 to 3.3.
Water Absorption	0.02% in 24 hours.
Plastic Yield with temperature. (Martens Test)	450° C.
Hardness Schleroscope	40.
Hardness Brinell	40 to 50.
Tensile Strength	5 to 6 tons per sq. in.
Bending Strength	10 to 12 tons per sq. in.
Resistance to Crushing	19 to 25 tons per sq. in.
Impact Notched	6 to 7 Kg. cm. sq. cm.
Impact Unnotched	6 to 7 Kg. cm. sq. cm.

From the above table it will be seen that the dielectric losses compare favourably with high grade ebonite, consequently Mycalex has an enormous field of application in high frequency work, either for panels (where its high mechanical strength enables the thickness to be appreciably reduced) or for strain insulators, where the material is either in tension or compression.

The high value of resistance to impact immediately suggests application in connection with track insulators for railways and also for insulators for telegraph, telephone and overhead power lines, which are subject to malicious, as well as accidental damage.

Resistance to Heat.

With regard to resistance to heat, Mycalex is claimed to be in a class by itself. In its ordinary form it is non-inflammable and fire-resistant, and is said to be unaffected by temperatures which would completely carbonise synthetic resin products; whilst in its most refractory form it is considered to be eminently suitable for arc-shields, spark-plug insulations and similar applications.

The Mycalex (Parent) Co. is considering applications of this medium in relation to all suitable insulation problems from the humble plug and socket for domestic installation to the more pretentious bushing for a 132 kV switch, or for transformer insulation.

Quantity production of the material is expected to commence in this country before the end of this year.

NON-FERROUS METALS.

Data on Employment in Manufacture of Washing Machines.

THE American Bureau of Metal Statistics has received reports respecting the use of non-ferrous metals in the manufacture of washing machines from companies that produced about 58% of the washing machines sold in 1928. From data furnished by these companies they estimate the total use of non-ferrous metals in the manufacture of washing machines, excluding that used in the electric motors, as follows, in tons of 2 000 lb. :—

	1926	1927	1928
Aluminium	10 200	8 800	9 200
Copper	5 000	3 800	4 200
Zinc	1 600	950	1 100

The above totals include the use of these metals alone or contained in alloys. The estimated actual use was as follows, in tons of 2 000 lbs. :—

	1926	1927	1928
Sheet copper	3 800	2 800	3 200
Sheet brass	800	400	500
Sheet zinc	1 100	600	700
Brass fittings	750	500	600
Bronze fittings	300	350	350
Aluminium	10 200	8 800	9 200

The American Washing Machine Manufacturers' Association report the sales of washing machines as follows :—

Sales	1926	1927	1928
Electric	843 685	775 661	820 430
Other	185 368	168 845	179 774
Total ..	1 029 053	944 506	1 000 204

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DIELECTRIC STRUCTURE AND BEHAVIOUR.

A Brief Survey of Various Attempts to Define the Phenomenon of Dielectric Failure—The Use of Porcelain for Experimental Verification of Theory.

By J. K. GILLETT, M.Sc.(Tech.)

IF we apply to an insulator gradually increasing voltage, a conduction current will flow, which, so long as the intensity is low, increases roughly in proportion to the applied voltage —i.e., the resistance of the insulator is more or less constant. As soon as the intensity becomes appreciable, however, the resistance begins to decrease, and the current increases more rapidly than proportional to the voltage.

Further increase of voltage leads to a further decline in resistance, until, finally, a condition is reached at which the current continues to increase without further increase of voltage. The insulator may then be said to have broken down, and the voltage at which this occurs may be termed the breakdown voltage. If the voltage were to be maintained at this value the power dissipated in the insulator would increase with the current, and in a very short time the insulator would be destroyed by the resultant heat. It should be noted, however, that this destruction is an effect, and not the cause of the breakdown. The general shape of the current-voltage curve of an insulator is shown in Fig. 1. Such curves were first obtained experimentally by Dr. K. W. Wagner (1).

The breakdown of a dielectric may consequently be defined as the initiation of a condition of current instability produced by increasing the voltage applied to the dielectric above a certain critical value. Such a definition presupposes a mechanism by which instability occurs, but does not rest on any particular theory of failure. It is, however, important to discover why this instability occurs.

We may here remark that no really satisfactory explanation of the matter can be given at the present date, nor is it reasonable to expect that this should be done. Dielectric failure is essentially a phenomenon of instability in the molecular structure produced by external forces; since our knowledge of this structure is extremely meagre in the stable state, it is hardly to be expected that we should comprehend the mechanism of its disruption. As in most branches of physics, we here have to rest content with an explanation which describes the phenomenon in terms of more familiar concepts.

While a number of individuals had expressed opinions on the subject of dielectric breakdown in more or less vague phraseology prior to 1912, no coherent theory capable of examination had been suggested. In that year, however, Prof. Miles Walker, in discussing a paper by Dr. E. H. Rayner (2), developed an idea which had been fundamental to the majority of subsequent work on the subject, and which, when expressed quantitatively, suffices to explain satisfactorily at least one type of breakdown. Prof. Walker's idea (3) was briefly as follows:—

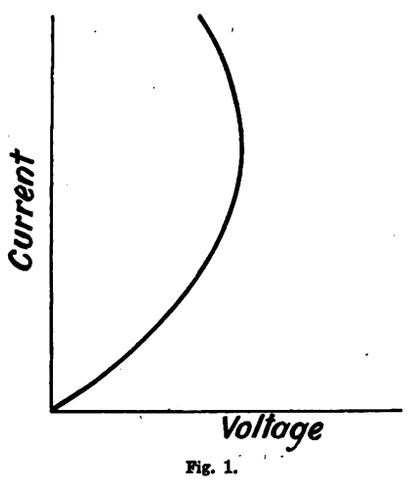

Fig. 1.

When a dielectric is under stress there occur in it dielectric losses—i.e., the conversion of electrical energy into heat. Although the magnitude of these losses is, in general, small when viewed from the standpoint of power engineering, yet the thermal conductivity of most insulation is also small, so that even these small losses produce an appreciable temperature rise in the dielectric. These dielectric losses, however, have the general property of increasing more or less rapidly with temperature. The slight elevation of temperature due to the initial loss leads, therefore, to an increase in the losses.

Higher losses lead to higher temperature, higher temperature again to still higher losses. The higher the temperature of the dielectric above its surroundings, however, the greater will be the amount of heat conducted away. It is, therefore, possible that a state of equilibrium will be attained at which the heat generated will just equal the heat dissipated, when no further temperature increase will occur.

It is, however, also possible that, due to the large increase of loss with temperature, a stable state will not occur, and the temperature of the dielectric will continue to rise until the material is destroyed by the excessive heat.

Prof. Walker's ideas, although exceedingly valuable, provide only a qualitative explanation of what happens when a dielectric breaks down, and one cannot be said to know very much about a phenomenon until it is possible to predict the conditions of its occurrence and calculate its magnitude. Prof. Walker's idea had to be expressed in a mathematical form, and this was first done by Dr. K. W. Wagner (1).

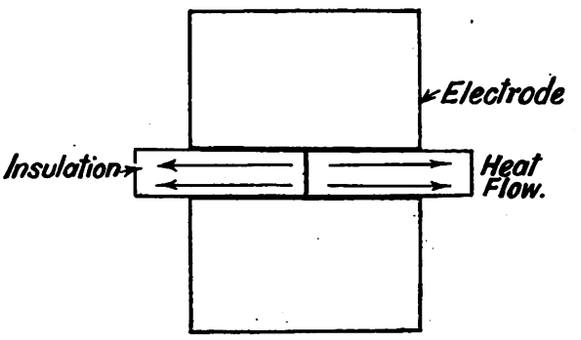

Fig. 2.

The Wagner Thread Theory.

The essence of the Wagner theory was the assumption of inhomogeneity in the dielectric—i.e., the existence of one or more localities in which the resistivity was lower (i.e., the losses higher) than the surrounding portions of the material. Wagner conceived these weak spots as filaments, or little cylinders, with the axes normal to the plane of the electrodes. The heat generated in the filament flows away into the surrounding dielectric entirely in a direction normal to the axis of the filament—i.e., parallel to the plane of the electrodes (Fig. 2).

The filament is, in fact, regarded in much the same way as the wire in a fuse. A certain number of watts per unit length per degree temperature rise can be dissipated into the surrounding medium, and heat conducted along the filament is neglected. When the rate of increase of loss with temperature becomes greater than the rate of heat dissipation with temperature, then instability of current occurs in the filament, and the temperature will continue to rise.

This fuse analogy at once indicates one of the weaknesses of Wagner's conception. It is well known that if a fuse is short the cooling effect of the terminals is appreciable, and similarly we may expect an appreciable flow of heat towards the electrodes unless the distance apart—i.e., the thickness of the dielectric, is considerable. In a thick slab of dielectric the likelihood of finding a weak thread or filament running all the way between its surfaces is exceedingly remote, so that the assumption does not correspond with fact.

Again, considering the variation of the breakdown voltage with the thickness of the dielectric, on the above assumption we deduce that the breakdown voltage should vary directly with the thickness—a result at variance with the majority of experimental data. Wagner's theory is also incapable of explaining the influence of the thermal conductivity of the electrodes on the result. Rayner and others have made tests, using electrodes of good and poor thermal conductivity, and found that in the latter case the breakdown voltage was invariably lower. This can only be due to the fact that heat conduction to the electrode does occur, and when the thermal conduction of the electrodes is poor, less heat is so abstracted, causing a higher temperature rise for a given loss.

Finally, it is obvious that matters must depend considerably upon the degree of inhomogeneity assumed. If this is only slight the material in the neighbourhood of the thread will also be warmed up, and in any case this must occur after the voltage has been applied for any length of time, since the heat from the thread must be conducted away, and we cannot postulate the existence of a sudden temperature change at the surface of the filament.

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It is when we come to consider what happens when the filament is gradually merged into its surroundings that it becomes obvious that a theory of thermal instability for an entirely homogeneous dielectric must be established before the effects of inhomogeneous media are considered.

The problem to be solved is essentially one of heat conduction, and was first attacked on a general basis by W.

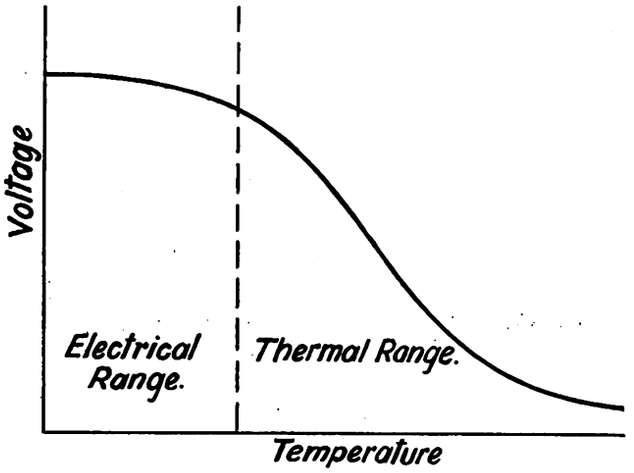

Fig. 3.

Rogowski (4), but the subsequent work of L. Dreyfus (5) and V. Fock (6) is somewhat clearer, and more rigorous. All these writers were compelled to restrict the analysis to the one dimensional case by the mathematical difficulties of the problem, but Dreyfus and Fock obtained general solutions for an arbitrary loss function, and, for a particular loss function, discussed a number of cases of practical importance. In particular, the relation between the breakdown voltage, thickness, and temperature of a plate of insulating material was discussed, and formulæ deduced for the calculation of the breakdown voltage from a knowledge of the thermal constants, thickness, and loss function of the dielectric.

The publication of this work at once gave rise to attempts to obtain experimental verification of the conclusions deduced. The most complete and thorough investigation of the matter was that carried out by the colleague of Prof. Fock at the Physico-Technical Laboratory in Leningrad.

In a series of papers (7) and (8) these investigators demonstrated that the phenomena and mechanisms of the breakdown of solid dielectrics are essentially different, according as the temperature is high or low.

Characteristic Phenomena.

The general shape of the breakdown voltage-temperature curve is indicated in Fig. 3, and can be divided essentially into two parts. First there is the low temperature or "electrical" range. The characteristic phenomena accompanying failure in this range are the considerable dependence of the breakdown voltage on the maximum intensity and form of the electrostatic field, the small influence of temperature and time on the breakdown voltage, and the practical independence of breakdown voltage and volume resistivity. Secondly, there is the high temperature or thermal range. Here the characteristic peculiarities are the great influence of the thermal conditions upon the breakdown voltage and the dependence of the breakdown voltage upon temperature, time, and volume resistivity.

It may be taken as pretty well established that, within the high temperature range, failure of solid dielectrics occurs by thermal instability, and the thermal theory of Dreyfus and Fock provides a satisfactory quantitative explanation of the matter. It is, however, equally well-established that this theory does not serve to explain the phenomena observed within the low temperature or electrical range, for which some other explanation must, therefore, be sought. Realisation of this fact imparted a further impulse to the investigation, and a number of theories of electrical failure, (9), (10), (11), have been put forward, only one of which will be considered here.

Horowitz (12), an investigator of the Leningrad circle, considered mathematically the stability of a small cavity in an electrically stressed medium. The elongation of such a cavity in the direction of the field tends to decrease the potential energy of the system, and there is consequently a force tending to produce such an elongation whenever an electrical field is applied. This force is opposed by (*a*) the surface tension and (*b*) the elastic force of the material.

It can be shown that when the intensity of the electric field exceeds a certain value the equilibrium becomes unstable and the crevice tends to extend itself. Calculations of this theory give results of the correct order of magnitude, the discrepancies being probably due to the impossibility of estimating with certainty the dimensions of the initial cavity.

A Remarkable Fact.

It is a somewhat remarkable fact that the discrepancy between the molecular and the technical strength of materials, both in the mechanical and the electrical sense, can be explained by an appeal to the microstructure. It is, therefore, of interest to inquire what further influence the structure may exert upon the electrical properties of a material.

In considering the structure of substances we classify them as homogeneous and heterogeneous, amorphous and crystalline, isotropic and anisotropic. The general type of a heterogeneous material is indicated in Fig. 4a; in a matrix of one material are interspersed particles of another. On traversing any line AB through the body, the physical or chemical property which we are considering changes in an irregular manner, as shown by the curve. According as this variation is large or small, well or poorly defined, so the body is the more or less heterogeneous in nature.

Heterogeneous media must be further subdivided according as to whether the magnitude of the property considered is or is not related to some particular direction in the body. In many crystals, for example, the electrical properties are different along the various axes. The structure of such anisotropic bodies is suggested in Fig. 4b.

Technically, the only important representatives of the anisotropic class in dielectrics are the laminated materials of the resin-paper type now so widely used; otherwise the insulating materials of technics can be considered as isotropic, except where the dimensions of the region considered are comparable with those of the dispersed particles.

In considering heterogeneous bodies we have to take into account both the composition and microstructure.

There can be no possible doubt that the size, shape and nature of any contained particles will have a considerable influence upon the stresses set up. For example, mathematical analyses indicate that if we place in a uniform field an extremely small sphere of dielectric constant ε, the intensity of the field in the neighbourhood of the sphere will be increased to $\frac{3\varepsilon}{\varepsilon+2}$ times its initial value. If the included particle is not spherical but ellipsoidal, the increase in the intensity will be still greater; it is obvious that very high intensities will be produced if the particle is angular and sharp.

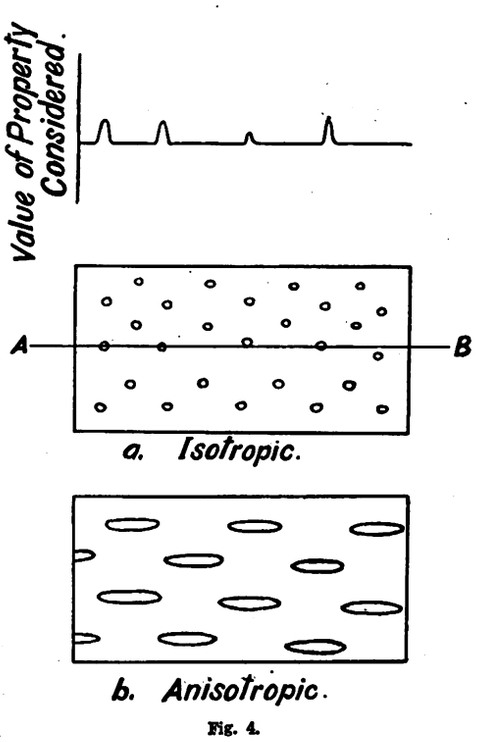

Fig. 4.

Again, if the included particles are dispersed in an irregular manner throughout the mass so that some of the particles are entirely isolated, we may expect much higher stresses than where the particles are all of the same size and shape, and are distributed uniformly throughout the mass.

These considerations suggest that a body of fine microstructure is better suited to resist electrical and mechanical stresses than one of coarse structure; the more homogeneous a material is the better it should behave.

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A dielectric in everyday use was therefore selected for the experimental verification of the foregoing theory, and since porcelain was found to be peculiarly suitable this material was subjected to various mechanical and electrical tests. How far the actual test results confirm the expectation arrived at by a study of the microstructure will be shown in a later article dealing with the characteristics of porcelains.

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THERMO-ELECTRIC TESTS FOR ALUMINIUM-MANGANESE AND OTHER ALLOYS.*

By CYRIL S. TAYLOR and JUNIUS D. EDWARDS.

THE need frequently arises for rapid physical tests for identifying certain metals and alloys. For example, an aluminium manganese alloy, containing about 1% manganese and known as 3S, is rolled in large quantities in the same mills with commercially pure aluminium. Occasionally the question arises as to the identity of a given lot of metal, and, if chemical analysis must be resorted to, some time must elapse before the answer is available. Likewise it is frequently desirable to make certain identification without damaging or destroying the sample or article.

In an investigation of the effect of impurities on the thermo-electric properties of aluminium, it was discovered that manganese, among the alloying elements commonly used with aluminium, was outstanding in its effect upon the thermo-electric properties of the metal. For example, aluminium alloys with copper, iron and silicon, in amounts even up to several per cent., show a thermo-electric force against pure aluminium at the melting point of less than 50 μV. On the other hand, about 1% manganese alloyed with aluminium will show a thermal e.m.f. of over 300 μV under the same conditions.

This high thermo-electric potential of the couple aluminium *vs.* aluminium-manganese alloy seemed to offer a ready and rapid means of distinguishing between these two materials. Accordingly an apparatus suitable for plant or laboratory was constructed for carrying out this test. An ordinary electric soldering iron, slightly modified, is used as a heating device; one with a removable soldering copper is used. A length of 99·4% aluminium wire is welded on to a suitable sized rod of the same purity aluminium, and this rod is then threaded tightly upon the projecting end of the soldering copper. The other end of the aluminium wire is attached to one terminal of a sturdy but sensitive portable galvanometer.

The aluminium rod and wire constitute one member of a thermocouple; the other member of the thermocouple consists of the specimen which is to be measured. The specimen is connected by means of a clip and wire to the remaining terminal of the galvanometer. An alternative method is to connect a large sheet of aluminium by means of a wire to the remaining terminal of the galvanometer. The specimen under test (test piece) is placed upon the sheet and thus becomes automatically connected to the galvanometer. This arrangement is illustrated in Fig. 1.

To make a test, the heated aluminium rod (soldering iron) is touched to the specimen, and the galvanometer watched for a deflection. If there is no deflection, the metal is pure aluminium; if there is a substantial deflection, the metal is the alloy 3S. As the point will not be at a constant definite temperature, it will be found useful in applying this method to have available for test, sample products of known composition, so that the galvanometer deflections can be compared between known and unknown samples under identical conditions of heating of the thermo-electric point. In the case of aluminium and 3S alloy, thermal e.m.f. developed is so large as not to require temperature control of the heated point.

Only a very small deflection is given by the alloys 17S and 25S, although each contains about 0·5% manganese in addition to 4 to 5% copper. The structural combination of the manganese with the other elements in these alloys is apparently such as not to affect the thermo-electric properties of the metal to anywhere near the same extent as is the case with manganese in the alloy 3S. It was found that magnesium base alloys containing aluminium also gave relatively large deflections when tested thermo-electrically with this apparatus against pure magnesium; the deflection was roughly proportional to the percentage of aluminium in the alloy. No doubt this apparatus could be usefully applied in the case of metals and alloys other than aluminium and magnesium.

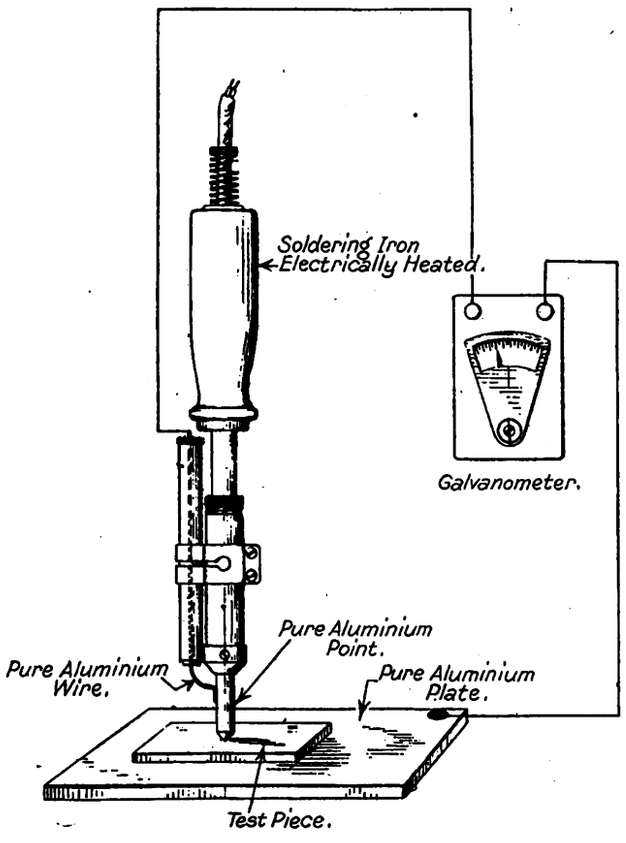

Fig. 1.

* A paper presented at the Fifty-sixth General Meeting of the American Electro-chemical Society, at Pittsburgh, Pa.

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THE PRODUCTION AND USES OF BERYLLIUM.*

Some of its Possibilities for Employment for Electrical Purposes—Improved Properties of Alloys after Heat Treatment.

By KURT ILLIG (of the Research Laboratories of the Siemens-Halske A.-G., Berlin).

THE year 1928 marked the centenary of the first production of beryllium by the celebrated German investigator, Wohler. During these hundred years almost all of the alkali and alkaline earth metals such as Li, Na, K, Ca, Mg, Ba, and Sr, have been prepared from fused electrolytes in commercial quantities. In the case of beryllium alone did all of the investigators fail, until recently, to prepare this metal in such quantities as to permit a study of its properties and uses. The difficulty which stands in the way of easy isolation of beryllium is its great affinity for oxygen. Before dealing with the modern methods of production, a brief résumé of the history of this interesting metal may be worth while.

EXAMINING RAW RUBBER.

RUBBER, an important raw material of the cable making industry, is here seen undergoing preliminary sorting and examination at the Helsby Works of British Insulated Cables Ltd. The rubber is carefully examined for impurities, and every piece is beaten and hand picked, dirty edges of sheets being cut off and put aside for washing. After blending the material goes to rubber mixers, the finished slabs passing thence to calendering machines where they are reduced to fine rubber sheets of thicknesses down to 0·006 in. The finished sheet is cut into tapes of from 4 in. to ½ in. wide and visually examined. It is then ready for application to the stranded wires.

Beryllium was discovered in 1798 by Vauquelin in the mineral "beryl," which had been known since antiquity. The ordinary beryl, an aluminium-beryllium double silicate, having the empirical formula $3BeO$, Al_2O_3, $6SiO_2$, has been comparatively unknown; the more valuable varieties of this mineral, the green emerald and the blue-green to pale blue or light rose coloured aquamarine, were known in pre-biblical times.

Other minerals are known to contain more or less beryllium, as for example, chrysoberyl, also named alexandrite $(AlO_2)_2Be$: phenacite Be_2SiO_4, which has a rather wide occurrence, and certain rare earth minerals, such as, euclase, gadolinite, helvinite, danalite, bertrandite, leucophane, melinophane—all of which are fundamentally silicates of beryllium, which differ from one another simply by the presence of silicates of other metals. A borate of beryllium, hambergite, and two phosphates, beryllonite and herderite, might also be mentioned.

Work of Stock and Goldschmidt.

The work which was decisive in the development of beryllium manufacture was accomplished by the German investigators, Stock and Goldschmidt, with the co-operation of Priess and Praetorius. They obtained metallic beryllium for the first time in the form of large reguli, directly from a fused electrolyte.

Investigations have shown that the most desirable conditions are fulfilled in general by the double fluorides of beryllium with sodium and barium. The barium-beryllium fluoride has an appreciable viscosity around 1 300 deg. C., but also has the advantage of being only slightly volatile at this temperature range; it has an appreciable dissociation within this range. The sodium-beryllium fluoride is strongly dissociated even at relatively low temperatures. This, therefore, offers a means of obtaining an electrolyte possessing a good conductivity. It has only one disadvantage, namely, that at very high temperatures the separated beryllium metal may be volatilised in appreciable quantities.

If the electrolysis is started with the sodium-beryllium fluoride and with rising temperatures some barium-beryllium fluoride is added in increasing amounts, there is obtained a useful mixture of the double salts for every temperature interval. When the final metal separating temperature of 1 300-1 350 deg. C. is reached, it is not difficult to continue the electrolysis for many hours, provided suitable additions of both double salts are made from time to time.

Stock and Goldschmidt protected this general method of procedure by letters patent in all large countries. They realised, however, that much additional work was necessary, before all of the details for the continuous production of large quantities of beryllium would be established. In order to study the problems on the broadest basis, the foremost German manufacturers organised a Beryllium Research Institute in 1923, under the chairmanship of the Siemens and Halske A.-G., of Berlin. It was the aim of this institute to make a systematic study of the fundamental Stock-Goldschmidt method in all its details, and to determine whether or not it was possible to produce beryllium metal in commercial quantities from fused electrolytes. The numerous variables which had to be considered made the work tedious, especially so since the temperature range of 1 300-1 350 deg. C. had never been used previously in fused electrolytic work. Some of the details of these investigations of the institute to date are herewith recorded.

Crucible and Electrode Materials.

The question of crucible and of electrode materials had to be settled first. In the early experiments of Stock and Goldschmidt, a crucible made of graphite was used as the anode. Graphite containing as little iron as possible is the only material to use. Acheson graphite is the best. The difficulties encountered in mounting the electrodes of the crucible were soon overcome. Various metals were tried as cathode; the most satisfactory was a special iron, made up into a hollow water-cooled electrode. The electrolysing current is sufficient to maintain the bath at the temperature required. At the start of the process the crucible is filled with pieces of carbon or graphite, the iron carbide is pressed firmly against these pieces, and as soon as the proper temperature is reached the pieces are quickly dumped out of the crucible and a charge of low melting sodium-beryllium fluoride is immediately put in. Then barium-beryllium fluoride is added until the required temperature range is reached for the electrolysis to begin.

Only after a large number of experiments were made was the best method for charging the crucible discovered, which method must be rigidly adhered to. Naturally there will be a relatively large burning loss of the graphite crucible, which, however, may be minimised by surrounding the crucible with another crucible packed with kryptol, to prevent contact between the very hot external wall of the graphite crucible and the air. Another method is to coat the external wall of the graphite crucible with a fused mass of the electrolyte, making an impervious coating, which is in no way objectionable since no impurities will be introduced into the electrolyte.

At first, relatively small reguli, of several grams only, could be separated from a single charge, and it was an exciting moment when several reguli of about 20 grams each were obtained. These reguli were still contaminated with the melt, and so were not fit for a scientific or technical investigation. Systematic and progressive development made it possible to obtain a single button of about 50 grams in weight, and at the same time containing only spots of very small amounts of impurities. It was this material that the several laboratories connected with the Beryllium Institute, as well as others not so connected, investigated. They determined the physical properties of beryllium metal.

Hand in hand with the scientific investigations on fused electrolytes went the determination of authentic methods

* Paper presented to the American Electrochemical Society.

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of analysis. The previous methods recorded in the literature were either too incomplete or entirely too circumstantial to be of undisputed value for rapid work. Very good methods are now available for the rapid determination of beryllium in the presence of aluminium and other metals. In 1926 the Institute felt convinced that in the Stock-Goldschmidt method there was a means by which a commercial production of beryllium metal might be expected. At the same time the commercial applications of this metal were studied.

Commercial Investigations.

On the grounds of the results of the investigations of the Institute during 1926, the Siemens-Halske A.-G. decided to make a systematic study of the applications to a commercial scale. The previous work had shown that the best scientific and technical production of beryllium would be possible only if the salts used were cheaply prepared; especially if they were not hygroscopic, such as the double fluorides. The preparing of the salt from the crude mineral beryl was next investigated. Both of these problems have been solved in the past two years. Simply and cheaply prepared salts, such as the double fluorides, which also give good material yields, are being investigated now.

In the older methods the electrolyte became more and more enriched in barium fluoride, thus shortening the time of a single charge, but with the advent of the new salts it is now possible to make the process continuous and without interruption. Practically speaking, this continuous method is now limited only by the burning of the graphite crucible.

The beryllium metal is in convenient reguli of about 150 grams, varying with the size of the apparatus, and is about 98 per cent. pure. By special methods of remelting the purity can be increased to 99.9 per cent., though the yields of this very pure material are small. The main impurity of our beryllium is iron, which is introduced from the graphite crucible. The recently developed double decomposition methods of the raw beryl for the formation of the electrolyte salts produce about 65 per cent. of beryllium, calculated as metal, so that starting from the mineral the final yield of beryllium metal is about 60 per cent.

While this work was going on, investigations were being made as to the location and size of the beryl deposits in the various parts of the world, and as to the prices at which the material was marketed. This analysis showed that as usual when the possibilities of a new use for a raw material bring it to the attention of the world, it is found in many places. Norway, Spain and especially Florida, Canada and Brazil, in the order of importance, have large deposits of beryl. There appear to be deposits larger than previously realised in south Germany, and in the Ural mountains.

It may be safely predicted that in the near future many beryl, deposits will be found because now for the first time mineralogists and geologists have a stimulus for looking for this mineral. The prices for the crude beryl are exceedingly high at present, probably because there is no direct market for the material, but more probably because the owner of a beryl mine has the false impression that he has a mineral classed as a semi-precious stone. The owner must be enlightened as to the actual facts.

The most promising field which has so far been recorded in the literature is in the use of beryllium as a light metal. But the first studies of the metallographic division of Siemens-Halske have indicated that such a use is rather remote at present. Pure beryllium is an extremely hard and brittle metal, which scratches glass and can neither be rolled nor drawn because of its coarse crystal structure. Nevertheless plates of about 1 to 2 mm. by 10 to 20 mm. have been made from pure beryllium by special methods for use in X-ray work. But this is no application for which large amounts of metal need be produced.

Alloying with Aluminium.

Since beryllium has a specific gravity of 1·8 it has been considered advisable to try to alloy it with sufficient aluminium to make it workable. In this respect many interesting results may certainly be expected. It was not in the programme of Siemens-Halske to make a systematic investigation in this direction, because the realisation of our ambition to apply beryllium to arts and industry seemed only possible if beryllium alloys were developed which would compete with other alloys.

It has been shown that the addition of 2 to 2·5 per cent. of beryllium to copper or nickel produced alloys possessing properties like those of the bronzes, a fact previously unknown. In the case of additions of beryllium to aluminium the alloy showed properties somewhat like those of duralumin and silumin, though there is no advantage in favour of the beryllium-aluminium alloy. The more expensive beryllium cannot compete with silicon, magnesium, and copper in making alloys with aluminium.

Some important data on beryllium-copper and beryllium-nickel alloys might be noted. Alloys of cobalt with beryllium are very similar, but the silver-beryllium alloys have interesting properties which could not have been determined previously. In the study of beryllium-iron alloys the work has not progressed far enough to permit definite conclusions.

The most outstanding property of the beryllium alloys is in their improvement upon heat treatment. A copper-beryllium alloy containing 2·39 per cent. of beryllium, after ordinary quenching, has a Brinell hardness of 100 kg./sq. mm., but after heat treatment for 17 hours at 300 deg. C. this rises to 440 kg./sq. mm. that is, to over 400 per cent. Some copper alloys containing over 6 per cent. beryllium have a hardness of over 730 Brinell numbers. These alloys cannot be worked in the untreated condition. Bronze-like properties are developed in these copper alloys, which, in the untreated condition, can be rolled, drawn or worked to the desired shape and then by heat treatment can be hardened and roughened. It is possible to make thin elastic pieces. The following information on the strength of these alloys may be of interest.

In the untreated quenched state a copper alloy containing 2·5 per cent. of beryllium has a tensile strength of 48·9 kg./sq. mm., but after heat treatment it is 135 kg./sq. mm. The differences in the transverse bending strength are most astonishing; in the untreated condition, but quenched, it is 60·7 kg./sq. mm., but after heat treatment it rises to 216·7 kg./sq. mm. In the same alloys the yield point changes from 15·7 to 128 kg./sq. mm. on heat treatment, while the elastic limit in the first case is 5 kg./sq. mm., and in the second it is 45·9 kg./sq. mm.

As the beryllium content of these copper alloys is increased the final values for these mechanical properties in the treated conditions are also increased. There is, however, a limit which is 6 to 7 per cent. Be in copper and nickel alloys In general it may be said that the quenched alloys are very elastic and strong.

Heat treatment increases the elastic limit, and the yield point by about 800 per cent., while the tensile strength and the transverse bending strength increase about 3 to 4 fold. The ductility decreases proportionally with strength. This is not detrimental, since the shaping and working after quenching is done before it is given the heat treatment, so that ductility requirements need not be considered after the treatment. These alloys may be successfully rolled, drawn, and pressed.

Electrical Conductivity.

It is worth noting that the electrical conductivity of these alloys is lowered rather appreciably by the addition of beryllium. Alloys of 2·5 per cent. of beryllium, after quenching at 800 deg.C., have an electrical conductivity of 9·8 recip. ohms/sq. mm., of cross section. Heat treatment changes this conductivity to 19 recip. ohms/sq. mm., and after annealing followed by a second hardening it reaches 21·5 recip. ohms/sq. mm. These alloys are more resistant to corrosion than the ordinary bronzes.

Beryllium has an interesting application as a deoxidiser in copper casting. It has been shown that the addition of 0·02 to 0·05 per cent. of beryllium to copper for casting changes the electrical conductivity of the casting from 35 to 50 recip. ohms/sq. mm. The various alloys and their applications have been protected by letters patent.

NEW COPPER REFINERY.

It is understood that 250 men are now engaged on the excavation work in connection with the erection of the custom copper refining plant being built by the Ontario Refining Co. at Copper Cliff, Ontario, at an estimated cost of £1 000 000. The number of employees will be brought up to 600 when work begins on the erection of the steel structure, and it is anticipated that the entire plant will be in operation by January, 1931.

The new plant is being erected on a 40-acre site, there being three main buildings, namely an electrolytic cell house and two casting buildings, one for crude copper and the other for refined copper. The cell house will be roughly 300 by 400 ft., and will have 1 200 reinforced concrete cells with lead linings. The casting buildings will be 200 by 400 ft.

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ELECTRIC WELDING.

Growing Applications in Electrical Manufacturing Processes.

IN view of the severe criticisms of certain applications of welding made in the recent annual report to the British Engine, Boiler and Electrical Insurance Co.'s special interest attaches to the "Impressions of American Industries, including Welding," which Mr. E. A. Atkins gave in a lecture to the Institution of Welding Engineers at Caxton Hall, Westminster, on October 3rd.

Mr. Atkins said that although prior to the war welding practice had been very much more advanced in the United Kingdom than in the United States, America had since jumped ahead in an extraordinary manner so far as welding operations were concerned.

Transformer Castings.

Among the works visited were those of the General Electric Co. at Pittsfield, where 7 000 people were employed, and he had been surprised by the extent to which welding processes were carried out there. The lugs of transformer casings, for instance, were not bolted and riveted on, but were welded on *en bloc* by an automatic system of welding, the casings being slung over a large bar or beam during the welding operation. Many methods of automatic welding had been developed.

In the welding of sheet metal for steel tubing by the carbon arc method, the filling material was laid right along between the two edges of the sheet, and the carbon arc travelled along and fused it in. Spot welding was used very commonly for all kinds of small joints, sheet metal work, and so on.

The multiple flame method of welding, which was used for welding sheet metal, was new to him. Two, four or more tips could be used; one tip of each pair of tips was above the sheet and the other below. The flames were regulated, and the sheet metal was mounted on a machine and passed through the flames at a speed which was regulated in accordance with the gauge of the sheet, the process being made either semi or completely automatic.

Welding was used extensively for very many purposes, and the lecturer illustrated its application to the repairing of various articles, such as wheels, brake shoes, etc., and the construction of other articles, including reels, which were made by welding together ribs of sheet or plate metal. His own experience of the use of such reels had proved that they were very strong, and appeared to be almost everlasting. Welding was also applied extensively in road construction, for welding reinforcing wire into panels and for jointing pipes.

It appeared that there was a big future for welding in structural work, and Mr. Atkins illustrated a number of buildings in the construction of which welding had been used extensively. The height of one building had been increased from 8 to 15 storeys, and, as it was obvious that the stanchions used for the original building were too weak to carry the load of the additional storeys, they were strengthened by the addition of stiffening ribs by means of electric welding.

Welding was also applied to steel structures to reduce corrosion. One of the disadvantages of rivets or bolts was that corrosion occurred much more rapidly at the riveted or bolted joints than at other parts of the structures, because the water lodged there, and welding was resorted to for filling up the corroded portions.

A type of welding which Mr. Atkins believed to be the latest on record was the atomic hydrogen method. This was in operation at the General Electric Co.'s works. The source of heat was an electric arc; hydrogen was blown on to the outsides of the arc, usually by two tips, the result being the production of an absolutely non-oxidising arc or zone. It was claimed that it gave a wonderful deposit, and he could confirm that, for never had he seen such a pure deposit of metal as that which he had seen deposited by this method.

Welding Refrigerator Parts.

The General Electric Co. used it for welding together refrigerator parts, but he was not prepared to say whether or not it would find an extensive commercial use, because it was more expensive than the ordinary electric arc or oxy-acetylene methods. It might be that somebody would develop some other method of surrounding the arc to keep the oxygen away. The weld could be bent like a piece of lead, and when examined under the microscope it was found to be solid, consisting of almost pure iron, free from slag or any oxide inclusion.

Speaking generally, he said, there was not very much advance in America with regard to welding methods, other than in the direction of the atomic hydrogen method, and there was no doubt that the Americans were going ahead with that. He had been impressed, however, with the manner in which the Americans tackled things in bulk. At the Pittsfield works of the General Electric Co. he was told that they had been very dubious about the adoption of welding for a long time, but as soon as they had found it could be done properly it had been used very extensively.

Many welding machines were coming into common use, with a view to cheapening production, and there seemed to be very little opposition on the part of the workers to the introduction of machines.

Photographs were shown of the applications of welding on the South American oilfields, where the oil tanks were welded structures. Welding was applied there also to the jointing of pipes, the repair of various pieces of machinery, etc. The automatic welding process was carried out quite well by native welders.

Replying to a question as to the types of electrode used generally in America, Mr. Atkins said the Americans liked bare electrodes, but in some cases they used flux-coated, and in others lagged electrodes. It all depended on the conditions and the class of joint required. The General Electric Co. used the atomic hydrogen welding method to get the tightest possible joint. In many cases the electrodes used in America appeared to be thinly coated.

ESTIMATING IRON IN CHROMIUM ALLOYS.

THE use of alloys containing iron and chromium, and often also nickel, is at the present time becoming very widespread in engineering, and therefore the following details (supplied by a correspondent) may be of interest to those engaged in the analysis of these alloys. The usual method of separation of iron from chromium is by means of sodium peroxide, but the author has found that the following method gives quite accurate and reliable results on this class of material. The method is based on the oxidation of the chromium by ammonium persulphate and then precipitation of the iron as usual with ammonia. The estimation is carried out as follows:—

From one to three grams of sample is taken (depending on the amount of iron suspected) and dissolved in dilute sulphuric acid if possible. If, however, the alloy is not completely soluble in sulphuric acid, then hydrochloric acid or aqua regia must be used to dissolve it, and then sulphuric acid must be added and the solution evaporated until white fumes are evolved. The solution is then diluted with hot water and boiled. If any silicon is precipitated at this stage it should be filtered off. The solution is now cooled, diluted to 250 ccs., and a measured quantity taken so as to give approximately 0·1 to 0·2 g. of iron in the estimation (a larger quantity may be difficult to filter). This is then made up to about 150 c.c. bulk, about 2 g. of ammonium persulphate crystals added, and the whole boiled for about a quarter of an hour. All the chromium in the alloy will now be oxidised, and any manganese will be precipitated as manganese dioxide, which should be filtered off. Ammonium chloride and ammonium hydrate are now added to the solution to precipitate the iron, which is filtered off, after boiling, and ignited and weighed as ferric oxide as usual. The percentage of iron is then calculated from the weight of sample taken as usual.

The resulting filtrate may sometimes be used for the estimation of nickel in the alloy by the dimethylglyoxime process, but here the estimator must use his discretion, as this depends on the amount of nickel present in the alloy.

ALUMINIUM FACTS AND FIGURES.

A further series of data sheets for inclusion in their handbook, "Aluminium Facts and Figures," has been issued by the British Aluminium Co. A.73 and A.74 show enlarged tables of the properties of stranded aluminium and steel-cored aluminium conductors, revised in conjunction with the British Engineering Standards Association. A.166 is a new data sheet on expanded aluminium sheets. The metal in this form makes up into economical framing, backgrounds and screening, and a variety of light structural uses.

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COMMERCIAL SHORT WAVE WIRELESS COMMUNICATION.

Solution of Propagation Problems—Operating Technique of the Network Outlined—The Monitoring System—World-wide Interconnection.

A LECTURE on "Commercial Short Wave Communication," illustrated with lantern slides and diagrams, was given by Mr. H. M. Dowsett, before the annual convention of the Radio Society of Great Britain at the Institution of Electrical Engineers, Savoy Place, London, on September 27th.

The lecture had a topical interest owing to the fact that a few days later wireless telegraph services formerly administered by the Post Office and the Marconi Co. came under the control of Imperial and International Communications, Ltd.

Mr. Dowsett's lecture was concerned with the manner in which those responsible for commercial wireless have applied the knowledge gained during the last few years to the solution of short wave propagation problems, and of the operating technique which has gradually been built up so that wireless traffic services are well established on an economic and satisfactory basis between this country and all parts of the earth.

Mr. Dowsett first spoke of the "Empiradio" services which, he said, provided the most striking example of successful commercial short wave working in the world, and were the outcome of the researches of Mr. Marconi and his assistants on short wave directional wireless from 1915 onwards.

The transmitter used for these services, he said, was of a design which gave great stability of wavelength, and, with 20 kW to the anode of the first magnifier, provided more than enough power for high speed working. The receiver was designed for strong signals, and these signals were not mutilated by short fade periods. It was three years since the first Imperial Beam service was opened to the public. In this period several types of projector aerial had been evolved and employed for commercial working in different parts of the world, but nowhere could they find a concentration of beam radiation equal to that provided at an Empiradio station.

Numberless short wave transmitters could be heard on the ether, many of them crystal controlled, but a careful watch disclosed that the Empiradio transmitter had a constancy of wavelength equal to the best of them, and that it was handling more traffic, and continuing in service without "sticks" for more hours than any other type of transmitter. These were some of the facts which helped to explain the astonishing commercial success of the Empiradio services.

Features of Beam Equipment.

Mr. Dowsett proceeded to describe some of the distinctive features of the Empiradio beam equipment, and said stability of wavelength was obtained by the extreme care taken in the construction of the set.

The routine at the transmitting stations was to start up the plant and keep it going. A continuous monitoring watch was maintained on both the incoming and outgoing signals, and according to the conditions prevailing the receiving station advised the central telegraph office when to change the operating speed, the route, or the wavelength. Communication by one route or on one wavelength was continued until the signals one way or the other failed, when the route or wavelength was changed; and then this change was carried out, when possible at both terminal stations at the same time. Monitoring was of great importance, and much of the success of a commercial wireless service depended on the efficiency and effectiveness of the monitoring. If the quality of signals fell off the operator at the C.T.O. was only in a position to recognise faults due to bad keying or badly punched tape at the other end. If it was due to any other cause than faulty transmission he concluded that conditions were worse, and he was inclined to ask for the messages to be sent twice—which dropped effective speed to half—or, alternatively, for the operator to send at a lower speed.

The monitory operator on constant watch at the receiving station, however, was immediately able to diagnose the trouble, whether it was due to atmospherics, fading, echo, or jamming, or some fault in the apparatus or landline link. He saved traffic time by indicating the source, if it was at his end of the channel, and could often minimise it, or clear it altogether by balancing the adjustments of his receiver, or by advising a change of wavelength if the source was to be found in changes which were taking place in the physical conditions of the intervening medium between the two stations, or by interference from some other transmitting station.

In addition to the Empiradio Beam services there was another extensive and important group of circuits which had its centre at Radio House, London, and was known as "Via Marconi" telegraph services. Many of these employed long wave channels, but the majority now used short waves, and the number of short wave channels in commercial use were steadily increasing.

On 15 circuits these services transmitted on 17 wavelengths, seven long wave and ten short wave, and the traffic from the corresponding 15 stations was received on some 85 different wavelengths, 39 long wave and 46 short wave.

Transmitting Stations.

Mr. Dowsett then proceeded to describe the wireless stations operated from Radio House, Carnarvon, Ongar, Brentwood, Dorchester and Somerton. Eight transmitters at Dorchester, he said, were worked simultaneously from Radio House, and signals from a similar number of stations were received through Somerton.

The Brentwood receiving station was originally built for the long wave services, and at present the long wave traffic, which in itself had considerable volume, all passed through this station. During the last few years, however, its short wave receiver equipment had been steadily increasing, and now the station had some 24 long and short wave receivers employed on traffic circuits which used some 60 wavelengths within the wide range of 15—30 000 metres. The Brentwood aerial equipment was necessarily varied in character, and illustrated the progressive changes in design which the development of new ideas was constantly bringing about.

One had to realise, said Mr. Dowsett, that the wireless services of the whole world were interconnected commercially, and to a large extent technically, and formed practically one network.

Owing to alternative routes by long or medium or short waves one need never be out of touch with the corresponding station. If for any reason a particular service should break down the outside network was there and became aware of it, and was at hand, if need be, to carry on the traffic. Wireless had the advantage that its transmitters could be switched from one service to another. For the economical running of a number of short programme services this became a necessity, and it was also brought about by the need to change wavelengths to avoid interference, or because of weak signals.

Mr. Dowsett then proceeded to discuss briefly the conditions of propagation which exist in the communicating medium between the wireless transmitting and receiving stations, and which periodically alter according to whether the Great Circle path through the two stations is in daylight, twilight or darkness, or is a combination of all three states. A careful systematic study, extending over a considerable period, had been carried out by the Marconi Research Department at Chelmsford on the strength of signals received from a large number of stations, at various distances and on various wavelengths, during the day and during the night. These observations had shown that on all wavelengths within the range of 15—100 metres, signals fell off in strength up to 100 miles, but below 60 metres there was a recovery of signal strength with increase of distance, the extent of the recovery for daylight transmission being greater the shorter the wavelength used, 15 metres for instance, producing a strong signal at 9 000 or 10 000 miles.

The accepted explanation of these effects was that at distances within 100 miles or so of the transmitter, propagation depended mainly on the direct rays which left the aerial at low angles, the energy from which was soon absorbed, whereas at great distances the received energy was obtained from the radiation leaving the transmitting aerial at higher angles which entered the Heaviside layer and travelled along it with minimum absorption and was finally bent down earthward again, the actual angle incident to the ground at which the rays reached the receiving aerial being about 15 deg.

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A High-Pressure Station. C. H. S. Tupholme. ("Electrical Review," September 20, p. 482.)

The 20 kV Underground Transmission System at Crown Mines, Limited. W. Elsdon-Dew and H. Denehy. (Transactions of the S.A. Institute of Electrical Engineers, July, pp. 160–190.)

Remote Control and Supervision of Electrical Power Systems. ("A.E.G. Progress," September, pp. 291–294.)

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Load Characteristics of Farm Lines. F. J. Zink. ("Electrical World," August 31, pp. 432–433.)

The Elbing Power Station of the Ostpreussenwerk A.-G. F. Ohlmuller. ("Siemens-Schuckert Review," No 8, pp. 169–172.)

The 100/50/10 kV Jena Transformer Station of the Thuringian Provincial Electricity Supply Co., Thuringia Works. H. Kyser. ("Siemens-Schuckert Review," No. 8, pp. 177–181.)

The Lightning Problem in Power Transmission and Distribution. H. M. Towne. ("The Bulletin," July, pp. 221–246.)

Factors Governing the Design of the 115–230 V Distribution at High Load Densities. G. L. Lillie. ("The Bulletin," July, pp. 247–256.)

The 1 500 lb. Pressure Steam Plant at Mannheim Power-Station. Dr.-Ing. F. Marguerre. ("Engineering," August 30, pp. 252–255, September 13, pp. 312–314.)

Interlocking of Power Station Switchgear. G. H. Bowden. ("Electrical Times," August 29, pp. 299–300.)

The Gatineau-Toronto Electric Transmission Line Terminal Station. II. ("The Engineer," August 30, pp. 214–217.)

Sub-station Grounding. F. H. Mayer. ("Electrical World," July 27, pp. 173–176.)

Conserving Floor Space by Electrical Layout. ("Electrical World," July 27, pp. 182–184.)

Petersen Arcing Ground Suppressors in a Large 30 kV Cable Network. E. Rühle. ("A.E.G. Progress," August, pp. 262–266.)

Geared Turbines. H. Melan. ("Siemens-Schuckert Review," Vol. V, No. 7, pp. 158–162.)

The Traction Sub-stations of the Paris-Vierzon Line of the Compagnie du Chemin de fer de Paris à Orléans. ("Revue Générale de l'Electricité," May 11, pp. 725–739.)

Protection Obtained and Dangers Caused by Varied Earthing in High Tension Networks. ("Revue Générale de l'Electricité," June 8, pp. 875–882.)

A Contribution to the Study of Short Circuits in Alternators. ("Revue Générale de l'Electricité," June 8, pp. 883–890.)

New Automatic Disconnector for Large Power Networks. H. Pecheur's Ballistic Auto-Interrupter System. ("Revue Générale de Electricité," June 8, pp. 891–901.)

Features of New 320 000 kW Extensions at Hell Gate. ("Power Plant Engineering," June 1, pp. 606–613, 648–651.)

TELEGRAPHY AND TELEPHONY.—Methods of Locating Cross-talk Faults on Loaded Cables. K. E. Latimer. ("Electrical Communication," July, pp. 45–48.)

The "Solid Back" Carbon Button Telephone Transmitter. L. C. Pocock. ("Electrical Communication," July, pp. 49–51.)

Telephone Transmission Networks. T. E. Shea and C. E. Lane. ("Journal of the A.I.E.E.," August, pp. 624–628.)

Carrier-Current Train Telephone Service. ("Railway Electrical Engineer," June, pp. 186–188.)

Telephone Development Studies. W. R. Burgess and A. R. Lewis. ("Telegraph and Telephone Journal," September, pp. 243–244.)

TESTING, ETC.—Tests on Paper Cables. R. D. Sherman. ("Electrical World," August 10, pp. 277–281.)

Surface Creepage and High Voltage Testing. T. Nishi and K. Ikeda. (Selected Papers from the Journal of the I.E.E. of Japan, No. 15, July, 1928.)

The Testing of Transformers. G. Camilli. ("General Electric Review," September, pp. 497–503.)

Effect of Cathode Rays on Hydrocarbon Oils and on Paper: A Contribution to the Study of the Mechanism of Cable Deterioration. C. S. Schoepfle and L. H. Connell. ("Ind. and Engng. Chem.," June, pp. 529–537.)

Testing High-Capacity Oil Switches. C. J. Webb. ("Electrical Review," September 6, pp. 383–385.)

Theory of Static Tests of Alternators and Three-phase Synchronous Motors. ("Revue Générale de l'Electricité," September 14, pp. 401–406.)

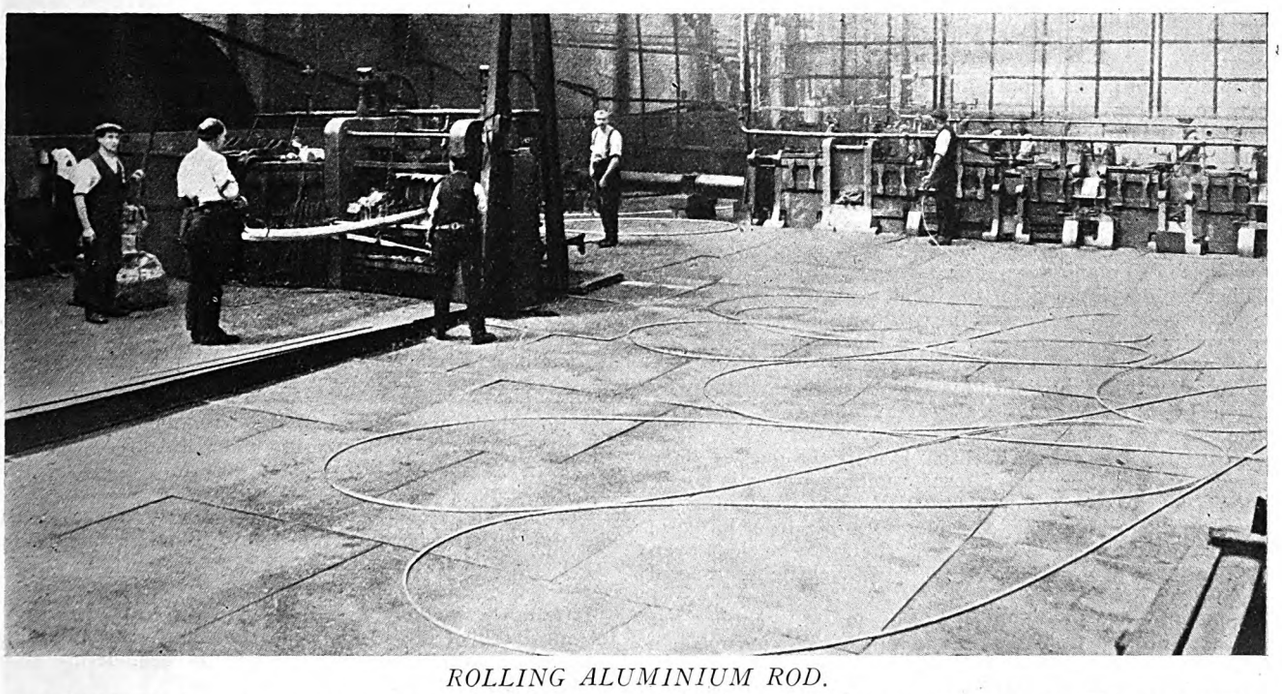
Acceptance Tests on Turbo-Generators. J. Eccles. ("Electrical Times," August 29, pp. 297–298.)

THEORY, DESIGN, ETC.—Economical Design of Underground Power Transmission Lines. M. Suzuki. (Selected Papers From the Journal of the I.E.E. of Japan, No. 18, July, 1928.)

Theory of the Induction-Type Watt-Hour Meter. (IV.) N. Kato. (Journal of the I.E.E. of Japan, Supplementary Issue. January-February.)

On the Experiment of Sudden Short-Circuit of Large Alternators. S. Yamada and M. Urushibata. (Journal of the I.E.E. of Japan, Supplementary Issue, January-February.)

Recent Experimental Work on the Theory of the Lead Accumulator. C. Féry. ("Revue Générale de l'Electricité," August 31, pp. 319–323.



ROLLING ALUMINIUM ROD.

ALUMINIUM is coming into increasing use for high voltage transmission lines with steel towers and long spans. The accompanying picture shows the rolling of aluminium rod at the Prescot Works of British Insulated Cables Ltd., where there are three rod mills. These are electrically driven, and have a combined weekly output of over 600 tons of rod. The largest of these mills is 210 ft. long by 70 ft. wide, and includes automatic devices for handling the bars, repeaters for the rolls, and automatic winding gear for the finished coils of rod.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

British Industries Fair, Birmingham.

[To the Editor.]

Sir,—The Fair authorities are very anxious to introduce into the Fair anything which will tend to promote smooth working and assist visitors.

There appears to be a demand for some method of signalling throughout the Fair to enable the chairman, secretary or other official to be found, and to convey other messages throughout the building. I understand that the number of different messages that it is desired to transmit is between ten and twenty, and the Fair authorities have asked if we can suggest some method of conveying such signals.

I shall be glad to hear from any firms or individuals who would like to suggest methods of dealing with the problem which I have indicated.—I am, etc.,

W. A. Vignoles,
Director and Secretary,
British Electrical Development Association.

London, W.C.2.
October 7th.

Where *Is* That Battery?

[To the Editor.]

Sir,—Your editorial of August 9th dealing with electric battery vehicles has produced an interesting correspondence, though one notes a tendency of certain correspondents to make it a polite "slanging match."

The electric battery vehicle has its own sphere, from which neither first cost nor speed will oust it. It is rather futile to throw "mud" at battery makers for not having produced a cheaper and lighter battery when it is realised that electro-chemical brains have for 50 years been unable to find a practical substitute for the lead battery other than the almost equally heavy and expensive nickel-iron. Such being the case, manufacturers have only been able to improve along mechanical lines as far as the grid and expanding material for the paste is concerned, both with a view to prevention of the disintegration of the lead at higher specific gravities and the shedding of paste.

Admittedly a lighter and cheaper battery is required and will doubtless materialise in time.

That the electric battery vehicle has its sphere in more than one direction is evidenced by the numbers used by municipal authorities for refuse collection (slow speed), tower, repair and delivery wagons in connection with tramway overhead equipment and electric services to consumers at speeds from 20/25 miles per hour.

So many municipal supply authorities now cater for consumers much beyond their boundary, and the tendency to extend boundaries, necessitating longer runs frequently extending into the country, naturally allows the petrol vehicle, in some cases, to overlap the sphere of the electric. The term "stink wagon" is to be regretted; those with the best interests of the electric battery vehicle at heart are careful to avoid exaggeration, for which there is no need, as the advantages in so many cases are admittedly beyond dispute.

Whilst the development of this type of vehicle is slow it is steadily improving, after certain setbacks, and will do so more rapidly if, as now seems to be the case, cheaper and lighter batteries may be employed.

As an advertising medium any vehicle is an asset, so why throw a brick at an electrical advertisement on a petrol vehicle?

The question of effective speed is entirely one of duty required. A possible speed of, say, 30 miles per hour is not of much use to a dust cart or a bread delivery van unless its delivery area is a long way, say over 10 miles, from its base, in which case the electric delivery is the more efficient even if the long distance supply is by petrol vehicle to a local sub-centre.

People talk very glibly of speeds of 30, 40, 50 miles per hour, and quite fail to realise what average speed means, as a test, or even calculation of speed through traffic, shows. Take an even acceleration per 110 yds. of one mile per hour (between 4 and 20 miles per hour); this gives at the completion of the 16th (i.e. one mile) a time of 5·6 minutes or, say, an average of 11 miles per hour, which is by no means an extreme case, and had a traffic stop been included, as would be quite reasonable, the figure would have been much more striking.

Battery manufacturers, as other commercial concerns, dispose of their profits as may seem most desirable to themselves. However, without exception, they maintain an experienced research and experimental staff which is ever on the look-out for improvements,—I am, etc.,

L. W. de Grave.

Derby.
October 3rd.

Control of Ships' Auxiliaries.

[To the Editor.]

Sir,—We have read with great interest Mr. A. C. Hardy's article "Marine Electricity" in your current issue, and in particular that portion dealing with the control of ships' auxiliaries.

Mr. Hardy says: ". . . there is one school of thought (in Holland particularly) which prefers to control all the auxiliary motors from the switchboard itself. . . . Other people consider that it is a safer arrangement to make each unit separately controllable at the unit itself. The idea has hitherto been used very little in British ships. . . ."

Our experience during the past ten years, extending over most of the prominent British and Dutch lines, is, however, that the general practice was, and still is, to control each auxiliary motor by means of a separate hand-operated starting panel closely adjacent to the motor itself. Mr. Hardy, in fact, states as much in an earlier part of his article, and the practice has certain obvious advantages of simplicity. Equally with automatic control, it provides "control of each motor at the motor itself," for with automatic control a push-button station is provided at the motor.

Actually, the advantage of automatic control (we speak as joint holders of the "Uni-start" system patent) is that, while the control point remains at the auxiliary motor, the bulky portion of the starting equipment is removed to a point (the main switchboard) where, possibly, it can be more easily accommodated. This obviously depends to some extent upon the design of individual ships, but automatic control gear on the "Uni-start" system has recently been installed on several important British vessels.

In particular cases, of course, automatic control may have other advantages. In one well-known British vessel, for example, the pump for the swimming bath is automatically controlled by the patented "Pneutrol" device according to the level of water, i.e., the pump is normally independent of human control. In the case of steering gear motors, automatic control makes it possible for the control point to be away from the steering gear motor or motors.

In conclusion, the practice on most of the Dutch motor ships is, or has been, in general, similar to that on British ships. True, there have been certain cases where motor control panels have been incorporated in the main switchboard (e.g., panels for lubricating oil pumps), but that is because on these particular vessels the engine controls and the switchboard were relatively close together. On these same boats the majority of the auxiliary control panels were adjacent to the respective auxiliaries.—I am, etc.,

For Brookhirst Switchgear, Ltd.,
H. M. Goody.

Chester.
October 7th.

[Several letters are unavoidably held over.—Ed.]

POINTS OF VIEW.

Get electricity across to the people in the same way as automobiles have been put across to them.—*Mr. Henry Ford.*

* * *

A household accustomed to the convenience and value of electricity will curtail its use only under the direst necessity.—*Mr. M. S. Sloan.*

* * *

The coal and steam age has givenp lace to the electrical age, and we stand hesitant, refusing to recognise the inevitable change.—*Prof. H. Levy.*

* * *

It is now relatively simple for the girl to go through the technical school or college education, and with her wits as bright as any man, obtain a degree in engineering at some University.—*Lady Moir.*

* * *

Telegraphy a dying industry? Not yet anyway, and probably not until the day arrives when man will find the medium through which he can transmit, not the written word, but his thoughts, across the sea.—*Mr. James J. Tyrrell.*

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NEWS IN BRIEF.

Wireless in German Church—Societies' Arrangements—I.M.E.A. and Meter Certification —Col. Purves' Address to be reproduced in Cardiff.

THE annual Electric Show at New York was opened on Monday and will close to-morrow (October 12th).

The eighth National Exposition of Power and Mechanical Engineering will be held in New York from December 2nd to 7th.

An electrical exhibition, to be held at the Baths, Kingston-on-Thames, from October 14th to 19th, will be opened by the Mayor, Coun. W. E. Blake Carn.

The congregation of a village church in Germany have dismissed their pastor and installed a wireless set in his stead. The services are to be received from Berlin.

The annual dinner of the Institution of Railway Signal Engineers will be held on October 25th, at the Criterion Restaurant, London.

The next general meeting of the Institution of Mechanical Engineers will be held on October 18th, when Mr. Daniel Adamson will deliver his Presidential address.

The first meeting of the 1929/30 session of the Students' Section of the North Eastern Centre of the I.E.E. will be held to-night (Friday), when the chairman, Mr. Vernon Clements, will deliver his address.

The opening meeting of the Autumn Session of the Birmingham and Midland Branch of the Electrical Association for Women, was held at the Queen's Hotel on September 26th, when about 100 members were present. Miss C. Haslett spoke on the need for education in the use of electricity, and Miss Palmer dealt specifically with "Electricity in the Schools." Miss Barrie, headmistress of King Edward's High School for Girls, presided.

The annual festival of the E.T.B.I. will be held at the Savoy Hotel, London, on November 26th, with Mr. H. Marryat, the president, in the chair. The dinner will be followed by a dance.

Liverpool Corporation has been recommended to place a contract for the extension of the electricity supply and lighting department premises at Highfield Street, Liverpool, amounting to £20 493.

Leeds Electricity Committee has been informed that the I.M.E.A. is of opinion that there is not, at present, sufficient justification to demand new legislation on the subject of the certification and stamping of electricity meters.

Imports of electrical goods into the Irish Free State during the period January to August last amounted to £387 197 compared with £285 921 during the same period last year. The figures for August this year and last were £39 949 and £39 210, respectively.

The opening meeting of the 1929-30 session of the A.S.E.E. will be held on October 15th at the Junior Institution of Engineers, when Mr. S. B. Donkin will deliver his presidential address, "The Production of Power from Natural Sources other than from Fuel." The chair will be taken by Mr. B. C. Garman, the chairman of the Association, and refreshments will be served from 6.30 to 7 p.m.

The Borough Engineer of Hastings has found it necessary to discontinue the supply of water for the purposes of the East Hill lift, which has therefore been closed. He suggests that an electric pump should be installed, by which means the water required for the lift could be repeatedly used, with very little waste. The cost of such a pump is estimated at £250, including fixing, and the estimated cost of current is 0·3d. for each time the lift is used. The Parks Committee recommends the provision of the pump.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN, *dated October 11th, 1879:—*

A mariner's compass was introduced which caused an electric bell to ring if the vessel deviated from a predetermined course.

Several railway companies were favourably considering the lighting of railway stations by electricity.

Profs. Ayrton and Perry were explaining the contact theory of voltaic action.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of October 14th, 1904, stated that:—*

Prof. Sylvanus Thompson publicly decried the use of the "live rail" on railways, characterising it as an obsolete device and an engineering blunder.

It was proposed that Kabul, the capital of Afghanistan, should be lighted electrically.

* * *

FIFTEEN years ago THE ELECTRICIAN, *dated October 9th, 1914, reported that:—*

Street lighting restrictions were imposed in London.

The invention was reported from Italy (but not subsequently confirmed) of a radio receiver which could be "worked by means of a connection with an electric light circuit."

The Midland Electrical Engineers' Ball will be held at the Grand Hotel, Birmingham, on November 15th.

The Secretary for Mines, on September 11th, made an Order approving the "Ringrose Miners' Lamp," subject to certain conditions.

The Batti-Wallahs' Society will hold a luncheon at the Hotel Cecil, London, on November 7th, at which there will be an address by Mr. Frank Hodges.

The application under the Merchandise Marks Act, 1926, for the marking of imported electrically driven vacuum cleaners is not being proceeded with.

The second general meeting of the 1929/30 session of the South Wales Branch of the Association of Mining Electrical Engineers will be held at the South Wales and Monmouthshire School of Mines, Treforest, tomorrow, Saturday.

The twenty-first annual dinner of the Faraday House Old Students' Association will be held on October 25th, at the Savoy Hotel, London. Dr. Alexander Russell, F.R.S., Principal of Faraday House and President of the Association, will be in the chair.

The twentieth annual exhibition of electrical, optical and other physical apparatus is to be held by the Physical Society and the Optical Society on January 7th, 8th and 9th, 1930, at the Imperial College of Science and Technology, South Kensington, London.

The Western Centre of the I.E.E. has arranged with the Post Office Engineering Department for the Presidential Address of Col. Sir Thomas F. Purves, to be delivered in London on October 24th, to be reproduced by means of loud speakers in the Conference Room of the South Wales Institute of Engineers.

Edinburgh T.C. has adopted the Lord Provost's Committee's recommendation that automatic traffic control systems be installed at the Duddington cross roads and the Niddrie cross roads.

A new telephone cable, 335 miles in length, from Paris to Bordeaux, entirely underground, has been put into service. The new cable, which cost about £1 520 000, is part of a national scheme, of which the first link, from Paris to Lyons and Marseilles, was inaugurated recently.

The Surveyor to Northfleet D.C. has arranged with the Borough Electrical Engineer of Gravesend for a separate circuit to enable Northfleet Council to take advantage of the power rate to drive the small motor which operates the oil-firing apparatus used in connection with the heating of the municipal offices.

The Board of Trade Standing Committee under the Merchandise Marks Act, 1926, has recommended that permanent magnets and certain tools imported into this country shall bear an indication of their origin at the time of sale or exposure for sale, the indication of origin to be applied by die stamping or other mode of impressing, etching, engraving or casting.

The opening fixture of this session's activities of the Electrical Association for Women took place on September 27th, when members of the Women's Engineering Society and the E.A.W. visited the Shipping, Engineering and Machinery Exhibition at Olympia. On September 28th the Surrey branch of the Association of Teachers of Domestic Subjects again held their annual meeting at the E.A.W. Club Room, 46, Kensington Court, W.8, followed by a lecture on "The Common-sense Handling of Electric Appliances," by Mr. R. W. Kennedy, arranged at the request of the teachers.

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PERSONAL.

ESTATE of the gross value of £14 841, with net personalty £14 276, was left by the late Mr. William Sharman Toplis, electrical engineer, who died on August 25th, aged 52 years.

Mr. A. P. M. Fleming, of the Metropolitan-Vickers Electrical Co., Ltd., has been appointed by the board of directors of the American Institute of Electrical Engineers to be honorary secretary for England for the two-year term August, 1929, to August, 1931. The local honorary secretaries are appointed under Section 46 of the Constitution of the Institute. The duties of the appointment include assisting the board with regard to applications for membership, extending courtesies to travelling members, and other services. Mr. Fleming's appointment is in succession to Mr. C. le Maistre, whose term has just expired.

Mr. A. P. M. Fleming, who has been appointed local secretary of the A.I.E.E.

Unsettled estate of the value of £65 224, with net personalty £47 846, was left by the late Lord Montagu of Beaulieu, chairman of Edison Accumulators, Ltd., who died on March 30th.

Unsettled estate of the value of £2 745, with net personalty £2 562, was left by the late Sir Sydney H. C. Hutchinso formerly director-general of Indian Government Telegraphs.

Sir Hugo Hirst, who has been re-elected Master of the Glaziers' Company, has inaugurated a scheme for rebuilding the Glaziers Hall, which was destroyed in the Great Fire of London in 1666.

Oswestry Corporation, which has taken over the Oswestry Electric Lighting and Power Co., Ltd., has decided to appoint Mr. H. W. Edwards, the company's engineer, as borough electrical engineer.

Estate of the gross value of £4 275, with net personalty £1 272, was left by the late Mr. Christopher Thomas Briscoe, chairman of C. T. Briscoe and Son, Ltd., electrical engineers, Blackburn, who died on July 23rd.

Mr. Howard Long, latterly manager, illumination department, Metro-Vick Supplies, has resigned his position to take up an appointment with the Benjamin Electric, Ltd., in charge of their lighting engineering services.

The following have been selected for interview out of 52 candidates for the post of engineer and manager of the municipal tramways and omnibus undertaking at Plymouth, made vacant by the resignation of Mr. H. P. Stokes:—Mr. R. Hoggard, general manager, Chesterfield Transport Department; Mr. F. G. Ford, traffic superintendent, Plymouth Transport Department; Mr. W. T. Young, engineer and general manager, Halifax Tramways; Mr. C. Jackson, general manager and engineer, Oldham Tramways; and Mr. J. A. Baker, general manager and engineer, South Shields Tramways. The salary offered is £850 per annum, rising to £1 000.

Obituary.

MRS. WHITMOYER, suddenly, on October 1st, the wife of Mr. J. C. Whitmoyer, manager of the Contracts Department of the Metropolitan-Vickers Electrical Co., Ltd.

MR. WILLIAM BANNISTER, on October 1st, aged 81 years. He was an original director, and for the past 27 years chairman, of the Chloride Electrical Storage Co., Ltd. He transformed this undertaking from a small concern, occupying one building, now used for the publicity department alone, into one of the three largest accumulator making concerns in the world. See page 445.

DR. RICHARD VERNON HANSFORD, on Sunday, as the result of a fall, aged 41 years. He had been attached to the engineer-in-chief's office at the Post Office. He was prominently connected with the introduction of the Transatlantic wireless telephony service, and was especially concerned with the design of transmitters for short-wave work. He was well known on the Continent and in the United States, and only returned last week from an international conference at The Hague. He was a Doctor of Science, a member of the Institution of Electrical Engineers, and was awarded the Willans Premium.

BUSINESS ITEMS.

TRUSLOVE AND CO., LTD., of Colchester, have opened new showrooms and offices in High Street, West Mersea, where a supply of electricity is about to be given by Colchester Corporation.

The CRYPTO ELECTRICAL CO., LTD., at Willesden, which recently acquired the business of "The Langham Gears" of Slough, has now completed the equipment of a new factory adjoining their present works in Acton Lane.

A firm of manufacturers' agents in Johannesburg desires to obtain additional agencies for electrical goods, etc. A partner of the firm is at present in this country and will be prepared to interview British manufacturers. The Department of Overseas Trade has further particulars. (Reference No. 356.)

With reference to our description of the "Sadia" stand type boiler on page 362 of the September 27th issue, we are asked to point out that a 44-gallon boiler of this type heated to 185 deg. F., only falls 7·5 deg. F. in 12 hours, provided no water is drawn off. The figures 39·5 were supplied in error.

With reference to the paragraph concerning the Electro-Velocity Radiator of the Artic Fuse and Electrical Manufacturing Co., Ltd., which appeared on page 364 of our September 27th issue, owing to a typographical error, the wording gives the impression that there are uncomfortable draughts, whereas there are no uncomfortable draughts with this form of radiation.

LIGHTING TRADES, LTD., with which is incorporated the WELSBACH LIGHTING CO., LTD., has effective showrooms arranged at Oriel House, 30/31, Farringdon Street, London, E.C.4, where the best products in the way of lighting fittings of the two concerns are displayed. The showroom consists of one large room oblong in shape and several small square rooms, some of which are devoted to period work and some to particular types of modern fittings.

The first of the smaller rooms contains modern imitations of Georgian, Sheraden and other Old English fittings in the candelabra style. Some of the "Tudor" models are especially effective. Lighting Trades, Ltd., also manufacture period fittings to architects' specifications; for example, their large "Hampton Court" pendant is a modern edition of a sixteenth century candelabrum in Hampton Court Palace.

A trade mark which we understand has recently been registered by the firm is "Moonmist," applied to special pressed glass of their own manufacture. This glass can be either pure white or slightly tinted. The best example at present on view is an ornamental plaque, taking a semi-oval form, embossed with a detailed representation of a three-masted sailing ship. In this case the glass has a faint yellowish tint, and when the lamps in the ship's base are switched on, the glowing appearance of the ship—without any direct source of light being visible—is very pleasing.

In connection with the new Polish broadcasting scheme which has recently been announced, it is interesting to learn that the contract obtained by the MARCONI'S WIRELESS TELEGRAPH CO., LTD., includes the provision not only of six new broadcasting installations, but also elaborate repeater equipment and correcting apparatus for landlines. This will be installed to carry out improvements in the scheme already in operation for the exchange of broadcast programmes between Warsaw and Berlin, Prague, Vienna and Budapest.

The National automatic telephone exchange, which is one of the new 10 000 line exchanges recently cut into commission, is equipped with two "Alton" batteries each of which has a capacity exceeding 10 200 Ah at the 10 hour rate of discharge. Both of these batteries are made up of 47-plate cells each weighing closely on 3 tons. The plates measure 20 in. by 30 in. each positive and negative weighing about 70 lb. and 45 lb. respectively, and the batteries are capable of giving an output in excess of 5 100 A for one hour. The dimensions of the cells are nearly 4 ft. in length and height, and 2 ft. 6 in. wide. See page 441.

Upwards of 90 members of the Ipswich Engineering Society journeyed to London on September 26th by motor coach to make a tour of the Osram Lamp Works of the General Electric Co., Ltd., at Hammersmith. The party, accompanied by Mr. C. J. Robinson, secretary of the society, and Mr. F. Crush, manager of the Ipswich branch of the G.E.C., included members from all the principal engineering firms and works of the Ipswich district, the electrical engineers section of the L.N.E.R. and the local Electrical Contractors' Association. There were also representatives from a number of East Anglian garages, architects, and others interested in electrical matters.

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LEGAL INTELLIGENCE.

Case Against the S., W. and S. Electric Power Company Dismissed.

At the Oldbury Police Court on October 1st, the Magistrates dismissed a case brought against the Shropshire, Worcestershire and Staffordshire Electric Power Co. by the Director of Public Prosecutions for an alleged breach of Regulation 18 (d) under the Factories Act, relating to sub-stations. The case arose out of a fatal accident in the McKean Road sub-station at Oldbury on July 4th. A fully competent electrician with his mate was instructed to remove from a block of steel clad switchgear, a spare cubicle bolted to the cubicle containing the incoming switchgear operating at 5 500 V. In order to do this it was necessary to unbolt the spare cubicle from the incoming cubicle. The incoming cubicle was built in three sections—the top section containing busbars, the middle section containing oil switch, and the bottom section containing the incoming cables. Before commencing the work, the electrician tripped the oil switch and drew the isolating links, thus making " dead " the middle and upper sections of the incoming cubicle, and also the whole of the spare cubicle. The incoming cable remained " alive," but the bottom section, enclosing the terminals of this cable was made safe by a screwed-on steel cover. After the spare cubicle had been unbolted, the electrician unscrewed the back plate of the middle section of the incoming cubicle, and also took off the protective plate of the bottom section of that cubicle for inspection. He then noticed a lamp wire in the middle section of the cubicle which connected with the detached spare cubicle, and omitting to replace the plate on the bottom section containing the terminals of the incoming cables, proceeded to remove the lamp wire from the middle section. In so doing his knee came into contact with the terminals and he was killed.

A representative of the Director of Public Prosecutions appeared for the prosecution, and Mr. E. S. Herbert, of Messrs. Sydney Morse and Co., for the company.

The case for the prosecution was that no work should have been done on the switchboard without first making " dead " the whole of it, including the incoming cables, and that there was no independent provision for making " dead " those cables except by disconnecting the whole of the cable at the Oldbury Road sub-station some distance away, thus disconnecting also a number of consumers *en route*.

The company contended that the case fell within Regulation 18 (d) (ii) and that as the switchboard was built in sections, and each section could be made " dead " independently, and as it was not necessary actually to do any work in the " live " section, there had been no breach in the Regulations.

The Magistrates found as a fact that the switchboard was built in sections and came within Regulations 18 (d) (ii), and that no work had to be done in the " live " section. The case was accordingly dismissed.

New Distributors of Edison Storage Batteries.

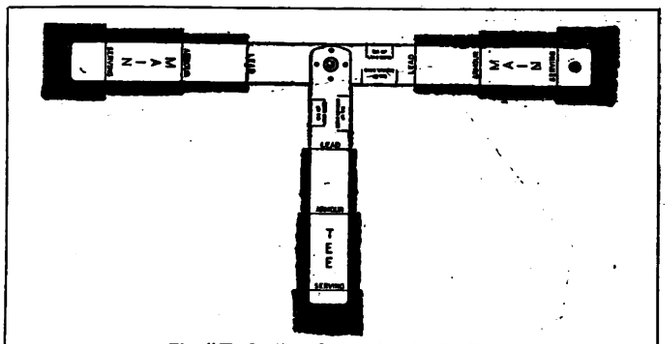
With reference to the motion brought by Edison Accumulators, Ltd., against the New Distributors of Edison Storage Batteries, Ltd., and reported in THE ELECTRICIAN last week, actually the sign complained of was at the back of the stand on the gallery balustrade, was erected by the exhibition authorities themselves, and did not form part of the exhibit of New Distributors of Edison Storage Batteries, Ltd. The reproduction of the stand on page 408 of the same issue containing the report shows clearly that the name of the company was correctly displayed over the stand.

ELECTRICAL SWIMMERS.

The " Sunco " Swimming Club held their first annual gala at the Holborn Baths on September 30th, when several interesting events were contested. Principal among these were the finals for cups presented by Mr. A. G. Beaver and Mr. R. Tweedy-Smith, the former being for men and the latter for ladies. The cups were won by Miss Glover and S. Davidson. A pole fight, in which R. J. Willis succeeded in upsetting all his opponents, caused much amusement. The G.E.C. were successful in the mens' team race, and Mr. Marsh, of Siemens, won the 90 yards race in great style. The events were concluded with a " Good-night " race (won by Mrs. Willis), in which ladies swam with night gowns over their costumes and a lighted candle held aloft. Prizes were then presented by Mrs. R. Tweedy-Smith.

CABLE TEMPLATES.

In introducing a range of steel templates for use with cable-grip boxes, W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, EC..1, point out that modern business methods demand something more than the mere selling of an article and leaving it at that. For example,



The "Henley" cable template in detail.

motor-car manufacturers quickly realised that in order to help their sales they must consider the transaction from the buyers' view-point, and give items of service which definitely assisted the owner in getting the most out of his car. But when one considers specialised articles of electrical distribution gear they do not appear to offer much scope for such organised selling methods. Take a service box, for example. To the engineer, a service box can be considered as just so much cast-iron. But looked at by the actual user, it is something which, if properly designed, can materially assist him in his daily job. Yet one can go much further even than the creation of the perfectly designed cable box. With cable-grip boxes are supplied printed cards with " Notes for the Jointer," which give him the quickest way to instal them. The introduction of a range of steel templates for use with these cable-grip boxes is another item of service. The idea of using such a template when stepping back distributor and service cables is of considerable value as an aid to better and quicker service installations. On each " arm " of the template is engraved the respective markings for stepping back to the lead armour and serving of the cables whilst the diameter of the armour grip and of the lead bond is also shown. The illustration gives an idea of the template, and a neat canvas case is supplied.

SUPPLY IN ULSTER.

Report of Electricity Commissioners for Northern Ireland.

A REPORT on the work of the Ministry of Commerce and the Electricity Commissioners for Northern Ireland deals with applications for Special Orders, the establishment of new and the extension of existing generating stations, the construction of main transmission lines, and borrowing by local authorities for electricity purposes. Appendices show the stage of development attained by undertakings giving a public supply of electricity under statutory powers, and the capital expenditure and working costs of the undertakings, fuel consumption, load factor and sales of current. A notable feature is the increase in the number of units sold by the Belfast Corporation undertaking, 56 212 857 kWh having been sold in the year ended March 31st, 1927. An appendix shows the growth of the sales of electricity in Northern Ireland during the years 1924 to 1927. The report mentions that while the average consumption in Northern Ireland had increased in 1927 to 47 kWh per head of population, such a figure is still considerably below the average rate of consumption in Great Britain. Reference is made to the powers granted by Parliament to the Antrim Electricity Supply Co. for the generation of electricity on the lower river Bann, and also to a comprehensive scheme for the County of Down, embracing as a first step the borough of Bangor and urban district of Holywood. The development of the Lagan Valley district, through the linking-up of centres in that area with the Belfast system, has already been commenced by the erection of a main transmission line between Belfast and Lisburn, and the extension of this line to Lurgan and Portadown is foreshadowed. It is pointed out that the application of electrical power to rural industry is likely to be slow.

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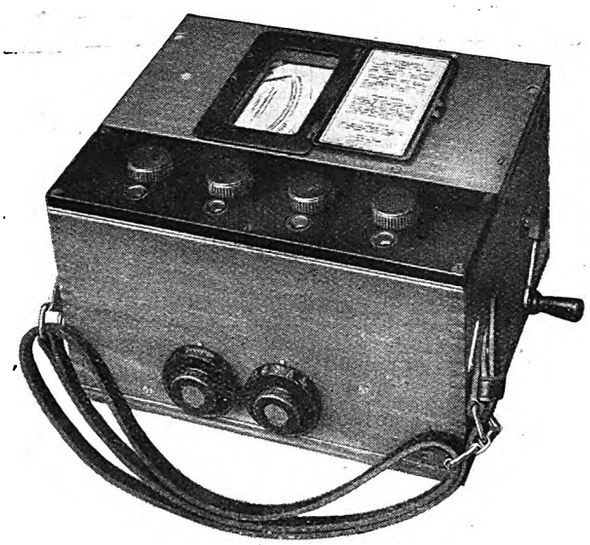
BRIDGE OHMMETER.

An Instrument Combining an Ohmmeter and Wheatstone Bridge.

THE object of the "Bridge Ohmmeter," introduced by the RECORD ELECTRICAL CO., LTD., of Broadheath, Manchester, is to provide means for extending the range of an ohmmeter to enable it to measure low resistances, such as are met with



The "Bridge Ohmmeter" by the Record Electrical Co., Ltd.

in ordinary general industrial work. An ohmmeter usually gives its first indication at 10 000 Ω and will measure any higher value up to 100 megohms and infinity. The Bridge Ohmmeter will measure resistances from 0.01 Ω up to 999 900 Ω on the bridge and from 10 000 Ω to 100 megohms on the ohmmeter scale; it also indicates a short circuit or open circuit.

The instrument consists of four essential units: a generator for producing the necessary current at high pressure, a direct reading ohmmeter convertible into a galvanometer for bridge tests, a decade resistance box with ratio switch in one arm of the Wheatstone bridge, and a multiple contact switch for changing connections from an ohmmeter to a Wheatstone bridge, all arranged in a portable carrying case complete with handle and shoulder strap.

The containing case is made of teak, which has natural resilience which renders it eminently suitable for portable apparatus.

The indicating unit consists of two coils mounted on the same spindle placed at an angle to one another, both rotating in the field of a permanent magnet. One coil carries the leakage current, the other exerts a controlling torque equivalent to the spring of a voltmeter, but with the difference that whereas a spring exerts a constant torque, a coil control varies with the pressure and automatically compensates for any variation in the testing voltage. Temperature errors due to the coils, any drop in magnet strength, and errors due to stray magnetic fields, all cancel out, due to the system of coil control.

The generator is wound for two voltages: 500 V for insulation testing and 250 V for ohmmeter testing. The voltage is automatically changed by the switch used for converting the instrument from an ohmmeter to a Wheatstone bridge. The generator is fitted with a constant pressure clutch which evens out voltage fluctuation and ensures steady and accurate readings on circuits having inductance or capacity. The Record improved handle is of novel design, and a departure from the usual folding knee joint. The handle consists of a lever in the form of a round rod with a handle firmly attached thereto; this shaft fits in a closely-fitting sleeve and a right angle turn folds the projecting handle flat against the case.

The current given to the circuit by the generator depends upon the resistance under test. At infinity, of course, no current flows, but the potential at the terminals is highest, viz., 500 V at a handle speed of 160 r.p.m. In making measurements on circuits where capacity and inductance are present, care must be taken to speed the handle until the clutch slips.

The internal resistances are carefully and accurately wound and adjusted, the instrument is protected from shocks by substantial rubber feet, the pointer comes instantly to rest at the correct indication, and is not affected by varying the speed of the generator except as explained in a previous paragraph. The variable decadence resistance box consists of four dials—units, tens, hundreds and thousands—indicating from 1 Ω to 9 999 Ω in 1 ohm stages. By means of the ratio coils these figures can be multiplied or divided by ten or hundred, thus extending the range from 0·01 Ω to 999 900 Ω.

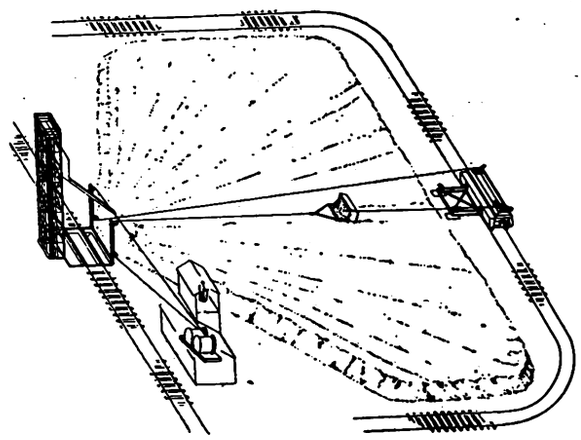
To test insulation resistance connect the conductor to the terminal marked "line" and the casing to the terminal marked "earth." Turn the control switch to ohmmeter. All the connections are then made for "ohmmeter." Turn the generator handle steadily at about 160 r.p.m. The pointer will immediately deflect across the scale and come to rest at a scale mark corresponding to the value of the insulation.

To measure low resistance—say a coil of wire—connect the ends to the same pair of terminals as for ohmmeter tests, turn the control switch to bridge, which changes the internal connections to those of a Wheatstone bridge, the current coil of the ohmmeter becoming the galvanometer coil and its deflections controlled by the pressure coil, the function of which is equivalent to the control exerted by the spring or torsion strip of an ordinary galvanometer. Turn the generator handle very slowly at first and increase or decrease the resistance until the pointer approaches balance on the infinity line; the generator speed should then be increased and final balance obtained. If the figures appearing in the windows of the resistance box are 771 and the ratio switch set to "divide by 10," the value of the resistance under test is 77·1 Ω.

MECHANICAL HANDLING.

Some Interesting Equipment Recently Installed in South America.

AN installation which illustrates the latest practice in the mechanical handling of coal and ash is that recently supplied to a works in Buenos Aires by the Underfeed Stoker Co., Ltd. The coal, which is of the "run-of-mine" bitumous



Sketch showing the principle of the "Beaumont" drag scraper conveyor.

variety, arrives at the works by railway and is discharged into a concrete track hopper below the ground level ready for conveyance to the storage dump or elsewhere. An understanding of the part played by the mechanical equipment will be gleaned from the illustration above.

The general principle is the same for practically any crushed material, and the equipment at Buenos Aires consists of an electrically driven "Beaumont" automatic skip hoist with "Simplex" loader, which cannot be over or underloaded, for the continuously running small wagons or skips which are taken up vertically by an endless wire rope, operated by a 30 H.P. electric motor. The normal capacity of this hoist is 70 tons of coal per hour, discharging to an overhead steel plate bunker, the whole arrangement being carried by a girder-work tower. From the bunker the raw coal discharges through an electrically driven "Norton" coal crusher, also with a capacity of 70 tons per hour, driven by a 15 H.P. motor. This passes the crushed coal down to an endless mild steel belt conveyor travelling at 300 ft. per minute which discharges as desired. The belt is 115 ft. long between centres and 1 ft. 6 in. wide, driven by a 5 H.P. electric motor.

A coal storage dump arrangement adjoining the skip hoist, discharges, by an overhead by-pass chute, in the opposite direction any desired amount of coal to one corner of the dump, instead of to the "Norton" crusher and the belt conveyor. The Underfeed Stoker Co., Ltd., has taken over the sole manufacturing rights in Great Britain and the British Empire of all "Beaumont" mechanical handling appliances.

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MANUFACTURERS' EQUIPMENT

New Equipment for Works—Testing Metal by Machinery—A New One-piece Industrial Lighting Fitting.

OWNERS of works, etc., whose equipment includes liquid starters will be interested in the new starter recently introduced by the BRUSH ELECTRICAL ENGINEERING CO., LTD., Falcon Works, Loughborough. These are built as plain rotor starting rheostats for induction motors or as starting rheostats for d.c. motors; they can also be adapted for certain other purposes. When the starter is used with an induction motor the liquid starter is connected in the rotor circuit only, and a separate stator switch has to be provided. For a d.c. motor there is required, in addition to the starter, a circuit-breaker, which should be fitted with a field discharge contact (closing as the breaker opens) and a metallic-type field discharge resistance connected to this contact. The starter has no automatic releases, so that whenever the motor is stopped the blocks must be raised manually before the circuit-breaker is closed again.

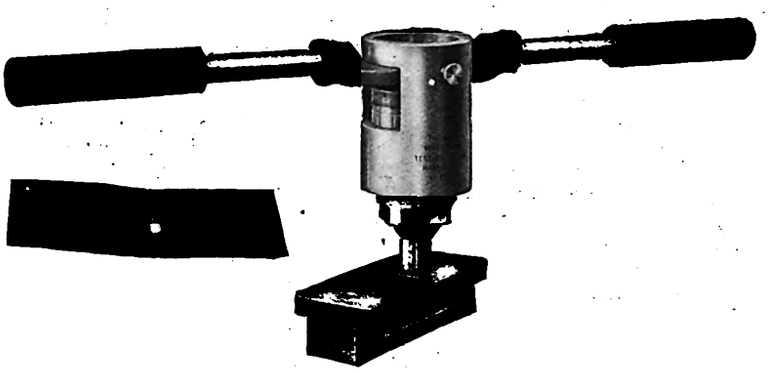
An s.p., s.t. air-break ironclad switch can be fitted to any of these liquid starters and interlocked mechanically with the operating gear. This can be used as an electrical interlock with the circuit-breaker, to ensure correct sequence. Motors are normally sent out with the auxiliary switches arranged to be closed when dippers are raised.

The starters are of industrial type arranged for floor mounting. The cast iron tanks are supported (with insulation) on mild steel rods fixed in cast iron end frames. The sheet iron dippers are fixed at one end to a steel spindle at one side of the starter. Rotation of the spindle causes the dipper to enter or leave the liquid. As the dippers enter, the resistance of the starter falls gradually until the position of maximum immersion is approached. A copper bar on the dipper frame then makes contact with a number of controller-type contact fingers on the tank, so establishing an effective short circuit. When raised, the dippers of standard starters leave the electrolyte entirely, but if preferred they can be arranged not to break the circuit completely—this being standard practice in the case of high voltages. Plain or perforated, sheet-metal covers prevent accidental contacts with live parts.

The operating gear of one, two, three, and four-tank starters consists of crank handle, machine-cut screw, nut, connecting rod and crank. Six-tank starters have a large hand-wheel, a balance weight and ball bearings; the self-locking character of the gear is retained. The standard arrangement for cable fittings comprises three wood-bushed holes for single-core V.I.R. insulated cables, but, if required, the cable entrance can be screwed for conduit without extra cost. Trifurcating boxes, having armour clamps and/or sealing chambers, can be provided as an extra. The electrolyte is prepared by dissolving common soda in water, the amount of soda, which depends on capacity, voltage, etc., being determined by experiment.

The searchlight of the London Electric Firm for use in prospecting work.

PHILIPS LAMPS, LTD., Philips House, 145, Charing Cross Road, announce the introduction of an improved type of their N.R. industrial reflector. The outstanding feature of the new type is that it is stamped from one piece of heavy gauge metal with an entire absence of welded or other joints. The angle of the cut-off is in accordance with Home Office recommendations. The fittings are made in five sizes, ranging from 10 in. to 18 in. in diameter, and can be supplied with hook suspension or screwed bush ($\frac{5}{8}$ in. and $\frac{3}{4}$ in. conduit thread or $\frac{1}{2}$ in. gas). The 10 in., 12 in. and 14 in. sizes can, in addition, be supplied with $1\frac{1}{8}$ in. hole. The reflectors are manufactured from vitreous enamelled heavy sheet steel, white inside and black outside, and the workmanship is stated to be of the highest standard throughout.



The "Avery" sheet metal testing equipment.

FRY'S (LONDON), LTD., of 24-26, Water Lane, Queen Victoria Street, London, E.C.4, have sent us particulars of their new-process "Enox" hack-saw blades. For general use the "Enox" standard S.T. type blade is recommended, but for works where only one class of material is dealt with there are offered a number of different kinds of blades—hardened and tempered to suit the jobs to be done. It is stated that the "Enox Flex" blade is almost impossible to break, while teeth cannot be ripped by unskilful use. The "Enox S.T." blade is another new line of the all-hard type, apparently a compromise between "Enox Standard" and "Enox Flex." Other blades offered are "Enox Alumin," for cutting aluminium; "Enox Cable Cutting," for wire and tape armoured cables; "Enox Type A.E.," for hard steels; "Enox Type S," for use in high-speed machines employed for cutting joists and sectional steels; "Enox TT," a flexible blade, with special set to the teeth and suitable for electrical conduit; "Enox 14," for cutting nickel chrome and other hard alloy steels. These blades are made from Sheffield 14% tungsten, cost four to five times as much as standard saws, but are claimed to cut usually seven to ten times as much. "Bi-kut" is a patented type of blade with groups of four teeth placed alternately, to cut both on forward and backward strokes. Suitable for rail cutting and for hand-operated saws, while the "Brasso" double-edged is for cutting tubing and soft metals. The "Brasso-Duplex" is yet another blade, and this is made of 21 gauge tungsten steel, about $\frac{5}{8}$ in. wide. The teeth have a wavy set, and on one edge the pitch is 18 T. to the inch (for cutting bolts, bars, etc.), while on the other the pitch is 28 T. (for cutting light sectional material).

The "Avery" sheet metal testing machine manufactured by W. AND T. AVERY, LTD., Soho Foundry, Birmingham, appears to furnish a simple method of ascertaining the relative ductility of sheet metal. The means adopted is the distension of a circular disc of the metal to a dome-like form until the point of fracture is reached. The machine measures the thickness of the metal and the height of the test specimen under distension: the micrometer graduations read to 0·01 m/m for thickness and 0·02 m/m for distension. A clamped or slip distension test can be given at the operator's choice; the difference in the height under distension when free to slip and when clamped gives an index of the workability of the material as distinct from ductility. Furthermore, the appearance of the dome surface after a test gives useful information as to the crystal structure of the metal.

The Avery machine consists of a vertical axial assemblage of distending spindle, inner and outer members, interconnected by screw threads, together with cross handles, the central portion of which carries the upper orifice washer. The upper end of the distending spindle supports a standard precision steel ball. The intermediate member—which, like the spindle, terminates in a square at the lower end—supports a duplicate orifice washer.

The test specimen, which should be 2 in. wide, with parallel edges, is inserted in the aperture below the cross handles and

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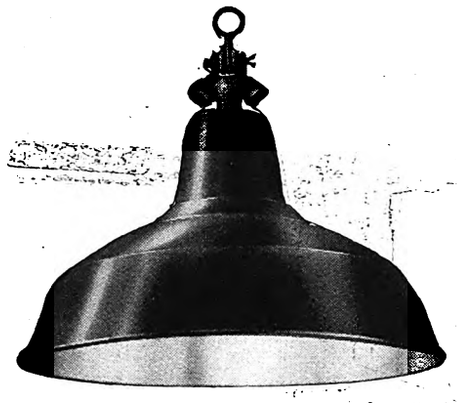
the larger square is then placed in the stand. The cross handles are next rotated to easy contact, and the thickness of the specimen measured by the graduations shown in the aperture below the handles. For a clamped test, rotation and leverage of the handles is continued, while for a slip test the specimen is just eased from contact. The test is completed by placing the lower square of the distending spindle in the stand and rotating the handles. Operation ceases when the specimen fractures. The maximum thickness of mild steel which the machine is capable of distending is 10 B.G. However, it is stated to be preferable to confine its use to 16 B.G.



The new industrial one-piece lighting fitting of Philips' Lamps, Ltd.

The "Total" fire extinguisher of L. E. Wilson and Co., Ltd., Hodson's Court, Corporation Street, Manchester, consists of a cylinder partly filled with sodium bicarbonate powder and a central cylinder full of carbon dioxide gas under high pressure. The turn of a wheel opens the gas outlet, and a powerful jet of gas and powder is emitted. The insulating qualities of CO_2 are claimed to enable "Total" extinguishers to be used at close quarters and for directing on live conductors with comparative safety; indeed, it is stated to be quite safe on h.t. work up to 100 000 V. Special features of the "Total" system are that the extinguishers are not affected by climatic conditions, the charge will not deteriorate over a period of some years. The contents can be removed for inspection by simply unscrewing the cap, and be replaced, and the "Totalite" powder is clean and dry.

The soldering irons of The General Electric Co., Ltd. (Magnet House, Kingsway, London, W.C.2), are now made in four different sizes. H.O. 5 914 and H.O. 5 915 are suitable for small work and for use in confined spaces, as behind telephone switchboards. H.O. 5 916 is a medium-sized iron, and H.O. 5 917 a heavier iron, of the same general purpose type, but designed to cope with work of a continuous nature. Each pattern is provided with an earthing terminal and wired with a length of 3-core cab tyre sheathed flexible cord. H.O. 5 916 and 5 917 are fitted with replaceable heating elements. The specifications are as follows:—

No.	Consumption. Watts.	Size. Ins.	Weight.
HO 5 914	60	$\frac{7}{8}$ dia. × 9	13½ oz.
HO 5 915	100	$\frac{7}{8}$ dia. × 12	1 lb. 2 oz.
HO 5 916	175	1¼ dia. × 13	1 lb. 14 oz.
HO 5 917	300	1½ dia. × 14	2 lb. 13 oz.

What is said to be a novel and highly efficient device for branding wood, cork, ebonite, leather, rubber, etc., is manufactured by Ellis and Coe (C. S. Ellis), 308, King Street, Hammersmith, London, W. It is known as the "Kausis," and can be supplied either as a small hand model or fixed to a press. The suitable voltages are 110 and 220; the consumptions are, No. 1 "Kausis," 200 W.; No. 2 "Kausis," 250 W.

Some of the interesting apparatus produced by The Rapid Magnetting Machine Co., Ltd., of Magnet Works, Lombard Street, Birmingham, has previously been described in The Electrician. Two new additions to the firm's range of labour-saving appliances are the "Rapid" self-contained magnetic truck, for picking nails, etc., from the floor, and the "Rapid" patent chute with foolproof stop-feed and discharge, for granular material. Both these additions to the firm's range we hope to describe in detail in a later issue devoted to manufacturers' equipment.

The Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Barford Street, Birmingham, have sent us particulars of a new range of switches entitled the "Memrex Senior." These new switches are of the "Memrex" pattern, but provided with top and bottom cable entry; knockouts are also provided, thus making the switch suitable for almost every position and method of wiring. The case is weather-proof and lined with white insulating enamel. The new series of switches complies fully with B.E.S.A. Specification 124, and is licensed to be so marked.

The Martindale Electric Co., Ltd., of The Hyde, Hendon, London, N.W.9, are producing a series of tools for armature repairs and commutator maintenance. These include air gap and feeler gauges, coil tamping tools, and commutator slotting files. The firm also sells "Commulac," an insulating liquid for painting slots on undercut commutators to reduce the possibility of short circuits. "Commulac" is oil-proof and withstands sparking without softening. The preparation is specially suggested for mine locomotives, pig mill motors and other equipment in dirty locations.

Mawdsley's, Ltd., of Dursley, are now manufacturing a welding equipment known as the "Mawdsley A.D.C. Multi-operator" welding set. The dynamo is compound wound, and designed to give a voltage only slightly in excess of that required at the electrodes. Usually the dynamo is made to give 35 V, but occasionally a higher voltage is necessary, as where the operator is a long way from the machine or when heavily coated electrodes are being used. The necessary increase in voltage to the 60 or 65 V needed for striking the arc is obtained in the following simple manner. From two slip-rings fitted to the armature of the welding dynamo a.c. is taken to the primary of a small transformer. The secondary of this transformer forms part of the welding circuit, and the tranformer is so proportioned that the sum of the direct and alternating voltages gives the required striking voltage. The alternating current is controlled by a small contactor switch which may be actuated either by a solenoid or by means of the magnetic leakage of the transformers or of an additional reactance. As soon as the arc has been struck the contactor switch opens the primary circuit of the transformer, and the welder is then supplied direct from the low voltage dynamo. When the weld is completed or the arc broken, the contactor switch automatically closes and the electrode volts rise to 60–65 ready for the arc to be struck again. The circuit supplying current to each welder is supplied with its own contactor switch, so that each operator is quite independent. In addition to the reactance a small welder's resistance is placed in each circuit to provide for independent adjustment of current according to the size of electrodes being used.

In The Electrician of April 12th we described the series of oil-immersed starters for squirrel-cage motors put on the market by The English Electric Co., Ltd., Queen's House Kingsway, London, W.C.2. The company has now introduced a line of oil-immersed stator-rotor starters for slip-ring motors, known as "Class OSR." The starters are ironclad and weatherproof, and suitable for floor or wall mounting. Starting and protection are catered for by one complete unit. A handwheel operates both the stator switch and the rotor drum, whilst the handwheel cannot be left in any position between "off" and "full on," at the same time complete "free-handle" freedom is provided for releases to operate in any position required. Interlocking with slip-ring short circuiting gear can be fitted if required. A large opening in the right-hand side of the starter is ordinarily covered by a steel plate with three wood bushes for cables. The bushes can be replaced by conduit glands when required. For use with armoured cable a special box with openings on all sides is fitted over the steel plate. The necessary bonding glands can be secured to any of the openings, the remaining apertures being covered by steel plates. The box has filling plugs for use when it is desired to seal the cable ends. The main advantages of the arrangement for cables are that the cable can be led to the starter from what is determined—after the starter is on site—to be the most convenient direction, and that it is not necessary to fix cable sizes before delivery of the starter.

The London Electric Firm, Brighton Road, Croydon, has introduced a small searchlight projector mounted on a tripod with extensible legs which is for use in prospecting work in connection with mining. It will be noticed, from our illustration, that tilting and training motions are provided, the manipulation being facile. The tripod is very rigid and will extend sufficiently to bring the centre of the light just over 6 ft. from ground level. The lamp is arranged for taking 12/14 V bulbs fed from a small accumulator in wood case, and the equipment can be carried by one man.

The "Helsby" twin wiring system is dealt with in a new brochure published by British Insulated Cables, Ltd., Prescot, Lancs. Leaflet P.F. 57, devoted to "Prescot" lead joint boxes, and replacing P. 233, has also been published. Another new issue is H. 117, describing Leclanché batteries and replacing H. 89.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

AYRSHIRE EDUCATION COMMITTEE.—Electrical work in connection with new school at Heathfield, Ayr. Particulars from Mr. William Reid, Education Offices, Ayr.

BRIGHTON CORPORATION, October 11th.—Supply of gas-filled lamps, for street lighting, for one year. Specification, etc., from the Engineer and Manager, Electricity Works, North Road, Brighton.

SALTCOATS CORPORATION, October 11th.—Electric light installations in 16 houses on Canal Bank, Canal Street, and 20 at Guthrie Road. Schedule (No. 7) from Messrs. Hugh Thomson and Sons, 60, Hamilton Street, Saltcoats.

STOKE-ON-TRENT CORPORATION, October 11th.—Electric light wiring and fittings, etc., in 65 houses on Vivian Road housing site, Fenton. Particulars from the City Surveyor, Town Hall, Stoke-on-Trent; deposit £1.

Church Lighting in Wales.

ST. MARY'S CHURCH, YSCEIFIOG, HOLYWELL, October 12th.—Electric light installation. Particulars from the Rev. T. Richards, The Rectory, Ysceifiog, near Holywell.

CARLISLE EDUCATION COMMITTEE, October 14th.—Electric light installation in Open Air School, Newtown. Specifications can be seen at the office of the Surveyor, 18, Fisher Street, Carlisle.

CLUTTON GUARDIANS, October 14th.—Electric light installation at the Institution. Specifications, etc., from Mr. J. Wayne Morgan, 9, Mount Stuart Square, Cardiff; deposit £2 2s.

EDINBURGH PARISH COUNCIL, October 14th.—Electric light and power installations at Craigleith Hospital. Schedules from Mr. J. M. Johnston, 47, Charlotte Street, Leith.

SHEFFIELD CORPORATION, October 14th.—Maintenance of private telephone and bell installations at the Lodge Moor, Winter Street, Crimicar Lane and Commonside Hospitals for 12 months. Form of tender from the Clerk and Steward, Lodge Moor Hospital.

MANCHESTER GUARDIANS, October 15th.—Supply of electric lamps. Forms of tender from the clerk, Mr. F. W. Greenhalgh, Union Offices, All Saints', Manchester.

BELFAST CORPORATION, October 21st.—Supply of circulating water pipes, for the electricity department. Specification (W.97) from Mr. F. H. Whysall, city electrical engineer and general manager, East Bridge Street, Belfast; deposit, £2 2s.

CARDIFF CORPORATION, October 21st.—Supply and erection of (1) water-tube boiler and mechanical stokers; and (2) fuel economiser. Specification, etc., from the City Electrical Engineer, Central Offices, The Hayes, Cardiff. Only contractors on the King's National Roll are invited to tender.

GLASGOW PARISH COUNCIL AND DISTRICT BOARD OF CONTROL, October 21st.—Six months' supply of electrical fittings to the institutions and offices. Form of tender (No. 62) from Mr. M. A. Reynard, inspector and clerk, 266, George Street, Glasgow, C.1.

STAINES RURAL DISTRICT COUNCIL, October 21st.—Construction of sewers and electrical and other equipment for pumping stations. Specification, etc., from the Engineer, Council Offices, London Road, Ashford, Middlesex.

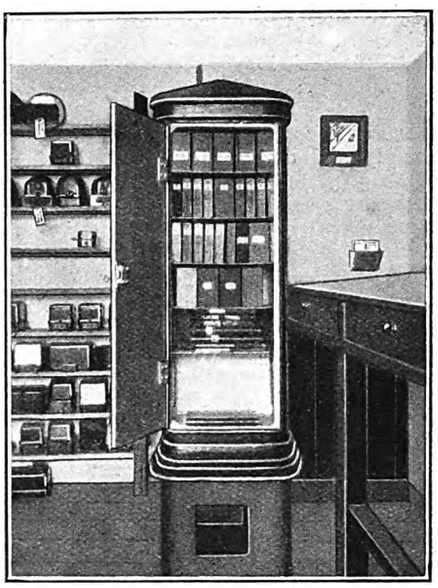
CLACKMANNAN MATERNITY AND CHILD WELFARE COMMITTEE, October 22nd.—Electrical installation in connection with additions and alterations at Alloa Day Nursery. Tenders to Mr. J. Reed, 2, Candleriggs, Alloa.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., October 22nd.—Supply of electric cable and wire. Forms of tender, etc., from the Controller of Supplies, H.M. Office of Works, etc., King Charles Street, Westminster, London, S.W.1.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 22nd.—Twelve months' supply of electric cables. Further particulars from the Electrical Engineer, Penrose Street, Walworth Road, London, S.E.17.

HASTINGS CORPORATION, October 23rd.—(*a*) 22 000 V, three-phase overhead lines and underground cables, Crowhurst section, No. 7 (about 7 000 yds.); (*b*) 400 V, three-phase, 4-wire, overhead lines and underground cable, Crowhurst section, No. 7 (about 4 200 yds.); (*c*) 400 V, three-phase, 4-wire, overhead lines and underground cable, Whatlington Road section, No. 8 (about 1 000 yds.). Specifications (deposit £1 1s. for each) from Mr. A. J. Ryan, borough electrical engineer.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, October 25th.—One 130 ton, 4-motor, electric, engine room crane, one 15-ton 3-motor, electric, auxiliary bay crane, and one 10 ton, 3-motor, circulating pump house crane, at Ironbridge power station. Specification (No. 6) from Mr. E. F. Hetherington, chief engineer and manager; deposit £1 1s.



ACCORDING to Mr. T. S. Shenton, chief engineer of the Rugby Electricity Department, this "Henley" pillar was in use on a 2 000 V feeder system 26 years ago, and, after having served its purpose on the mains, is now doing excellent service in the meter room as a fireproof cupboard for the meter books. As may be seen from the photograph, it has been fitted with iron shelves. The bottom is filled in with 3 in. of granolithic concrete, and the ventilating space between the dome top and the pillar walls is packed with asbestos yarn.

STAFFORDSHIRE EDUCATION COMMITTEE, October 31st.—Electric light installation in two new elementary day schools in Brettell Lane, Brierley Hill. Specification from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

CENTRAL ELECTRICITY BOARD, November 9th.—Supply and erection of overhead 33 000 V transmission lines in South Lincolnshire, in connection with Mid-East England scheme. Specification (No. M.E.E.—S.L.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

EAST RETFORD CORPORATION, November 19th.—Electrically driven centrifugal borehole pump (60,000 gall. per hour). Specification from Mr. S. O. Pacey, Gas and Water Electricity Offices, East Retford; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH INDIAN RAILWAY CO., LTD., October 11th.—Overhead contact and distribution lines, in connection with electrification of Madras suburban services. Specifications (10s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

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EGYPTIAN MINISTRY OF THE INTERIOR, October 15th (extension of time).—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B. 5 674.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Supply of B.P.O. type resistances. (No. P. and T., 151/1 712.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 15th.—Condensers (P. and T. 151/1 733). (Reference B.X. 5 602.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 15th.—Seven 5 500 kVA single-phase auto-transformers, with accessories, for Waitaki power scheme. (Reference B.X. 5 417.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 15th.—Switchboard instruments, test plugs and sleeves (schedule C. 472). (Reference B.X. 5 541.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE.—October 15th.—Telephone jacks (schedule No. C. 488). (Reference B.X. 5,695.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type resistances. (Reference B.X. 5 551.)

WELLINGTON POSTS AND TELEGRAPHS DEPARTMENT, October 15th.—Supply and delivery of B.P.O. type retardation coils. (Reference B.X. 5 552.)

CAPE TOWN MUNICIPALITY, October 16th.—Supply of paper insulated cables (specification No. 474). (Reference B.X. 5 640.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 16th.—Electric motors, pumps, filters, and artesian well. (Reference A.X. 8 373.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic wall and table telephones. (Reference B.X. 5 509.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 16th.—Automatic telephone dials (P. and T. 151/1 734.) (Reference 5 605.)

JOHANNESBURG MUNICIPALITY, October 17th.—Tramcar motors (contract No. 253). (Reference B.X. 5 664.)

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Turbo-alternators, steam piping, crane and switchgear (contract 52). (Reference B.X. 5 607.)

SALISBURY (S. RHODESIA) MUNICIPALITY, October 17th.—Supply of h.t. cables, transformers and sundries, in connection with extensions of the electricity undertaking (contract 53). (Reference B.X. 5 604.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 17th.—One 10-ton electric overhead travelling crane (tender No. 1 533) (Reference A.X. 8 463.)

ROUMANIAN GENERAL POST OFFICE, October 18th.—Supply of 31 500 kilos of 3 mm. h.d. copper wire. (Reference A.X. 8 551.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 21st.—Supply of switchboard cords (P. and T. No. 151/1813). (Reference B.X. 5 715.)

WELLINGTON CORPORATION, October 21st.—High and low tension switchgear (contract No. 449). (Reference B.X. 5 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Supply of insulated wire (schedule C. 475). (Reference B.X. 5 580.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Telephone transformers (schedule C. 474). Reference BX. 5 581.)

VICTORIAN RAILWAY COMMISSION, October 23rd.—Dry-core telephone cable (contract No. 43 384). (Reference B.X. 5 638.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of time switches, with automatic astronomical dial, electrical operation and winding, for street lighting use (contract No. 263). (Reference B.X. 5 709.)

JOHANNESBURG MUNICIPALITY, October 26th.—Three-phase, 6 600 V, draw-out truck type switchboard panels, suitable for installation as single panels or coupled to form a multiple panel switchboard (contract No. 262). (Reference B.X. 5 710.)

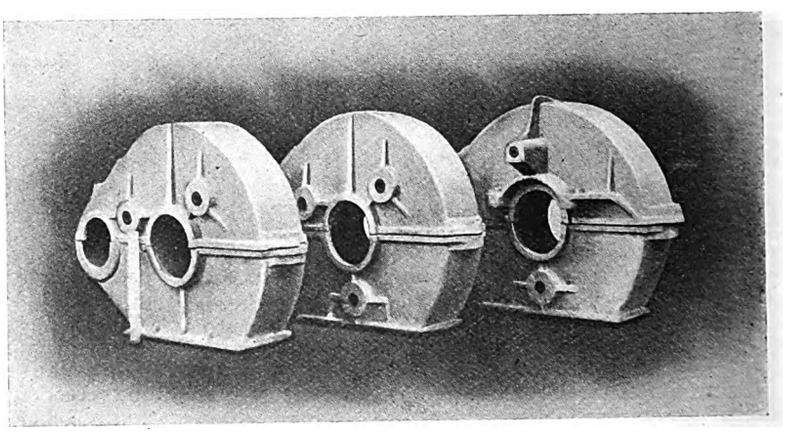
DUBLIN UNITED TRAMWAYS CO. (1896), LTD., October 28th.—Twelve months' supply of electric lamps and fittings, etc. Forms of tender (2s. 6d.) from the Company's Offices, 59, Upper O'Connell Street, Dublin.

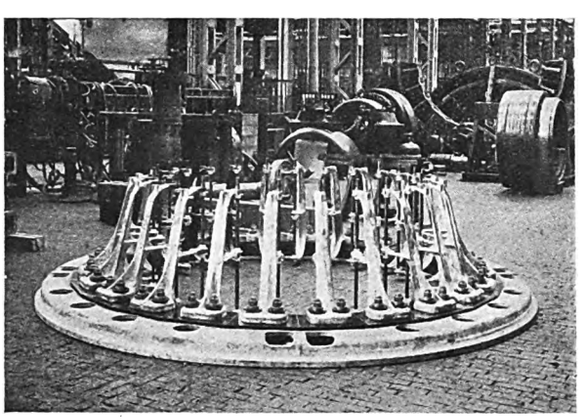
NEW SOUTH WALES GOVERNMENT RAILWAYS, October 29th.—Railway traction motor testing equipment, comprising electric motor, booster, main field excitation generator and short field exciter (quotation No. B.E. 508). (Reference B.X. 5 693.)

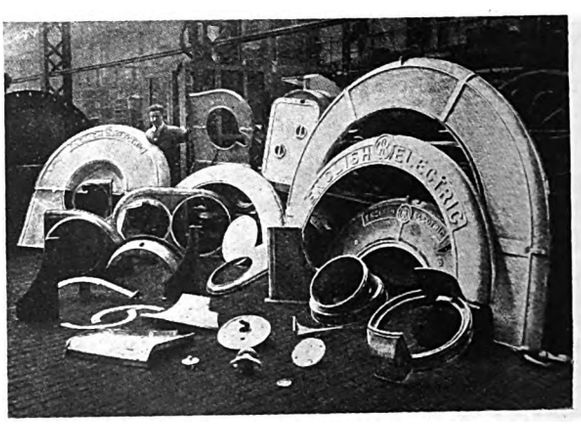
MELBOURNE CITY COUNCIL, October 30th.—Two 2 500 kW motor-convertors and accessories, or two 2 500 kW rotary

LIGHT ALLOYS.

THESE illustrations, reproduced from "Light Alloys in Industry," by courtesy of the British Aluminium Co., Ltd., show interesting electrical applications of these alloys. To the right are gear cases for traction motor reduction gears cast in "Wilmil" light alloy. Below are (left) brush-holder arms and supporting ring for a 4 000 kW rotary convertor, and (right) turbine end brackets, all cast in aluminium alloy.







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convertors, with transformers and accessories. (Reference B.X. 5 570.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 30th.—Head receivers (P. and T. 151/1/725.) (Reference V.X. 5 603.)

JOHANNESBURG MUNICIPALITY, October 31st.—Outdoor type 3-phase and single-phase transformers (contract No. 266). (Reference B.X. 5 736.)

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Distribution pillar shells and link units and cable sealing ends. (Reference B.X. 5 682.)

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Low tension porcelain insulators, etc. (Reference B.X. 5 648.)

EGYPTIAN DEPARTMENT OF PUBLIC HEALTH, November 5th.—Twelve months' supply of electrical refrigerators.

NEW ZEALAND POSTS AND TELEGRAPHS, November 12th.—Four-conductor telephone operators' cords. (Reference B.X. 5 685.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 12th.—Supply of 15 kW generating set for installation on the "Maui Pomare" (tender No. 369). (Reference B.X. 5 683.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Transmitters and associated parts (schedule C. 477). (Reference B.X. 5 653.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Receivers and associated parts (schedule C. 477). (Reference B.X. 5 656.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 14th.—Supply of 400 000 lb. of hard drawn copper wire, 2 000 lb. of soft drawn copper wire and 2 000 lb. of soft drawn tinned copper wire (tender No. 173). (Reference A.X. 8 510.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 18th.—Resistance spools (P. and T. 151/1832). (Reference B.X. 5 716.)

EGYPTIAN MINISTRY OF THE INTERIOR, November 19th.—Supply of 160 H.P. Diesel-electric generating set for Manfalout power station (Assiut Province). (Reference B.X. 5 720.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 19th.—Telephone transformers (P. and T. No. 151/1807). (Reference B.X. 5 718.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 19th.—Automatic wall and table telephones (P. and T. No. 151/1825). (Reference B.X. 5 717.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Supply of telephone generators and motor generators (schedule No. C. 479). (Reference B.X. 5 662.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Motor generators (schedule C. 486). (Reference B.X. 5 694.)

MELBOURNE CITY COUNCIL, November 27th.—Totally-enclosed, metal-clad, 6 000 V, three-phase switchgear (specification No. 1 000). (Reference B.X. 5 708.)

MELBOURNE CITY COUNCIL, November 27th.—Supply of 600 V d.c. switchgear (specification No. 1 001). (Reference B.X. 5 734.)

VICTORIAN RAILWAY COMMISSION, November 27th.—Supply of automatic oil switches (contract No. 43 411). (Reference B.X. 5 735.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General for Western Australia, Savoy House, Strand, London, W.C.2.

INDIAN STORES DEPARTMENT, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

VICTORIAN ELECTRICITY COMMISSION, December 16th.—Oscillographic equipment (specification No. 29/115). (Reference B.X. 5 692.)

Tenders Accepted.

HOLYWOOD COUNCIL.—Johnson and Phillips, Ltd., cable and transmission line work.

WAR OFFICE.—Edison Swan Electric Co., Ltd., supply of vacuum and gasfilled lamps.

H.M. OFFICE OF WORKS.—R. Langston, Jones and Co., wiring Ministry of Labour Training College, Slough.

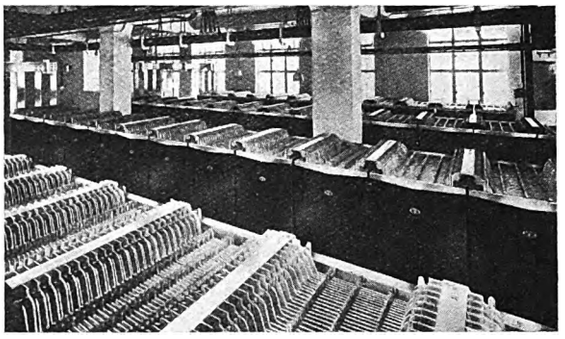
H.M. OFFICE OF WORKS, ETC.—Supply, etc., of switchgear: National Physical Laboratory, English Electric Co., Ltd.

RUGBY URBAN DISTRICT COUNCIL.—W. T. Henley's Telegraph Works, Ltd., cable, etc., for Barby Road, extension, £1 068 10s.

BATTERSEA (LONDON) BOROUGH COUNCIL.—Babcock and Wilcox, Ltd., "Bailey" cooling walls for two boilers, £2 500. (Recommended).

LONDON COUNTY COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., one rotary convertor, with supervisory control at tramway sub-stations, £5 568.

BARKING URBAN DISTRICT COUNCIL.—Siemens Bros. and Co., Ltd., supply and laying of cable from Axe Street to sewage works, £2 779 3s. (Recommended.)



THE "Alton" batteries at the National automatic telephone exchange which was recently cut into commission. *See paragraph on page* 434.

IRISH FREE STATE DEPARTMENT OF LOCAL GOVERNMENT.—Sphinx Electric Supplies (Ireland), supply of street, house lighting and automobile lamps for 1929–1930.

STOKE-ON-TRENT CORPORATION.—J. H. Bates and Son, electric wiring of St. Paul's Church clock, Burslem, £4 15s., and supply of automatic time switch, £7 10s.

LEICESTER CORPORATION.—Electric Construction Co., Ltd., supply and erection of rotary convertors, transformers, control gear, etc., at Lero power station, £4 198 10s.

MARKET DRAYTON URBAN DISTRICT COUNCIL.—Market Drayton Electric Light Co., public lighting by 100 or more lamps from September to April next, £3 10s. per lamp.

MAIDENHEAD CORPORATION.—Hewittic Electric Co., Ltd., rectifier plant for sub-station, £1 231 10s.; Drake and Gorham (Wholesale), Ltd., extra high pressure switchgear, £68.

BRADFORD CORPORATION.—Electrical improvements at Kirkgate market, £295 15s., plus 10% for departmental charges and £196 for fittings.

SALFORD CORPORATION.—E. M. Evans and Sons, Ltd., maintenance of intercommunication telephones in Town Hall and Education Offices, for 5 years, £90. (Recommended).

MAIDSTONE EDUCATION COMMITTEE.—Corporation Electricity Department, electric light installation at Union Street School, £90. Five tenders received; highest £202 11s.

KILKENNY COUNTY COUNCIL.—M. E. Kent, electric lighting and heating of Thomastown courthouse; Keatinge and Gaule, electric lighting and heating of Callan courthouse.

EPSOM GUARDIANS.—Alpha Manufacturing and Electrical Co., for electric light installation in a portion of the Institution, including board room, chapel, dining hall, and kitchen, £114.

LEEDS CORPORATION.—Cables: W. T. Henley's Telegraph Works Co., Ltd., £2 015; Enfield Cable Works, Ltd., £2 718; Macintosh Cable Co., Ltd., £3 090; Hackbridge Cable Co., Ltd., £687.

IRISH FREE STATE DEPARTMENT OF LOCAL GOVERNMENT.—Siemens Electric Lamps and Supplies, Ltd. (Dublin Branch), six months' supply of Siemens' standard lighting lamps and automobile type lamps.

CENTRAL ELECTRICITY BOARD.—Tees Bridge and Engineering Co., Ltd., manufacture and galvanising of the whole of the steel structural work (about 6 000 tons) in connection with Mid-East England electricity scheme.

KETTERING URBAN DISTRICT COUNCIL.—Works and supplies in connection with supply to Pytchley and Warkton: Gabriel, Wade and English, poles, £206; British Electric Transformer Co., Ltd., two transformers £132.

WICKLOW URBAN DISTRICT COUNCIL.—I.F.S. Electricity Supply Board, public lighting of town for current season, £205. Wicklow Gas Co. tendered for 3 years at £150 p.a., two years at £170; to March 31st next at £220.

BARKING URBAN DISTRICT COUNCIL.—New Switchgear Co., Ltd., two truck-type cubicles for Upney sub-station,

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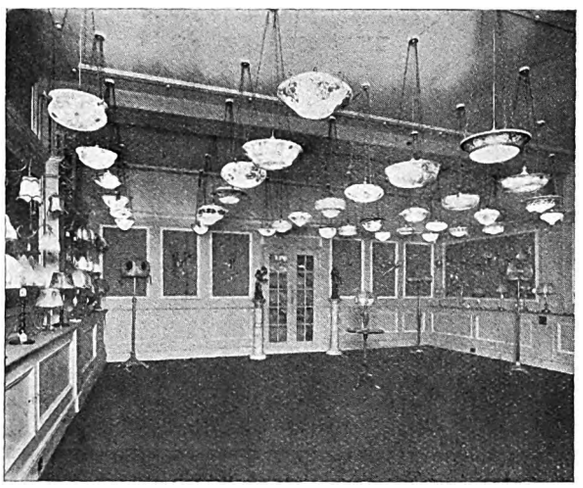
£176, and two for the works of Warne and Co., £176; Siemens Bros. and Co., Ltd., 3 300 yds. of cable for public lighting at the bye-pass road.

INDIAN STORES DEPARTMENT.—Greaves, Cotton and Co., generating set, R. 6 850; General Electric Co. (India), Ltd., ceiling fans, R. 2 658, and meters R. 1 326; W. T. Henley's Telegraph Works Co., Ltd., cables, R. 1 571; Siemens (India), Ltd., meters, R. 1 022.



A GENERAL view of the lighting fittings showrooms of Lighting Trades, Ltd., at Oriel House, Farringdon Street, London, E.C.4. *See paragraph on page 434.*

STOKE-ON-TRENT CORPORATION.—E. Green and Co., Ltd., replacement of two economisers for water tube boilers at central power house, £5 262. Stirling Boiler Co., Ltd., replacement of four superheaters for water tube boilers at central power house, £1 243.

GENERAL POST OFFICE.—Batteries: Blackburn Telephone Exchange, Chloride Electrical Storage Co., Ltd.; Radio Equipment, London Repeater Station, Standard Telephones and Cables, Ltd.; Telephone Exchange Equipment, Hounslow, Automatic Telephone Mfg. Co., Ltd.

GENERAL POST OFFICE.—Electric lighting—Paddington District Post Office, Alpha Mfg. and Electrical Co., Ltd.; telephone exchange equipment—Scotstoun (Glasgow), Ericsson Telephones, Ltd.; Wembley, Automatic Telephone Mfg. Co., Ltd.; Whitehall, Siemens Bros. and Co., Ltd.

LIVERPOOL CORPORATION.—Tramway special trackwork: Parker Street and Church Street Junction, E. Allen and Co., Ltd., £1 530; Castle Street and Water Street Junction, Edgar Allen and Co., Ltd., £1 270; Church Street and Lord Street intersection, Titan Trackwork Co., Ltd., £580. (All recommended.)

MANCHESTER EDUCATION COMMITTEE.—Mather and Platt, Ltd., motor generator; and Albert Loudon, electric light installation at Central High School for Boys; John Adams, Ltd., electric lighting installation at Cooke Street domestic centre; Jackson Electric Stove Co., Ltd., electric cooker for Soss Moss Special School.

BRADFORD CORPORATION.—A. Reyrolle and Co., Ltd., earthing resistance, for generator at Valley Road power station; British Thomson-Houston Co., Ltd., six sets of current-limiting reactors, for Valley Road power station; H. Taylor and Co., Ltd., electric lighting at Bolling Hall school. £836. (All recommended.)

MARYLEBONE (LONDON) BOROUGH COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., and British Electric Transformer Co., Ltd., 12 months' supply of transformers; A. Reyrolle and Co., Ltd., 12 months' supply of switchgear; Chamberlain and Hookham, Ltd., and Ferranti, Ltd., 12 months' supply of meters. (All recommended.)

ROTHERHAM CORPORATION.—Callender's Cable and Construction Co., Ltd., supply of 4 000 yds. of e.h.t. cable, £3 149 19s. Heating at High School for Girls: Young, Osmond and Young, Ltd., Unity tubular electric heaters, £70 2s. 3d.; Ibbotson Bros. (Rotherham), Ltd., wiring and installation, £22. (All recommended.)

MANCHESTER CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply of 5 kW motor-generator, with control gear; Callender's Cable and Construction Co., Ltd., maintenance of 33 kV feeder cables; Metropolitan-Vickers Electrical Co., Ltd., supply of supervisory control gear; Alfred Herbert, Ltd., pulverised fuel boosting plant at Stuart Street Station.

BARKING URBAN DISTRICT COUNCIL.—A.C.E.C., supply of cable, £1 809. (Recommended.) Also tendered: Power and Lighting Cables, Ltd., £1 953; Enfield Cable Co., Ltd., £2 035; W. T. Glover and Co., Ltd., £2 066; Callender's Cable and Construction Co., £2 071; Hackbridge Cable Co., Ltd., £2 075; Pirelli-General Cable Works, Ltd., £2 075; Siemens Bros. and Co., Ltd., £2 096; Union Cable Co., Ltd., £2 101; Standard Telephones and Cables Co., Ltd., £2 109; Johnson and Phillips, Ltd., £2 116; W. T. Henley's Telegraph Works Co., Ltd., £2 120.

WEST HAM CORPORATION.—Harland and Wolff, Ltd., electric lighting of Plaistow Secondary School extension, £570. (Recommended). Also tendered: Telephone and Electrical Maintenance Co., £1 185; General Electrical Maintenance Co., £1 138; Rely A. Bell Co., £1 047; Distributors (British Electrical), Ltd., £870; West Ham Corporation Electricity Department, £800; General Installation Co., Ltd., £775; "Servu" (Cameron and Graves), £740; S. Taylor and Sons, £725; Alpha Mfg. and Electrical Co., Ltd., £688; M. J. T. Thomas and Co., £665; C. H. Simmonds, £660.

LONDON COUNTY COUNCIL.—British Thomson-Houston Co., Ltd., supply and installation of eight rotary convertors at tramways sub-stations, £23 902 (accepted in part); Metropolitan-Vickers Electrical Co., Ltd., £23 802 (accepted in part). Also tendered: Bruce Peebles and Co., Ltd., £23 802; English Electric Co., Ltd., £23 802; General Electric Co., Ltd., £23 802; Mather and Platt, Ltd., £23 802; A. Reyrolle and Co., Ltd., £23 802; Electric Construction Co., Ltd., £24 090; Crompton Parkinson, Ltd., £26 242; Oerlikon, Ltd., £27 526; (alternative), £29 530; Harland Engineering Co., Ltd., £28 041; Electric Motor and Transformer Co., £29 582; British Brown-Boveri, Ltd., £34 152; Hewittic Electric Co., Ltd., £39 084. Two last mentioned tendered for mercury arc rectifiers.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—Supply of cables: Enfield Cable Works, Ltd., 0·01 sq. in. twin, 5 000 yds., £575; 0·0145 sq. in. four core, 1 000 yds, £208; 0·15 by 0·08 by 0·15 three-core, 1 500 yds, £810; 0·05 sq. in single, 1 400 yds., £233; 0·8 sq. in. single, 700 yds., £81. (Recommended.) Also tendered: Pirelli General Cable Works, Ltd., £583, £211, £825, £235 and £82; Macintosh Cable Co., Ltd., £584, £212, £823, £238 and £82; Callender's Cable and Construction Co., Ltd., £588, £212, £827, £239 and £82; Siemens Bros. and Co., Ltd., £592 £214, £834, £240 and £83; Union Cable Co., Ltd., £594, £215, £836, £241 and £84; British Insulated Cables, Ltd., £595, £215, £836, £241 and £84; W. T. Glover and Co., Ltd., £600, £217, £845, £244 and £85; W. T. Henley's Telegraph Works Co., Ltd., £600, £216, £847, £245 and £84.

GLASGOW CORPORATION.—T. B. and J. A. Mathieson, Ltd., electrical work at new baths and washhouses; Fraser and Bothwick, Ltd., additional battery charging plant at refuse destructor garage, Govan, £19 443, and overhead charging feeder system, £349; A. Anderson, Ltd., ground lighting installation at Mearnskirk Sanatorium, £3 358 (subject to £101 included for day work and contingencies). Electric wiring in connection with housing schemes. Shettleston and Tollcross, R. J. M'Intyre, £396; Saracen Street, No. 2, R. J. M'Intyre, £809; Quarrybrae Street, R. J. M'Intyre, £1 355; Altyre Street, D. Henderson, £651. Manganese steel points, Edgar Allen and Co., Ltd.; pinions for 49b. equipments, W. C. Yuille and Co., Ltd.; ⅝ in. insulated bolts, British Insulated Cables Ltd.; storage battery for Bearsden sub-station, Hart Accumulator Co., Ltd.; armature coils, Dyer and Young, Ltd.; wire, Callender's Cable and Construction Co., Ltd.; car seats (150 sets), Bennet Furnishing Co., Ltd.

NEW ANGLO-BELGIAN CABLE.

Important Order for British Manufacturers.

We understand that Siemens Brothers and Co., Ltd., Woolwich, have received an order for a duplicate of the Anglo-Belgian telephone cable which they made and laid in 1926. The new cable will be of the 7-quad type, and the route will be Canterbury and Dumpton Gap to La Panne.

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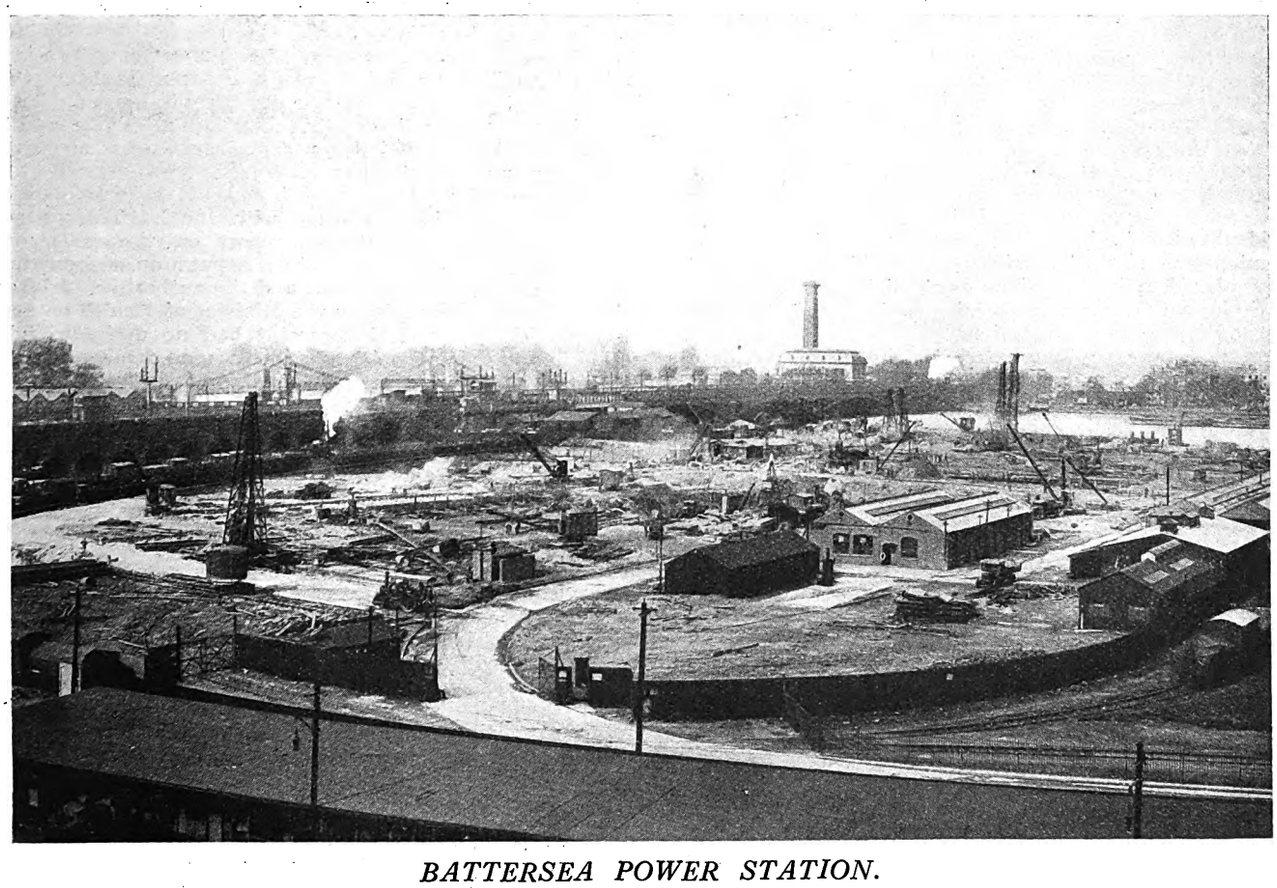
ELECTRICAL INVENTIONS.

Some of the Novelties Shown at the Exhibition of Inventions.

THE exhibits at the fifth International Exhibition of Inventions, which was opened by Lord Askwith, president of the Institute of Patentees (the promoters of the exhibition), last week, at the Central Hall, Westminster, are more numerous than on any former occasion, and while mainly British, include inventions which have come from the United States, several European countries and China. The following are amongst the new inventions: An electric iron, incorporating an audible warning device, consisting of a buzzer which continues to buzz while the current is on and the iron is not in use. It can be connected to a lampholder or wall plug in the ordinary way and the additional current consumption is said to be almost negligible when compared with similar irons of ordinary type, while a fault in the buzzer does not affect the use of the iron (catalogue No. 121). An electric iron which switches off automatically if left unattended in the ironing position (No. 141). A motor-car clock, incorporating an automatic lighting switch, is also shown, and this can be set to operate the lighting system of a car at any desired time, e.g., during the driver's absence (No. 213). An electrical device to cut off the magneto of a motor vehicle and operate an alarm if an unauthorised person attempts to start the engine (No. 243). Another device to prevent motor-car stealing cuts off the petrol supply and self-starter. Movement of the latter or release of the brake sets the horn sounding (No. 277). Immersion heater for motor car radiators (No. 282). Combined loud speaker and reading lamp. The loud speaker is over the lamp, in the shade (No. 304). Device, involving the use of Neon lamps, to indicate when current is flowing in a circuit (No. 306). Private portable telephone which can be used on the house bell wiring system (No. 307). Automatic electric lock. This works on an ordinary 2V battery, and is very simple in construction, the bolt being held in position by a canted lever operated by two springs (No. 308). Electric lamp locking device (No. 310). Improvements in thermionic valve circuits (No. 311). Door bolt opened electrically. This can be operated from a distance, and a bell is rung at the same time if desired (No. 412). Door bolt operated either in the ordinary way, or electrically by means of switch or push button (No. 414). A hand egg tester. This consists of small electric lamps held between the fingers. Mr. Donald J. Cook, of Holt, Norfolk, is the patentee (No. 520). Desk or table appliance for lighting cigars, cigarettes, etc., adaptable for battery and coil or magneto ignition (No. 523). Device for holding telephone earpiece, leaving the hands free (No. 543).

In the trade section, the exhibitors include Four-Edge Safety Razors, 24, John William Street, Huddersfield, who show electric lamp locks; St. James's Electrical Co., 20, St. James's Square, London, S.W.1, electric mains, bells for fire alarms, etc.; Tellus Super Vacuum Cleaner, Ltd., 68, Victoria Street, London, S.W.1, vacuum cleaners of various sizes of the "non-bag" type. Model M, for household use, has a loading of 113·5 W; G. S. Walliker and Son, 22, Aeroville, Booth Road, Hendon, illuminated advertising letters and pictorial signs; Illuminated Road Signs, Windsor House, Victoria Street, London, S.W.1, traffic control and other signs; W. R. Patents, Ltd., Great Wilson Street, Leeds, "Ringrose" gas operated electric cut-outs, and system of electric lighting for gassy mines; O. Overbeck, Chantry House, Deansgate, Grimsby, medical electrical instruments for home use; Neophone Engineering Co., 9 and 10, Little St. Andrew Street, St. Martin's Lane, London, W.C.2, seamless vulcanite core diaphragms for wireless loud speakers. These are said to contain 70% pure rubber; Southend and District Light Supply Co., Ltd., 217, London Road, Southend, S.O.S. safe alarm. An important feature of this is a metal ball which is placed on a cone in a chamber at the top of the cabinet. When the ball is dislodged by any movement and touches contacts fitted around the inside of the chamber, a bell rings continuously.



BATTERSEA POWER STATION.

A GENERAL view of the site of the much criticised power station of the London Power Company at Battersea, taken from the south side looking across the Thames. The station was approved and selected by the Central Electricity Board in 1928, as an integral feature of the adopted South East England Electricity Scheme. In spite of the assurances given by the Power Company, and published in THE ELECTRICIAN *of May 17th last, that the station will incorporate new methods of flue gas treatment, opposition is still being put forward by the Westminster City Council and others, on the ground that the emission of sulphur fumes would be a danger to public health. Meanwhile, as the picture shows, the work of erection is being continued.*

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ELECTRICITY SUPPLY.

Bermondsey's New Power Station—Lancaster's Extended Supply Area—Assisted Wiring at Portland—Cheap Supply for Potteries—Boston and District Extensions—The Battersea Power Station—Marylebone Plant Extension.

BARKING U.D.C. seeks sanction to borrow £2 682 for wiring houses on the Eastbury Estate.

The supply at Hungerford has been switched over to the bulk supply of the Wessex Electricity Co.

Portsmouth Corporation is seeking an Order to authorise a supply of electricity for the parish of Hambledon.

Carlisle R.D.C. has given consent to a Special Order applied for by the City Council to supply the area of the R.D.C.

Cannock U.D.C. is to spend £1 086 upon cable extensions and street lamps at Pye Green and Old Hednesford Road.

The Central Electricity Board has purchased from Leicester Corporation a site of about an acre for the erection of a station.

Kingston-on-Thames T.C. has received sanction to a loan of £41 678 for the installation of additional plant.

Scalby and Filey District Councils have intimated to Scarborough T.C. that they will not consent to the erection of overhead lines in their districts.

Retford R.D.C. has declined to consent to the erection of overhead lines in a portion of its area by the Nottinghamshire and Derbyshire Electric Power Co.

Bermondsey (London) Electricity Committee has decided that the official opening of the new power station by the Mayor shall take place on October 26th.

The Electricity Commissioners have suggested to Lancaster Corporation that the proposals for an extension of area of supply should be considerably modified.

Glasgow Corporation proposes to take over from the Clyde Valley Electrical Power Co. the distribution of electricity in the Shettleston and Tolcross area at the end of the present year.

Hastings R.D.C. is to make representations to the T.C. with a view to obtaining a reduction in charges for current outside the borough, which are 8d. for lighting, and 2d. for power.

Birkenhead Electricity Committee is seeking sanction to borrow £2 500 for overhead lines; £4 000 for short lengths of feeders, etc.; £2 000 for sub-station equipment, and £1 500 for small static sub-stations and kiosks.

Chesterfield T.C. has approved a reduction of the charge for current for ordinary lighting to 3¾d. per kWh, bringing the whole of the charges down to pre-war rates.—The mains are to be extended for general supply in the Old Brampton area.

Maidenhead T.C. has given approval to improvements and extensions of the electricity undertaking estimated to cost £8 364. The items include extra high pressure feeder, pilot cable, a brick-built sub-station with a 96 kW rectifier plant, and four steel kiosk stations.

Domestic apparatus connected to the Ilford mains to March 31st, 1929, amounted to nearly 29 000 kW, including cookers, 4 931 kW; irons, 1 868 kW; kettles, 1 440 kW; motors, 6 854 kW; radiators, 11 960 kW; and smaller amounts for various other appliances.

Portland Electricity Committee has fixed the price for electricity at 8d. per kWh for lighting and 3d. for power and other uses. The Committee has decided that where consumers wish to take advantage of the deferred system of payment for wiring they must have a minimum of four points installed. The clerk is to write to wiring contractors asking for prices for wiring, according to a schedule.

Mr. C. H. Yeaman, city electrical engineer, Stoke-on-Trent, reports that five electric kilns are at work, which last year consumed 1 909 256 kWh at an average of 0·409d. per kWh, and that several further kilns are under negotiation.—In the all-electric houses in Avenue Road, Shelton, the average consumption per house has been during the past year, for lighting, 170 kWh, heating and cooking, 5 065, water heating, 3 006, at an average price of 0·71d.

In a recent address to the Cork Rotary Club, Dr. T. A. McLaughlin, managing director of the I.F.S. Electricity Supply Board, said from 65 to 80 million kWh of electricity were being provided by steam, gas or oil engines and used in the towns and villages to which the Shannon supply was being brought. The figure on which the experts based the economy of the Shannon scheme was 110 million kWh. It was quite obvious that the market possibilities far exceeded 110 million.

Leeds Improvement Committee has sanctioned a proposal of the Central Electricity Board to erect overhead cable from Kirkstall station to the city boundary in the direction of Wakefield.—The Electricity Committee recommends application for sanction to borrow £175 000 for services and £50 000 for assisted wiring.—The Health Committee has accepted the offer by the Yorkshire Electric Power Co. for the supply of current to Gateforth Sanatorium.

A public supply of current has recently been commenced in Long Sutton and Sutton Bridge, and the parishes of Fleet and Little Sutton. These districts are supplied from the Mount Bridge power station of the Boston and District Electric Supply Co., Ltd., by means of 11 000 V three-phase overhead lines, extensions from the Boston-Holbeach transmission line. Local distribution is at 400/230 V, 50 cycles. The whole of the public lighting at Holbeach has also been converted to electric, and the company is busy installing services and wiring houses and shops.

Croydon Electricity Committee has decided, in connection with further supplies required at the Post Office exchange and other premises in Surrey Street, to lay a three-phase e.h.t. main from Drummond Road sub-station to Surrey Street sub-station, at a cost of £1 800, including switchgear.—The Committee has obtained sanction to borrow £70 000 for buildings, civil engineering works and a concrete cooling tower, and £200 000 for generating plant.—The Committee recommends a special discount of 33% off the flat rate of 6½d. per kW, in the case of the off-peak demand by places of worship.

Bedford Electricity Committee agreed recently to an extension from Kempston to Wootton Pillinge of the existing 11 000 V supply, by means of an overhead line, to meet an increased demand by the London Brick Co. and Forders, Ltd., and for supply to the intervening rural area. The estimated cost of these works was £4 900. The company has now decided to instal 840 kW of additional plant, and to meet this further increase in the demand it will be necessary to lay a duplicate main from the generating station to Wootton Pillinge, and to provide additional transformers. The committee recommends the necessary works at a cost of £13 400.

The Mayor of Chelsea, as chairman of the special committee appointed in connection with the Battersea power station question, presented a report on the matter to Chelsea B.C. last week. He said a deputation, representing the borough councils concerned and the authorities of Westminster Abbey, were told by the Minister of Health on September 26th that the Government had no desire to take action in any scheme which was likely to do damage but the subject would raise the question of money already spent. Unless they were satisfied, on the advice of their chemists, that danger would be avoided, the scheme would not be proceeded with. The Minister of Transport also said he did not resent the agitation to which the scheme had given rise. He added that consent would not be given for the Fulham station unless the Office of Works and the Electricity Commissioners were satisfied that there would be no danger to health or to the buildings of London.

Marylebone (London) Electricity Committee seeks sanction for a loan of £50 000 for mains and services and transformer stations on consumers' premises.—The Commissioners, after consultation with the Central Electricity Board, have informed Marylebone B.C. that they are given to understand that a possible bulk supply is not at present available for the Council's growing requirements, that it would be prudent to proceed at once with the installation of the 25 000 kW turbo alternator set, etc., and that the Board is prepared to issue a direction in respect of the proposed extensions. The Commissioners have also expressd the hope that the Council will not raise any objection to the attachment to any consent of a condition which would place the Council under obligation to take the best-known precautions for the prevention of the emission of grit, etc., from the station. The Committee does not feel that the Council can take any further action until it has had an opportunity of considering the reports of the experts who have been appointed to advise on the matter.

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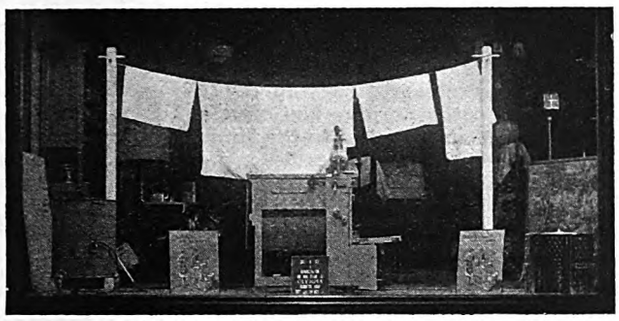
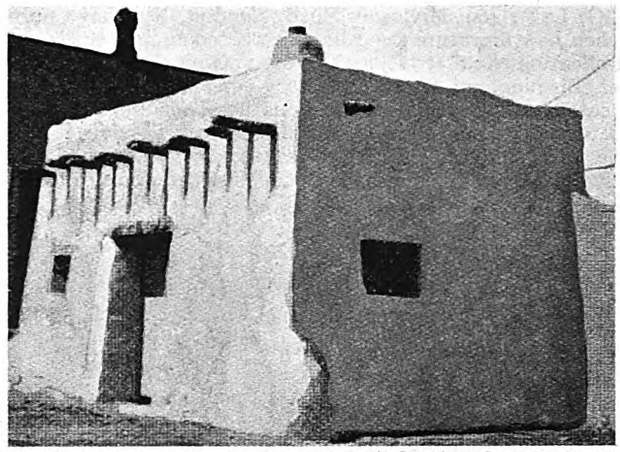
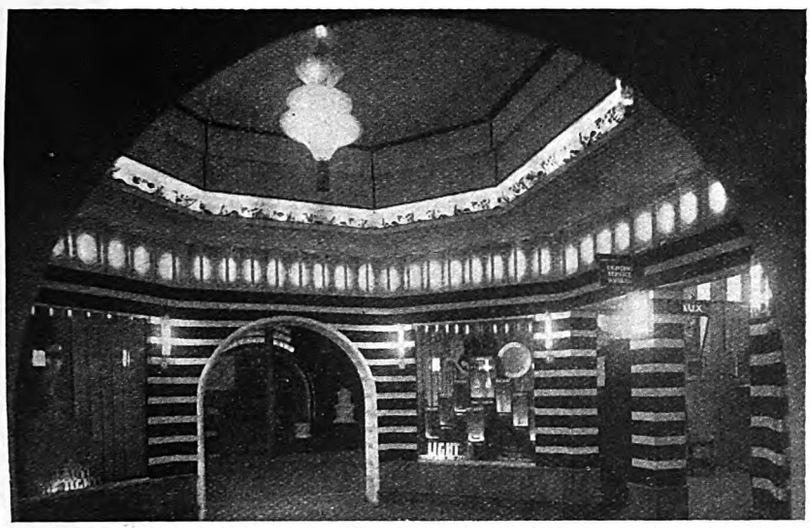
ELECTRICAL NEWS OF THE WEEK IN PICTURES.



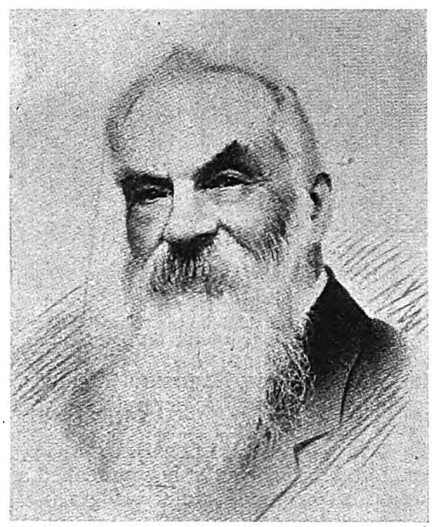
An electric washer display in the window of the Bradford Corporation Electricity Department, with specimens of washed but unironed laundry on a clothes-line between the two posts behind.



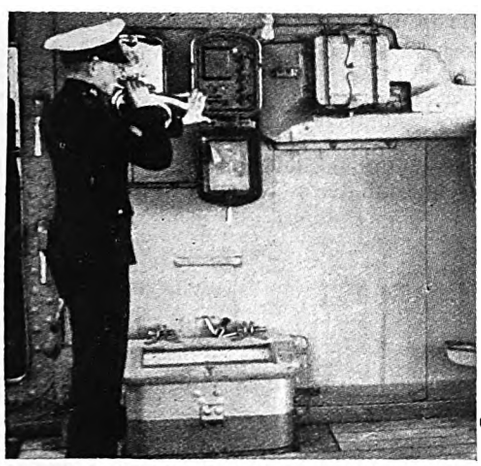
The new Barker sub-station of the Public Services Co. of Colorado presents the novel architectural idea shown above and follows studies of Indian pueblos in New Mexico and Arizona. Instead of a lawn, the building will be surrounded with specially planted desert vegetation. (Photo: "Electrical World.")



This general view of the Hall of Light of the Electric Lamp Manufacturers' Association at the North-East Coast Exhibition serves to remind us that the exhibition will close on October 26th, after a very successful run since the opening in May. Readers who have not yet visited this "Wembley of the North" should do so at the earliest opportunity, for chief among the many exhibits are those provided by the electrical industry.



This picture of Mr. W. Bannister, whose death is referred to on page 434, is reproduced from the framed portrait which was presented to him by the employees of the Chloride Electrical Storage Co., Ltd.



Sounding the "stand easy" in H.M.S. "Rodney." The vessel is fitted with special "public address" equipment involving 300 loud speakers, which provide communication with every deck and station. The bugler, here seen before one of the transmitters, is thus able to pass a command to all hands immediately he is instructed to do so.

A snapshot taken during the annual bowling match of the Electrical Contractors' Association of Scotland (East *v.* West), held on September 25th, on the bowling green attached to the Hall of the Royal Company of Archers, Edinburgh. Three rinks were played, and, as usual, the West were victorious, winning the match by two rinks to one. The visitors, after the match, were entertained to tea in the Archery Butts of the Royal Company by the Edinburgh members.

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TRADE PUBLICATIONS.

SIGG, LTD., 469, Holloway Road, London, N.7, have published new literature regarding electric cooking utensils.

Publication No. 8 329 R. by DONOVAN AND CO., 47, Cornwall Street, Birmingham, concerns factory type isolating switches.

A catalogue of special productions has been published by BECK AND CO., LTD., 130, Great Suffolk Street, London, S.E.1.

The latest publication of BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester, is a leaflet dealing with the automatic control of motors.

Two views of the "All-Electric Three" folder published by Radio Instruments, Ltd., showing the "plug" in and out of position.

The WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD., has published a new booklet relative to the hire of heating and cooking apparatus.

The WHITE-HALL BOILER BRIDGE CO., 35/36, St. Thomas Street, Lymington, Hants, has published a new leaflet dealing with smoke-consuming boiler bridges.

A special leaflet dealing with a new constant potential battery charging equipment has been published by NEWTONS OF TAUNTON, 6, Grape Street, Shaftesbury Avenue, London, W.C.2.

Catalogue Section No. 23, illustrating and describing metal-clad internal isolation switchgear (Whitehead system), has been published by SWITCHGEAR AND COWANS, LTD., Elsinore Road, Old Trafford, Manchester.

MAVOR AND COULSON, LTD., 47, Broad Street, Mile End, Glasgow, have published list No. 217/1 dealing with d.c. motor starters for industrial services, and list 218/1 describing similar starters but of the flameproof type.

An interesting publication by RADIO INSTRUMENTS, LTD., is a folder dealing with the "All Electric Screened Grid Transportable 3" receiver. This folder has on its first page an illustration of the set arranged with a silken cord attached to a "plug" for insertion in a "lamp socket" on the second page.

ILLUMINATION DESIGN COURSE.

A tentative programme for the twentieth Illumination Design Course, which commences on October 21st, has been prepared by the E.L.M.A. Lighting Service Bureau, and meetings at 15, Savoy Street, London, W.C.2, will be held as follows:

October 21st, 7 p.m. Registration and paper by Mr. L. E. Buckell, entitled "The Lamp of To-day." October 28th, 7.30 p.m. "Illumination Design," by Mr. F. March. November 4th, 7.30 p.m. "Selling Electric Light to the Shopkeeper," by Mr. T. Catten. November 11th, 7.30 p.m. "Electric Light in Industry," by Mr. S. Anderson. November 18th, 7.30 p.m. "Electrical Advertising," by Mr. H. Lingard. November 25th, 7.30 p.m. "Architectural Lighting," by Mr. R. W. Maitland. December 2nd, 7.30 p.m. "Miscellaneous Lighting Problems," by Mr. W. J. Jones.

ELECTRIC TRACTION.

Extensive Electrification Scheme in Bangkok and District.

ABOUT 93 miles of railway lines around Bangkok are to be electrified.

Doncaster T.C. has decided to scrap all but two of its tramway routes and to substitute trolley buses.

The change over from tramcars to railless trolley vehicles on the Allerton (Bradford) route will take place this month.

Edinburgh Transport Committee agreed last week to recommend the construction of a tramway 800 yards in length between the existing termini at Gorgie and Saughton Road.

Southend T.C. has applied to the Ministry of Transport for a loan of £2 160 for traction cables and section boxes on the extended trackless trolley route and for £540 for excess expenditure in connection with the extension.

The L.M. and S. Railway Co. is unable to adopt the suggestion of the Coventry Chamber of Commerce that the branch lines between Coventry and Leamington and between Coventry and Nuneaton should be converted to electric traction.

The annual report on Aberdeen Corporation's tramways and motor bus undertaking, which shows a net profit of £6 377 for the past year, states that orders have been placed for 12 of the latest type of tramcars, with transverse seats in the saloon and upholstered seats on the top deck.

Droylsden U.D.C. proposes to grant to Manchester Corporation a lease of a tramway extending from the boundary between Droylsden and Manchester to the boundary of the Droylsden and Audenshaw urban districts.

Glasgow Corporation recently approved a recommendation by the Parliamentary Bills Committee that, in connection with a proposal to require railways in the city to be electrified, it should be remitted to the Town Clerk to consult counsel and others on the matter, and that, in the meantime, the proposal be included in the next Provisional Order.

Brighton T.C. has decided that Volk's electric railway, which runs along the eastern beach, shall be retained. Notice had been given to Mr. Magnus Volk to determine his lease this month, but nearly 5 000 people signed a petition asking the corporation to revoke its decision. The railway is to continue for five years, subject to the station near the Palace pier being moved east of the proposed promenade extension.

A successful trial trip from Montreal to Toronto has been made on the Canadian National Railway by a new oil-electric locomotive. A Diesel engine on the locomotive drives d.c. generators, which operate motors geared on the axles. The H.P. developed is 2 660, and the continuous draw-bar pull is 40 000 lb. The engine is started by "motoring" the generators by means of accumulators. It is proposed to reduce the oil consumption by means of superchargers.

THE E.T.B.I. COMPETITION.

Solution to Cable Competition Organised in Connection with E.T.B.I. Funds.

WE give below the solution to the competition organised by the Electrical Trades' Benevolent Institution, and any competitor who has sent in a correct solution of all the names of the towns concerned should send in a claim to the office of the E.T.B.I., at 9, Southampton Street, London, W.C.1, on a postcard, setting out the solution sent in, together with the mileage of cable estimated to be required to join up these towns.

CLUES.	SOLUTIONS.
Godiva's Home	Coventry.
The Town of Fair Maids	Perth.
Robin Hood's City	Nottingham.
Bloater Town	Yarmouth.
Victory's End	Portsmouth.
Steel	Sheffield.
"Boaters"	Luton.
Bird and Water	Liverpool.
London's Shore	Brighton.
The Centre of the Cotton Trade	Manchester.
The Trouser University	Oxford.
Jan Ridd's County Town	Exeter.
Beau Brummel's Stage	Bath.
Butter Scotch	Doncaster.
"The 'Varsity as Rows"	Cambridge.
Opposite the King's Lost Jewels	King's Lynn.

Length of cable required, 1 496½ miles.

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COMPANY NEWS.

Rise in Prices of Railway Stocks—Associated Fire Alarms Meeting—Philips' Glowlamp-works New Issue—Hurst, Nelson and Co.'s 20 per cent. Distribution—Reports and Dividend Announcements—New Companies.

THE firmest spot this week in the electrical share market is the railway section. Metropolitan and District ordinary stocks were bought, the quotation for the former rising 2½ points to 61, and the latter a point to 72½. Underground Electric Railways ordinary shares have moved up 6d. to 22s. 6d. British Electric Traction 6% preferred stock is 2 points higher at 124½. In the manufacturing section Insulateds and Callenders are each 1s. 3d. down. Crompton-Parkinson 2nd preference have changed hands at 18s. Marconi's International Marine have shed another half-crown.

Last Annl. Divd.	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
(*d*)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	31/-	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/6	17/6	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	,, ,, ,, ,, 6% C.P...	22/-	23/-	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	54/6	57/6	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/-	21/3
(*c*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/6	27/6	37/6	23/-
1/9½	Metro. Elec. Sup. Ord.	46/3	46/3	53/-	24/9
4½	,, ,, ,, 4½% C.P. ..	17/6	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	26/3	26/3	30/3	19/3
6	N. Metro. Elec. 6% C.P. ..	21/6	22/6	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	21/-	21/-	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/-
4½	,, ,, ,, 4½% C.P. (£1)	17/-	17/6	17/10½	16/7½
8	Yorks. Elec. Power Ord. ..	36/-	36/6	38/9	24/6
6	,, ,, ,, 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	122½	152	117
7·67	,, ,, ,, 6% Pf. Stk.	124½	122½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4	,, ,, ,, 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	77½	77½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	,, ,, ,, ,, 4% Pf. Stk.	71	71	77	68
4	,, ,, ,, ,, 4% Deb. ..	76	76	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	95½	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	,, ,, ,, 5% Deb. ..	68½*	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	61	58½	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	61	61	76	60½
3½	,, ,, ,, 3½% Deb.	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk. ..	72½	71½	77½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	79½	79½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	112½	112½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
7	Underground Electric Rlys. Ord.	22/6	22/-	28/2	11/-
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	,, ,, ,, 1st Deb...	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.—	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	80/-	81/3	86/3	56/-
6	,, ,, ,, 6% C.P.	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref...	22/6	22/6	24/9	19/7
7	,, ,, ,, 7% Deb. ..	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	130½	153½	120
15	Callender's Cable Ord.	78/9	80/-	91/3	66/-
6½	,, ,, 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/-
8	Crompton-Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	,, ,, 6% Cum. 2nd Pf.	18/-	16/10½	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	,, ,, 7% C.P. ..	21/3	21/3	22/9	21/-
—	English Elec. Ord.	8/1½	8/1½	15/9	5/-
—	,, ,, 6% C.P.	8/9	8/9	18/9	7/-
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord...	19/-	18/9	92/3	18/1
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	52/6	52/6	46/6	26/6
25	W. T. Henley's Ord.	130/-	132/6	120/-	69/3
10	Johnson & Phillips Ord... ..	40/-	40/	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref.	23/9	23/9	25/-	22/3
7½	Siemens Bros. & Co. Ord. ..	28/9	28/9	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	82½	82½	—	—
	"B" Ord. Stk.	57½	57½	—	—
	5½% Cum. Pref. Stk. ..	93½	92½	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	,, 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Great Northern Telegraph (£10)	30½	31	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	52/6	55/-	90/-	16/6
4	Western Tel. 4% Deb. Stk. ..	74	75½	82	76

(*a*) 19¼d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. * Ex dividend.

PYE RADIO, LTD.—Transfer books will be closed from Oct. 24 to 31, inclusive.

STOTHERT AND PITT, LTD.—Div. of 10%, less tax (agst. 6% last year) is announced.

PENN-OHIO EDISON CO.—Div. on common stk. of 50 cents will be payable on Nov. 1.

AMERICAN COMMONWEALTH POWER CORPORATION.—Div. of $1 p. sh. on common stk. will be payable on Nov. 1.

ANCHOR CABLE CO., LTD.—Ord. sh. registers will be closed from Oct. 18 to 30, inclusive, for preparation of div. warrts.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—Intm. div. of 4% on ord. shs. will be payable on Nov. 15.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—Net earngs. for qrtr. ended June 30, before providg. for taxatn., £302 255.

AMERICAN WIRELESS MERGER.—A $36 000 000 merger of the Kolster Radio Corporation and the Freedeiseman and Earl Companies was consummated on Oct. 2.

METROPOLITAN DISTRICT RAILWAY CO.—Int. for half-year endg. Oct. 31 on 4% prior lien deb. stk. will be payable on Nov. 1. Transfer books will be closed from Oct. 17 to 31, inclusive.

CITY AND SOUTH LONDON RAILWAY CO.—Int. for half-year ending Oct. 31 on 4% perpetual deb. stk. will be payable on Nov. 1. Transfer books will be closed from Oct. 17 to 31, inclusive.

CALLENDER'S CABLE AND CONSTRUCTION CO., LTD.—Intm. div. of 5%, less tax, on ord. shs. (same rate as last year) will be payable on Nov. 2. Ord. sh. registers will be closed from Oct. 19 to 31, inclusive.

CANADIAN HYDRO-ELECTRIC CORPORATION.—Energy produced in Aug., 1929, 163 779 000 kWh, increase 68% over Aug., 1928. From Jan. to Aug., 1929, inclusive, output was 1 304 137 000 kWh, increase 78%.

ASSOCIATED FIRE ALARMS, LTD.—Pft. for year ended June 30, 1929, was £5 441, agst. £7 004. Reserved for income tax, £1 018, agst. £1 058; to res., £1 000, agst. £2 000. Div. 8%, less tax (same as last year). Fwd. £1 694, agst. £1 932.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—Intm. divs. of 3½% on 7% cum. pref. shs. for current year, less tax, and 4% on ord. shs., tax free, are announced. Warrants will be posted on Oct. 31. Sh. transfer books are closed until Oct. 22, inclusive.

MEXICAN LIGHT AND POWER CO., LTD.—Divs. at rate of 7% p.a. for half-year endg. Oct. 31, 1929 ($3·50 p. $100 sh.) on 7% cum. pref. shs. and at rate of 4% p.a. for half-year endg. Oct. 31, 1929 (10 cents. per $5 sh.) on 4% cum. red. 2nd pref. shs. will be payable on Nov. 1.

HURST, NELSON AND CO., LTD.—Fin. div. of 10%, plus bonus of 2½%, less tax, on ord. shs. will be payable on Nov. 11, makg. 20% for year (same as last year). To res., £10 000; to depreciatn., £5 636; appropriation for 6% pref. div. due May 15, 1930, £4 800. Fwd. £10 917, agst. £9 629.

PHILIPS' GLOWLAMPWORKS, LTD.—The issue was announced last week of 1 367 000 ord. shs. at 250%, and 440 000 6% cum. pref. pft.-sharing shs. at 130%, with rights to shhldrs. in the proportn. of one new sh. for three old. The new cap. is needed for the company's extensn. Pfts. for the first nine months of the present year are stated to have been considerably higher than for the correspondg. period last year, and the management expects to be able to maintain the div. upon this increased cap., with full allowance for necessary writg-off.

SOCIETE INTERNATIONALE D'ENERGIE HYDRO-ELECTRIQUE (SIDRO).—It is announced that div. for year 1928-1929 will be paid on Nov. 4 at following rates against presentatn. of coupons No. 6: coupons from pref. shs. at frs. 47 (Belgas 9·40), coupons from ord. shs. at frs. 47 (Belgas 9·40), coupons from founders' shs. at frs. 171·83 (Belgas 34·366). In arriving at these amts. Belgian tax has been taken into consideratn. Amt. payable in Belgas will be converted into sterling at sight rate of exchange ruling on day of presentatn. Coupons may be presented at offices of Baring Bros. and Co., 8, Bishopsgate, E.C.2, and J. Henry Schroder and Co., 145, Leadenhall Street, E.C.3, London.

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MONTREAL LIGHT, HEAT AND POWER CO.—Div. on common shs. of 60 cents p. sh. for qrtr. endg. Sept. 30 (same as last year) will be payable on Oct. 31.

AMERICAN AND FOREIGN POWER CO.—Div. of $1·75 on 2nd pfd. A stk. for the period from Oct. to Dec., 1928, in addition to regular qrtrly div. on $7 and $6 pfd. stks., is now payable.

NORTH AMERICAN CO.—Blce. sheet for year ended June 30, 1929, of North American Co. and its subsidiaries shows total assets have grown from $811 582 951 to $863 671 243. Res. fund stood on June 30 at $111 024 717, against $101 228 587 on June 30, 1928. Surplus, at $109 273 103, is made up of cap. surplus $24 645 241 and undivided pfts. $84 627 862. Correspondg. figures for previous year were: total surplus $90 970 465, comprising $25 668 032 cap., surplus and undivided pfts $65 302 432. Property and plant are valued at $745 164 651, agst. $698 486 364. Current assets $50 840 078, agst. $48 168 638, include $21 544 321 in cash, agst. $18 985 421. Funded debt for subsidiaries stands at $346 485 830, agst. $329 405 377, and current liabilities amt. to $11 627 546, agst. $19 818 411. It is stated that the North American Co. and its subsidiaries control the largest electric light and power system in America under single ownership. Under the terms of a recent offer made by this company with the object of raising $54 800 000 (£10 960 000) fresh cap. for further developmt., stkhldrs. will have right to subscribe until Nov. 15 to one sh. of common stk. at $100 p. sh. for each 10 common shs. now held. The new money raised by the stk. subscriptn. will be used in accordance with the company's policy of maintaing. its proportnate. int. in subsidiaries, especially in those which have recently expanded considerably. Extensive developmts. in the North American system are in progress in the Cleveland (Ohio) area, in California, and in the Osage River district, where a £6 000 000 hydro-electric project is now in process of executn.

POWER CORPORATION OF CANADA.—Operatg. revs. for year ended June 30, 1929, show increase of 130% over precedg. year at $1 947 590, compared with $849 871. Profits on sale of securities were $1 364 514, agst. $1 278 770, leaving gross earngs. $3 312 104. Deductg. exs. and taxes, net earngs. applicable to bond int. amt. to $2 846 418, agst. $1 802 557, and, after mtg. int. of $400 589 and divs. on both classes of pfd. totalling $680 000, residue applicable to common stk. was $1 765 829, equivalent to $4·46 p. sh. on 395 557 shs. outstandg. This compares with earngs. equivalent to $5·67 p. sh. on only 200 205 shs. outstandg. for precedg. year. Deduction of $394 843 for div. on common stk. and $550 000 for disct. on securities left pft. and loss surplus at $2 502 919, compared with $1 681 932. Changes in the blce. sheet reflect wide expansn. in operatns. of the company, total assets being over $18 000 000 higher at $46 963 045. Heavy increases are shown in investmts. in subsidiaries and other investmts., the former being up over $6 000 000 at $16 526 913 and the latter more than doubled at $29 504 222. The president states that it is the policy of the directors to pay cash divs. out of the rev. only, and any stk. divs. paid will be out of the pfts. realised from sale of investmts.

Company Meeting.

ASSOCIATED FIRE ALARMS, LTD.—Mr. Gordon H. Brown, presiding at the meeting on Tuesday, said a satisfactory feature of the accounts was that they were able again to recommend the payment of a dividend at the rate of 8%. In his address to the shareholders at last year's general meeting he foreshadowed the advisability of an early extension to their works at Walthamstow. That work had now been completed and the whole cost was charged in the accounts. The value of property in the United Kingdom protected by their alarms was over £100 000 000, and of this more than £50 000 000 represented property where they periodically examined and reported on their installations. In respect of the latter the result for the year to December, 1928, showed that the ratio of losses to premiums in respect of such property was under 1%. A more general use of automatic fire alarms would considerably reduce the heavy burden of the cost of fire losses, amounting to some £12 000 000 a year, which this country had to bear. The report and accounts were adopted.

Last Sunday night all the towns on the Leinster loop of the Shannon scheme were supplied, for the first time, with current generated in the power station at Ardnacrusha. This circuit has been fed from the Dublin electricity works as a temporary arrangement.

NEW COMPANIES.

NORWOOD RADIO, LTD.—Cap., £1 000. Manufacturers of and dealers in wireless and electrical apparatus and accessories, etc. Reg. Office: 28, Budge Row, London, E.C.4

KENNEDY AND KEMPE, LTD.—Cap., £2 500. Electrical and marine engineers, vehicle manufacturers and repairers, etc. Reg. Office: Harewood Forest, Longparish, Hants.

PHILIPS LAMPS (IRELAND), LTD.—Cap., £1 000. Electricians, manufacturers of, agents for and dealers in electric lamps, etc. A subscriber:—A. De Gong, 148, Kings Avenue, London, merchant.

ELECTRIC CENTRAL HEATING AND VENTILATING CO., LTD.—Cap., £20 000. Lighting, ventilating, heating, electrical and mechanical engineers, etc. Reg. Office: 157, West George Street, Glasgow.

HONEYCOMB BATTERIES, LTD.—Cap., £100. Electrical engineers, electricians, manufacturers of and dealers in electric cells, etc. A subscriber: R. H. Brown, 10, Coverdale Road, London, W.12, accumulator specialist.

JOSEPH PECK, LTD.—Cap., £25 000. To acquire business of dealer in electrical appliances and wireless apparatus, electricia n etc., carried on by J. A. E. Peck at Rotherham as "Joseph Peck." Reg. Office: College Square, Rotherham.

RADIO CLOCKS, LTD.—Cap., £100. To acquire and sell letters patent, brevets d'invention, licences and inventions, or any interest therein, to manufacture and deal in machinery, etc. Reg. Office: 53, Great Marlborough Street, London, W.1.

WEST LONDON ELECTRO-MEDICAL MANUFACTURING CO., LTD.—Cap., £100. To acquire patents or licences in connection with use of electro-medical or other electrical apparatus, etc. Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, London, E.C.4.

T. B. GERARD AND SONS, LTD.—Cap., £2 000. Electrical and mechanical engineers and contractrs, manufacturers of and dealers in electrical, magnetic, telegraphic, telephonic and other appliances and apparatus, etc. Reg. Office: 201, High Road, Chiswick, London, W.4.

AUTOMATIC LIGHT CONTROL, LTD.—Cap., £10 000. Electrical engineers and contractors, manufacturer and repairers of and dealers in machinery, electric, magnetic, galvanic and television apparatus, etc. Solicitors: R. A. Rotherham and Co., 38, Bailey Lane, Coventry.

GARDNER AND CO. (PORTSMOUTH), LTD.—Cap., £1 000. To acquire business of electrical engineer, etc., carried on by C. A. Gardner at Portsmouth, and to carry on same and business of manufacturers of and dealers in electric and other apparatus used in connection with wireless, etc. Reg. Office: Building Site, Hulbert Road, Bedhampton.

ARUN ELECTRICAL SUPPLIES, LTD.—Cap., £100. To acquire business of supplier, fitter and repairer of and dealer in electrical fittings, fixtures, apparatus, wires, lamps, shades, screens and other articles to be used as means of employing electrical power, carried on by W. L. Sibley as "Arun Electrical Supplies" at 15, Queen Street, Arundel. Reg. Office: 7, Hanover Square, London, W.1.

METAL AND CHEMICAL PRICES.

TUESDAY, October 8th.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£77 15 0	—	10s. 0d
Electro Wirebars .. .. „	£84 15 0	—	—
H.C. Wires, basis .. .. per lb.	11 1/16d.	—	—
Sheet .. .. .. „	11 1/16d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2 1/16d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet „ .. .. .. „	10 1/16d.	—	—
Wire „ .. .. .. „	11 1/16d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£24 15 0	—	5s. 0d.
Foreign or Colonial .. .. „	£23 5 0	—	7s. 6d.
Tin—			
Ingot .. .. per ton	£198 15 0	—	£4 10 0
Wire, basis .. .. .. per lb.	2s. 7 1/16d.	—	1d.
Aluminium Ingots . .. per ton	£95 0 0	—	—
Spelter .. .. „	£23 17 6	7s. 6d.	—
Mercury .. .. per bottle	£22 5 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £30 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2 1/2d.
Sodium Bichromate—Per lb. 3 1/2d.

Rubber—Para fine, 9 1/2d.; plantation, 1st latex, 9 1/2d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

Owing to lack of demand from consumers, the market last week was reported by James Forster and Co. to have sagged daily, and prices closed at the lowest. The American price is unchanged at 6·90 cents. Closing prices on October 4th were £23 5s. for October and November, £23 6s. 3d. for December, and £23 7s. 6d. for January, 3s. 9d. to 5s. per ton lower on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ABBA ELECTRICAL CO., LTD., Engine Street, Smethwick. £11 5s. 1d. August 19th.

APPLE, B., Mr., 87, Tottenham Court Road, W., wireless dealer. £10 3s. 6d. August 27th

BASSON ELECTRICAL CO., LTD., 32, Station Road, Swinton, wireless dealers. £36 8s. 11d. August 21st.

BATES, H. V., Mr., High Street, Linton, radio dealer. £20 18s. 5d. August 27th.

DAVIS CASH AND CO., LTD., 47, Mount Pleasant, E.C., electrical engineers. £17 15s. 2d. August 27th.

EAST SURREY WIRELESS CO., 20a, Station Road, Epsom, wireless engineers. £12 12s. 9d. July 31st.

GOLDMAN, H., Mr., 52D, High Street, Southend-on-Sea, electrical fittings manufacturer. £15 11s. 10d. August 6th.

HOLLINGS (C.) AND CO., 3, College Avenue, Staveley, wireless engineers. £105 17s. 9d. August 3rd.

LEYS, Sidney James, Mr., 144, East Esplanade, Southend-on-Sea, wireless dealer. £10 9s. 4d. August 31st.

MILLER, Harding, 168, Bedford Road, Rock Ferry, radio engineer. £11 2s. 10d. August 23rd.

NEW SIMPOLIA WIRELESS CO., 170 and 172, West Green Road, Tottenham, wireless dealers. £12 5s. 1d. August 15th.

RADIO BATTERY SERVICE CO., 194, Northfield Avenue, West Ealing, radio engineers. £20 14s. 8d. August 13th.

SENIOR'S WIRELESS AND ELECTRICAL STORES, 961, Abbeydale Road, Sheffield, wireless dealers. £15 14s. 2d. August 2nd.

SHIELDS AND GARE, 48, Queen's Road, Buckhurst Hill, electrician. £26 19s. August 28th.

SHORTHOUSE (F. A.) AND CO., 922, Stratford Road, Sparkhill, electrical engineers. £10 17s. 3d. August 20th.

WHOLESALE RADIO SUPPLIES, 126, High Road, Leyton, wireless dealers. £17 8s. 11d. July 31st.

WOODWARDS (CYCLE AND WIRELESS) STORES, High Street, Lyndhurst, electrical engineers. £22 15s. 7d. August 16th.

Bills of Sale.

KNIGHT, Otto Algernon, 4, The Common, Ealing, trading as KAY AND CO., 169, Railway Approach, Shepherd's Bush, wireless factor and general merchant. Dated September 26th, filed October 2nd. £80.

STERLING, James Daniel, 18, Carter Street, Sunderland, electrician. Dated September 28th, filed October 1st. £50.

Deed of Arrangement.

EDGINTON, Henry John Hewerton, and BROWNE, Ernest George, junr., trading at 34, Chapel Street, Sherwell, Plymouth, as WESTERN TRADING SYNDICATE, electricians. Dated September 27th, filed October 4th. Trustee, N. C. Eyre, 10, Princess Square, Plymouth, C.A. Liabilities unsecured, £493; assets, less secured claims, £108. Separate estate of H. J. H. Edginton. Liabilities unsecured £7, assets, nil. Separate estate of E. G. Browne, junr. Liabilities unsecured, £4; assets, nil.

Receiverships.

ANIMATED DISPLAYS, LTD. B. Biggs, of 202, Abbey House, Westminster, S.W.1, was appointed Receiver and Manager on September 27th, under powers contained in mortgage dated June 24th, 1929.

ROBINSON AND REX, LTD. A. W. Eccles, of 614, Garratt Lane, S.W.17, was appointed Receiver on September 27th, under powers contained in debenture dated May 25th, 1929.

THURSFIELD (C. J.) AND CO., LTD. W. F. Alldritt and C. E. Ward, of Sun Buildings, Bennett's Hill, Birmingham, were appointed Receivers and Managers, in substitution for the late W. E. Alldritt on September 13th, 1929, under powers contained in debentures dated January 8th, May 13th and October 10th, 1927.

TRE-COIL WORKS, LTD. J. E. Costello, C.A., of 90, Cannon Street, E.C., was appointed Receiver on October 2nd, under powers contained in debenture dated February 4th, 1929.

London Gazette, etc.

Company Winding-up Voluntarily.

STERLAND AND TATE, LTD. By resolution, September 17th, confirmed October 1st. F. Thompson, Junr., Chartered Accountant, 62, John Street, Sunderland, appointed as liquidator.

Bankruptcy Information.

DAFT, Hugh Edgar, Gloucester Place, Monument Street, Peterborough, electrical engineer. Receiving order, October 1st. Debtor's petition.

GRAHAM, Frederick Henry, 14, Hilltop Avenue, Harehills, Leeds, electrician. Receiving order, October 1st. Debtor's petition.

PHILLIS, William James, 87, Overton Road, Leicester, electrical engineer. Receiving order, October 2nd. Debtor's petition.

PAGE, Edgar George Matthews, 46, Bohemia Road, St. Leonards-on-Sea, dealer in wireless sets and accessories. First meeting, October 18th, 11.30 a.m., Official Receiver's Offices, 12A, Marlborough Place, Brighton. Public examination, November 11th, 2.15 p.m., Town Hall, Hastings.

Application for Discharge.

STRATHDEE, Andrew Knox Ewart, 923, Romford Road, Manor Park, trading as EMSCO RADIO, electrical engineer. Hearing, October 29th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Partnership Dissolved.

WOOD'S MAGNETO REPAIR DEPOT (Thomas William WOOD, Alick WEAVER, and George GUY), automobile electrical specialists, 8, Rotten Row, Christchurch, Hants, by mutual consent as from July 1st, 1929. Debts received or paid by A. Weaver and G. Guy, who continue the business.

Bankruptcy Proceedings.

DEEBLE, Samuel John, senior, electro therapeutist, and DEEBLE, Samuel John, junior, engineer, trading as the ELDON SUN RAY CENTRE, 18, Eldon Square, Newcastle-upon-Tyne. The statement of affairs shows gross liabilities amounting to £388, of which £298 is expected to rank, and no assets. Debtors attribute their failure to opposition by the medical profession. At their public examination at Newcastle, the Official Receiver suggested to the debtors that there was no opening for their business in Newcastle. The senior debtor replied that there was a big opening for the business, but people in Newcastle did not realise the value of sun ray treatment. Debtor was questioned regarding his financial affairs, and admitted that he twice previously made deeds of arrangement. The examination was adjourned.

STONE, George Frederick Amos, trading as the STONE MANUFACTURING CO., electrical accessories manufacturer, 108, Great Saffron Hill, London, E.C. At the first meeting of creditors, a statement of affairs was submitted which showed ranking liabilities £1,889, and net assets £177, after deduction of £68 in respect of preferential claims.

It appeared from statements made by the debtor in preliminary examination that prior to the war he was an established civil servant in the engineering department of the Post Office. He joined the Army in 1916, received his discharge in 1919, and returned to his employment in the Post Office. Service with the Army, however, having unsettled him, he resigned his position in May or June, 1920, and commenced business on his own account in the style of the General Maintenance Electricity Co., at 14, High Street, Pinner. His capital was £150 or £200. After trading for 12 months his business was taken over by a company. As consideration he received 300 fully paid £1 shares in the company and he became sales manager at the head offices of the company, Whitecross Place, E.C., at a salary of £6 p.w. Within 18 months the company went into liquidation, and he lost his position and received nothing in respect of his shareholding. A month later he made a fresh start with a capital of £200 at Finsbury Place, where he traded as the Lighting Supply Company. He did an improving business, and extended his premises by taking two further shops, Nos. 4 and 5, Finsbury Place, and within two years was making a net profit of £1,000 p.a. He then took in a partner, who introduced £2,500 into the business. A company was immediately formed with a capital of £7,500, and offices at 45, Horseferry Road, S.W., which took over the business and transferred the connection to the new address. As vendor, he was to receive £1,000 in cash and 4,000 fully paid £1 shares in the company. He was allotted the shares, but received only £400 in cash. He became joint managing director at a remuneration of £400 p.a. and travelling expenses, and held that position until July, 1927, when a receiver was appointed by a debenture holder, and the company was wound up. In the same month, July, 1927, with £90 raised from his bankers on security, he recommenced business on his own account at 108 and 109, Gt. Saffron Hill, as the Stone Manufacturing Co., and he continued to trade there down to July last. The business consisted of articles manufactured under his own patents, for which he had obtained provisional protection (since expired), and he was handicapped by lack of capital. In June last he had a nervous breakdown, and was away from his business for a month. During his absence his affairs were investigated by his two brothers, who consulted an accountant, who advised that a meeting of the creditors should be called. The meeting was subsequently held, and an offer was made by which the creditors were to accept 5s. in the £ by instalments extending over 12 months, and that he should continue the business, working under a committee appointed by the creditors reporting to the trustee every three weeks with a view of paying 20s. in the £1. The accountant was appointed trustee under that proposal and went into possession of his business and there the matter remained until the petition was filed against him. He attributed his failure to the delay in the delivery of raw materials and to insufficient capital.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

292 499 A.C. Spark Plug Co. Thermostatic control for magnetic measuring instruments. (20/6/27.)
316 360 W. R. Hume. Electric welding-machines. (7/5/28.)
316 366 M. Rehse. Submersible alternating-current motor-driven pumping-apparatus. (17/5/28.)
291 115 Associated Telephone and Telegraph Co. Train-control systems. (27/5/27.)
292 465 Forges et Ateliers de Constructions Electriques de Jeumont. Asynchronous electric cascade generator. (18/6/27.)
316 378 W. P. Digby and R. B. Fairthorne. Cooling of electrical transformers. (8/6/28.)
296 019 C. Epner. Production of electric discharges at elevated temperatures. (23/8/27.)
312 140 Langendorf Watch Co. Manufacture of electric contact pins or plugs. (21/5/28.)
316 384 General Electric Co., Ltd., and W. Wilson. Electric time switches. (15/6/28.)
293 300 Patent-Treuhand-Ges. Fur Elektrische Gluhlampen. Alternating-current rectifying devices. (2/7/27.)
302 219 Energos Ges. Electrically-operated brushes for treatment of the skin. (12/12/27.)
316 392 T. E. Ward. Totalisators. (25/6/28.)
316 405 Igranic Electric Co., Ltd., and A. H. Curtis. Electric variable-resistance devices. (3/7/28.)
293 425 Fabrik Elektr. Apparate F. Sauter Akt.-Ges. Time-switch mechanism. (6/7/27.)
316 416 Electrical Improvements, Ltd., L. C. Grant and G. R. Wilson. Electric heating boilers, steam generators, and the like. (12/7/28.)
316 421 J. Fiddes. Recording means for electromotors. (13/7/28.)
316 433 O. Y. Imray (I.G. Farbenindustrie Akt.-Ges.). Manufacture of accumulator plates. (24/7/28.)
295 650 Akt.-Ges. Brown, Boveri, Et Cie. Means for controlling electrically driven transporting machines, such as winding-engines and hoists (16/8/27.)
316 436 Electrical Improvements, Ltd., and L. C. Grant. Protection of alternating-current dynamo-electric machines and systems. (25/7/28.)
316 439 Aronwerke Elektrizitats Ges. and W. Stern. Electrical distant-indicating plant and a method of adjustment thereof. (30/7/28.)
295 329 Associated Electrical Industries, Ltd. Electrical circuit-interrupting devices. (9/8/27.)
295 286 International General Electric Co., Inc. Electric plug-and-socket connections. (8/8/27.)
316 446 G. Monaghan. Anodes for electrolytic baths. (9/8/28.)
316 449 W. L. Shaw, J. Joseph and Radio Instruments, Ltd. Electrical transformers. (22/8/28.)
316 455 M. B. Wild and Co., Ltd., and E. Small. Electric cable winches. (25/8/28.)
296 415 S. Loewe and E. Roemhild. Electron valve with indirectly-heated cathode. (31/8/27.)
297 059 R. Bosch Akt.-Ges. Switch-boxes for the starter and battery ignition in internal combustion engines. (13/9/27.)
299 304 General Railway Signal Co. Railway-control systems. (22/10/27.)
299 700 Siemens-Schuckertwerke Akt.-Ges. Electric switch-gear with air blast. (29/10/27.)
301 018 Maschinenfabrik Oerlikon. High-speed direct-current circuit-breaker. (23/11/27.)
301 823 Akt.-Ges. Der Maschinenfabriken Escher, Wyss, et Cie. Mercury switches. (6/12/27.)
316 484 Cine-Sound, Ltd. (E. Marcus). Apparatus for the synchronous production or reproduction of pictures and accompanying sound. (31/10/28.)
302 650 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Electric voltage indicators. (19/12/27.)
300 244 Associated Telephone and Telegraph Co. Train-control systems. (27/5/27.)
302 228 Telefunken Ges. Fur Drahtlose Telegraphie. Analysing or synthesising apparatus for television. (12/12/27.)
301 841 British Thomson-Houston Co., Ltd. Apparatus for colouring glass. (6/12/27.)
316 352 Y. Mercier. Apparatus for treatment of liquid hydrocarbons by the electric arc. (20/4/28.)
305 166 Soc. Technique D'Etudes et D'Enterprises Pour L'Industrie and A. Huguenin. Electric signalling systems. (1/2/28.)
285 077 D. P. A. A. Kayser. Lighting of luminous electric discharge tubes. (11/2/27.)
316 632 W. Phillips and Elliott Bros. (London), Ltd. Electrical measuring instruments and circuit arrangements for use therewith. (29/3/28.)
291 785 Siemens and Halske Akt.-Ges. Thermionic cathodes of high emissivity. (10/6/27.)
290 278 Siemens-Schuckertwerke Akt.-Ges. Arrangement for introducing voltages into alternating current circuits. (12/5/27.)
316 566 V. Hope. Electric fuse boards or boxes. (27/4/28.)
316 598 H. Waterhouse. Street traffic controlling or signalling devices. (28/4/28.)
316 529 A. Reyrolle and Co., Ltd., and N. Cooke. Electric protective relay arrangements. (30/4/28.)
300 622 K. Von Dreger and A. F. Horn. Electrically driven talking machines, gramophones, or the like. (18/11/27.)
289 884 E. Wehren. Telephone systems. (5/5/27.)

Applications for Patents.

July 11th.

21 340 Associated Electrical Industries, Ltd. Control systems for elevators, etc. (11/7/28, U.S.).
21 332 J. L. Baird and Television, Ltd. Television apparatus, etc.
21 373 British Thomson-Houston Co., Ltd. Transformers. (11/7/28, U.S.)
21 374 British Thomson-Houston Co., Ltd., and W. B. Green. Motor control systems.
21 375 British Thomson-Houston Co., Ltd., and G. S. C. Lucas. Photo-electric cells.
21 367 Callender's Cable and Construction Co., Ltd., and F. S. Smith. Producing high voltages.
21 338 H. L. Duncan. Commutators, etc.
21 349 Graham-Amplion, Ltd., and G. Holdway. Electric switches.
21 350 G. Holdway. Electric supports, etc.
21 363 Lodge-Cottrell, Ltd. (H. V. Welch). Electrical precipitation plants.
21 364 Metallges Akt. Ges. Electric conductors. (15/10/28, Germany.)
21 388 Pioneer Instrument Co., Inc. Illuminating dials of instruments. (26/3/29, U.S.)
21 382 E. A. Rosengrens Kassaskapsfabriks Aktiebolaget. Welding with rolling electrodes. (12/3/29, Sweden.)
21 360 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. X-ray apparatus. (21/7/28, Germany.)
21 294 H. W. Stapleton. Electric time switches.
21 289 R. N. Wellington. Electrical switching device for electrical reproducing gramophones, etc.
21 341 Westinghouse Lamp Co. Electron emission materials. (11/7/28, U.S.)

July 12th.

21 556 Automatic Telephone Manufacturing Co., Ltd., S. G. Eddowes, and T. C. Jordan. Switches for telephone systems.
21 557 Automatic Telephone Manufacturing Co., Ltd., and G. A. Burns. Electric signalling systems.
21 421 G. G. Blake. Regulating electric currents.
21 496 British Thomson-Houston Co., Ltd. Amplifier circuits.
21 497 British Thomson-Houston Co., Ltd., and W. J. Pool. Electric motor control.
21 498 British Thomson-Houston Co., Ltd. Gaseous conduction lamps. (12/7/28, U.S.)
21 501 British Thomson-Houston Co., Ltd. Transformers. (12/7/28, France.)
21 532 P. Dunsheath. High-voltage cables.
21 553 Electrical Research Products, Inc. Telegraph repeating devices. (18/7/28, U.S.)
21 567 G. B. Ellis (Soc. des Usines Chimiques Rhone-Poulenc). Photo-electric cells.
21 568 G. B. Ellis (Soc. des Usines Chimiques Rhone-Poulenc). Generation of photo-electric currents.
21 506 G. E. T. Eyston. Control of superchargers.
41 439 C. W. Hynd. Coin-freed dynamos, etc.
21 566 E. V. Kayley. Thermionic valves.
21 410 F. A. Lindemann. Photo-electric cells.
21 456 W. Ludke. Production of electric rotating fields. (12/7/28, Germany.)
21 534 Perryman Electric Co., Inc. Navigational direction finders. (5/12/28, U.S.)
21 573 Pioneer Instrument Co., Inc. Mariners' compasses. (11/5/29, U.S.)
21 468 L. Poulsen and Co. Shadeholder for electric lamps. (21/7/28, Denmark.)
21 509 Siemens-Schuckertwerke A.G. Electric interrupter apparatus. (13/7/28, Germany.)
21 510 Siemens-Schuckertwerke A.G. Sleeves for lead cables. (14/7/28, Germany.)
21 526 Westinghouse Lamp Co. Electron discharge devices. (12/7/28, U.S.)
21 412 T. E. Williams. Wireless receiving sets.
21 455 C. S. Afia. Electric lamps.

July 13th.

21 649 Associated Electrical Industries, Ltd. Arc extinguishing devices. (14/7/28, U.S.)
21 621 Automatic Telephone Manufacturing Co., Ltd., and P. N. Rosbby. Magnet cores for loading coils, etc.
21 647 C. E. G. Bailey and Gramophone Co., Ltd. Wireless tuning systems.
21 616 British Thomson-Houston Co., Ltd. Altitude indicating systems for aircraft.
21 617 British Thomson-Houston Co., Ltd., C. G. Mayo and J. G. Wellings. Electric measuring apparatus.
21 618 British Thomson-Houston Co., Ltd., and H. Trencham. Electrical contacts.
21 592 J. S. Burns. Electric switches.
21 609 R. H. Camp, A. J. Hughes, H. Hughes and Sons, Ltd., and D. H. Perkins. Magnetic compasses.
21 632 E. N. Elford, Graham-Amplion, Ltd., and D. Sinclair. Indicator scales for wireless apparatus.
21 634 E. N. Elford and Graham-Amplion, Ltd. Indicator scales for wireless apparatus.
21 631 Felten und Guilleaume Carlswerk A.G. Aerial cables. (26/9/28, Germany.)
21 654 Ferranti, Ltd., and W. Holmes. Voltage testing devices.
21 633 Graham-Amplion, Ltd., A. D'A. Hodgson and G. Holdway. Switchgear
21 619 International General Electric Co., Inc. X-ray tubes. (14/7/28. Germany.)
21 580 J. Neale. Thermo-electric couples, etc.
21 603 J. Whiting. Electric trailing cables.

COMING EVENTS.

Saturday, October 12th.

Association of Mining Electrical Engineers (Western Sub-Branch).—Chairman's address.
27th A.A. Battalion R.E. (T.A.).—Battalion Dance. Headquarters, Rochester Row, London, S.W.1. 7.30 *p.m.*
Association of Mining Electrical Engineers (South Wales Branch).—South Wales and Monmouthshire School of Mines, Treforest. Paper by Mr. J. B. J. Higham on "Cotton in Engineering." 6 *p.m.*

Monday, October 14th.

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting.
Electrical Contractors' Association (Hastings Branch).—Lewcock's Restaurant. Ordinary meeting.
Institute of Transport.—Institution of Electrical Engineers, Victoria Embankment, London. Inaugural address by the President. 5.30 *p.m.*
Institution of Electrical Engineers (Western Centre).—South Wales Institute of Engineers, Cardiff. Chairman's (Capt. S. B. Haslam) inaugural address. 6 *p.m.*
Institution of Heating and Ventilating Engineers (Associate Members and Graduates' Section).—Borough Polytechnic, Borough Road, Southwark, London, S.E. Paper by Mr. F. F. Powell on "Vacuum Cleaning." 7 *p.m.*
Sheffield Illumination Society.—Lecture Hall, Y.M.C.A., Fargate. Paper by Mr. F. L. Nichols on "Lamps, Ancient and Modern." 7.30 *p.m.*

Tuesday, October 15th.

Electrical Association for Women (Bristol and District Branch).—Electricity Offices, Colston Avenue. Lecture on "How a House is Wired," by Mr. H. R. Beasant. 3 *p.m.*
Association of Supervising Electrical Engineers.—Junior Institution of Engineers, 39, Victoria Street, London. Presidential address by Mr. S. B. Donkin. 7.15 *p.m.*

Wednesday, October 16th.

Electrical Contractors' Association (Sussex Branch).—Midland Bank Chambers, Brighton. Ordinary meeting.
Overhead Lines Association.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Annual general meeting. 5.30 *p.m.*
Institution of Electrical Engineers (North Midland Centre, Sheffield Sub-Centre).—Royal Victoria Hotel. Address by the chairman, Mr. H. W. Walker 7.30 p.m.

Friday, October 18th.

North-East Coast Institution of Engineers and Shipbuilders.—Bolbec Hall, Newcastle-upon-Tyne. Presidential address by Mr. L. E. Smith.
Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. General meeting. Presidential address by Mr. D. Adamson. 6 *p.m.*
Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Personal Salesmanship in the Electrical Industry." Speaker, Miss G. Burlton. 7.30 *p.m.*

Saturday, October 19th.

Electrical Power Engineers' Association (Southern Division).—Hotel Cecil, Strand, London. Eleventh annual dinner. 5.30 for 6 *p.m.*

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THE ELECTRICIAN

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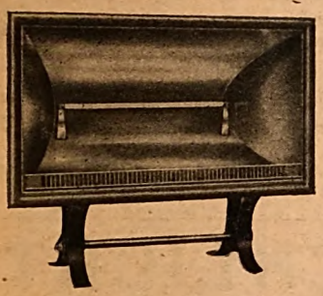

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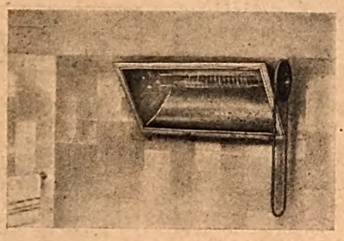

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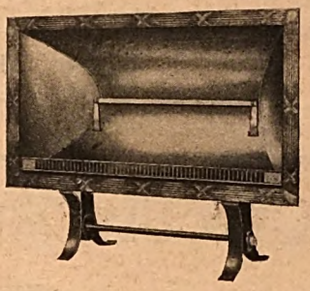

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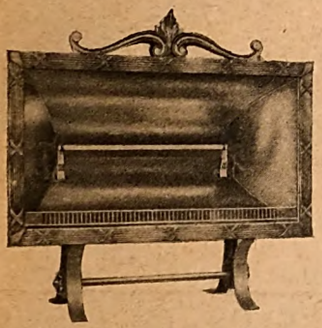

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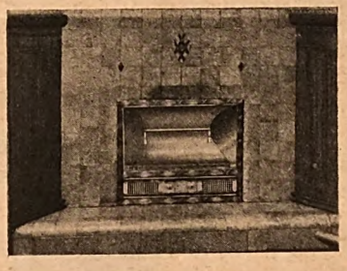

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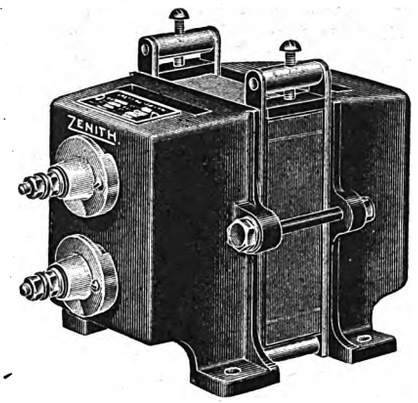

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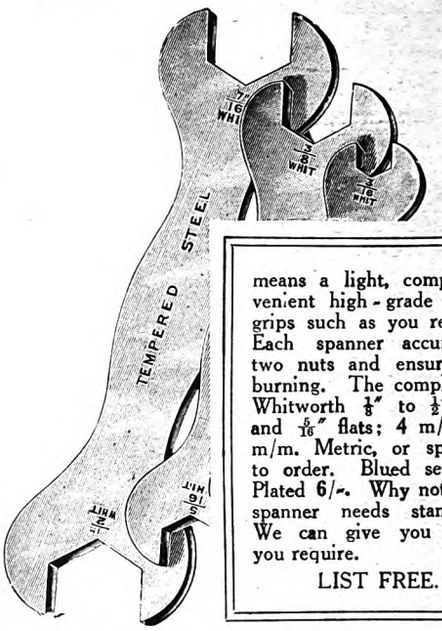

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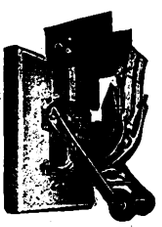

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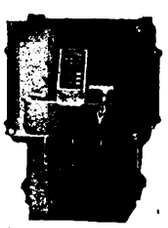

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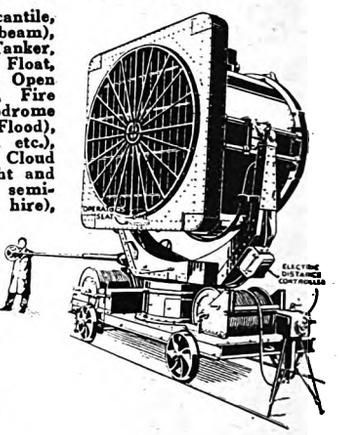

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

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Current Topics.

Problems for Contractors.

IN an intensely provocative article on another page of this issue, Mr. T. C. GILBERT, who claims to be one of the Bolshevists of the electrical installation trade, outlines some of the outstanding problems which confront electrical installation engineers to-day, examines proposals for setting the contracting house in order, and attempts to reconcile the many conflicting opinions which are held regarding these matters. Mr. GILBERT, like most of the people whose views he quotes on one side or the other, has devoted considerable thought to the problems with which the contracting trade is beset, and though some of his arguments may not meet with universal approval, we do think that his summing-up of the present position is worthy of careful consideration as a basis for the formulation of a clear-cut policy which will in turn permit active steps to be taken to remedy some of the troubles from which the good-class contractors are now suffering. The two outstanding matters round which argument centres are compulsory registration and compulsory wiring rules. Both of these important measures are generally considered to be fairly satisfactory in principle, but when detailed examination of the proposals begins, remarkable divisions of opinion immediately appear. As the contractors themselves seem unable to dispose of the difficulties, we are glad to see one of their number appealing for advice and suggestions from other sections of the industry, and we hope that some useful hints will be offered as the result of this appeal. In consideration of the big problems connected with the large-scale generation and distribution of electricity, many of us are apt to overlook the undoubted importance of the installation which permits the consumer to use the resources which the industry as a whole has provided for him. The installation side has improved tremendously in the past few years, but it would be futile to suggest that it is not still severely handicapped by the "kerbstoner." The cry for betterment in the installation trade, as Mr. GILBERT points out, comes to-day from within and not from without, and we hope that realisation of the truth of the saying that a chain is as strong as its weakest link will stimulate constructive thinkers in other branches of the industry to formulate practical suggestions for consideration by the contractors.

"Regional" Broadcasting and the Contractor.

THE official working of the first of the regional broadcasting stations in this country will commence on Monday, when the Brookman's Park station takes over the responsibilities of the present 2LO at Oxford Street. Since, for the time being, the new station will radiate only one programme, there is likely to be little inconvenience to the general public, apart from the fact that there may be some difference in the volume distributed in certain areas. Such difference in signal strength, if any, will have already been detected during the test transmissions of the last month. So far, so good, but a somewhat different problem is likely to arise when Brookman's Park starts radiating the second programme on the wavelength of 261 metres. The problem will be common to all regional transmitters when they are "put on the air," and it behoves the electrical contractor to gain first-hand experience from the fare offered by Brookman's Park, in order that he may be able to meet later contingencies. Once the two transmitters come into operation many of the older receivers now in use will be incapable of separating the programmes. We say "receivers now in use" somewhat guardedly, for any of the modern equipment, or any of the recently published receiving circuits should, without reservation, prove equal to an even greater demand upon their selective abilities. On the other hand, many licence holders are still using the sets they bought three, four and five years ago, when conditions called for no great degree of selectivity.

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Under the regional scheme these early sets may not be equal to the task of separation, even though the wavelength difference be over 100 metres. Indeed, some of these same receivers even now receive 5GB with a background of 2LO, thus making the regional problem from a receiving point of view all the more acute.

Solving the Difficulty.

THE far-seeing electrical contractor will have already realised that regional broadcasting will have a very considerable effect upon his radio business, bringing him into contact with many of the listening public who, through inability to obtain satisfactory results, will seek his aid. Obviously, the first recommendation to make in such cases will be the installation of a good modern receiver of the multi-valve type, but where financial inability to purchase is a deciding factor the recommendations should take the form of suggestions whereby existing apparatus may be altered to cope with the new conditions. In order to assist the electrical contractor in this direction, we publish elsewhere in this issue details of a number of methods whereby the selectivity of old receivers may be improved, and though, for reasons of space, these do not cover the whole of the field, they nevertheless serve to show how to improve most of the circuits with which contractors are likely to be concerned. It will be appreciated that the details given are concerned solely with programme separation and not in increasing signal strength. Should "regional" distribution prove to originate queries bearing on increasing the range of old equipment, then the subject will be dealt with in article form at a later date. Meanwhile, considerable business may be done in components, such as coils, formers, condensers, etc., in readiness for the somewhat more exacting conditions which will come about in the very near future.

October 21st.

THOSE of our readers who have followed the controversy regarding the American plans for a world-wide celebration of "Light's Golden Jubilee," honouring Mr. EDISON (instead of the late Sir JOSEPH SWAN) as the inventor of the incandescent electric lamp, will remember that this misplaced tribute culminates on October 21st with an attempt to broadcast throughout the world a special tribute to EDISON. Various foreign countries have been asked to undertake the organisation of broadcasting and public lighting displays on this occasion, and those which are not aware of SWAN'S undoubted priority seem to be interesting themselves in the proposals. In this country—much as we admire EDISON'S many valuable inventions in other fields—we are naturally unable to support the American claim. On the contrary, suitable steps are being taken to draw public attention to SWAN'S achievement. Sir OLIVER LODGE will give a broadcast talk from 2LO this (Friday) evening on "The Beginnings of Electric Lighting," and his remarks should prove a useful corrective to the mistaken notions in regard to this matter which are so persistently held by our friends in the United States.

The Sussex Downs Scheme.

IN sanctioning the erection of overhead transmission lines on the Sussex Downs in the face of formidable opposition, Mr. MORRISON, the Minister of Transport, has shown peculiar strength and foresight, and his recent public statement on the matter may be taken as an indication that while he is determined that material need shall not ride rough-shod over "England's green and pleasant land," he is fully alive to the industrial and domestic importance of the construction of the "grid" scheme in its entirety. He has shown that he will not be intimidated by the reactionaries whose sole mission in life seems to be to preserve everything, including, presumably, the shacks and unsightly buildings with which the Sussex Downs are already afflicted. The opposition relating to this question is not dead yet, but the decision of the Minister of Transport permits us to regard it as at least bereft of its sting.

Our Overseas Trade.

BRITISH export trade during the nine months of this year showed an increase of £8 457 118, when compared with the same period last year, and an increase of £24 916 393 by comparison with the same months of 1927. Exports for September, 1929, however, do not convey the same good impression for, by comparison with August last, trade declined by nearly £8 000 000, though only £1 575 715 when compared with September, 1928. Imports during September last also increased by some £11 000 000 when compared with the total for September, 1928, the increase being due to larger purchases of foreign manufactured goods in the way of non-ferrous metals, electrical goods and machinery, and to bigger importations of raw materials. With respect to the increase of £8 457 000 in export values for the nine months, three-fourths of this amount was accounted for by increased coal exports, manufactured goods actually showing a decline of £878 000, due in a large measure to the falling off of textile trade. The returns to date show an adverse trade balance, that is imports in excess of exports, of £269 000 000, as against £259 000 000 last year and £290 000 000 in 1927. The rise in imports and the fall in exports were largely due to trade in cereals in the case of imports and the falling off of the trade in textiles, wool, etc., which has taken place in the case of exports.

The Electrical Position.

TRADE conditions appertaining to the electrical industry were also partly responsible for the lower export figures for the month, for, according to the Board of Trade returns, of which details are given on another page, the total exports for the month under review were £148 038 less than for the corresponding month last year. On the other hand, the details show a considerable increase during the month of export trade in machinery other than railway and tramway motors, and rubber insulated cables and wires other than submarine, which between them show an improvement of no less than £97 413 when compared with September, 1928. These improvements are not by any means isolated, for electrical measuring instruments, batteries and accumulators, switchboards other than telegraph, all show substantial increases, together with other items. Submarine cables, however, show a bad return, with a total for the month of £45 612, or £327 446 less than for the same month last year. Imports during the month under review were, with the exception of three items, all heavier than during the same month of 1928. Notwithstanding this fact, the value of the exports for the month was £547 609 in excess of that of the imports, while we still maintain a favourable electrical trade balance for the nine months of £8 486 907.

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OUR HOUSE IN ORDER.

Urgent Problems for Electrical Installation Contractors—How to Improve the Standard of Work—Registration or Regulations ?—The Inspection Bogey— The Need for a Clear-cut Policy.

By T. C. GILBERT.

EVERY week in our technical papers we read interesting details of super-station equipment, of larger and better generators and transformers; every day we read in our newspapers of big contracts awarded to this or that manufacturer, for overhead equipment to bring us the output of these super-stations. All these things, we are told, are done for one purpose only, and that is to bring electricity into most, if not all, of the houses in the country.

But one important point in this chain from station to house we neglect. We study the wind stresses on the overhead line carrying the supply to the farmhouse down to the fifth decimal place, but we do not worry as to what sort of installation the farmer has inside his house; the details of an installation where some of these enormous supplies are applied to public use are beneath our dignity.

Surely the point of contact (figuratively speaking of course) with the public should be a question of at least as much importance as, say, the disposal of ashes in a super-station, or the rival merits of concrete, steel, or wood poles? But do we find equal consideration given in our technical papers? I venture to state that the space allotted to installation practice per annum is probably equal to that given to businesses for sale.

Installation Problems.

This cannot be because the installation side has no problems or does not cry out for notice, as it is to-day shot through with inefficiency and incompetence, and its name stinks unto high Heaven. Nowhere is this better realised than within the installation trade itself, and it is at least a sign of grace that the cry for betterment comes from within and not from without. At the same time our critics are by no means silent, and it is becoming increasingly realised that better standards of work will have to be set up in view of the prospect of universal a.c. supplies for domestic use. These supplies at lethal pressure will be directly handled by the public, and the installation engineer is very worried as to how these improved conditions are to be brought about and maintained.

Public utterance of the electrical contractors' plea for a better standard of work was made by the President of the E.C.A. on the occasion of the annual dinner of the E.C.A. and Allied Associations, held at the Savoy Hotel, on January 23rd of this year. This plea was warmly upheld by the then Minister of Transport, Col. Ashley, at the same function, when he roundly condemned shoddy work. Speeches and writings of presidents and others who speak with authority for the E.C.A., have been burdened with this plea for many years.

The incompetent and half-trained contractor will, of course, always carry on his nefarious trade until he is forcibly prevented from doing so, but the greatest tragedy of all is the spectacle of the skilled and the expert being forced to carry out mediocre work because of price conditions.

The legitimate contractor has to-day to compete with the ex-blacksmith and the plumber, or worse still, with the mechanic from the neighbouring factory or dockyard, who works in his spare time.

All will agree that here is a state of affairs calling for instant remedy if public confidence in electrical service is to be maintained, and the greatest possible use made of our abundant electrical supplies. The problem is, of course, how to bring about the greatly desired improvement, and it is here, possibly, that persons outside the installation side of the business may help with their advice and suggestions, seeing that our own leaders' views are so sadly divided.

As a humble member of the rank and file my weak voice has been raised in other quarters as to how we should work to improve the general standard of safety in electrical installations in this country, and I have been told so many ways that I can only hope that they will not all be tried at once. Two main answers—Registration and Regulations—stand out from amongst the welter, but no two opinions on either seem to be alike, and in some cases are diametrically opposed; my own conclusions appear to meet with nobody's approval, so where are we? Cannot our big brothers of the super-stations and the grids spare us a few moments from their own problems and help us with their suggestions as to the solution of ours?

For their information, let me marshal the varied opinions of our own leaders as I understand them to-day. It is now generally accepted amongst them that only three main ways exist for the improvement of the standard of electrical installation work, these being either Compulsory Registration, Compulsory Regulations, or (most votes of all) a combination of both. So far, opinions are not seriously divided, the general body of contractors agreeing that to work along some, or all, of these lines may bring about the desired end. When, however, we come to examine these proposals in detail, opinions differ at almost every point, and these differences I propose to boil down as far as possible, and set out as clearly as I can.

To take the first remedy, compulsory registration. Several E.C.A. members, notably Mr. E. R. Morris, have had the temerity to suggest that compulsory registration, without any appendages such as compulsory wiring rules, will fill the bill. In an article in the February "Electrical Contractor," after condemning compulsory regulations on various grounds, Mr. Morris says, "The compulsory registration of contractors and the licensing of wiremen is a much more simple and effective measure and cuts right to the heart of the trouble in one thrust." The present writer supported this view in a subsequent article in the same paper, but a load of trouble has now descended upon our heads, for our proposals are stated to be illogical, seeing that before we can have compulsory registration we *must* have a compulsory wiring code. In a communicated article in the "Electrical Contractor" (September, 1929) we find the following:—

> "In any case, no system of compulsory registration can possibly be brought into effect prior to the setting up of a compulsory code of wiring rules. To suggest that compulsory registration can precede compulsory rules is to put the cart before the horse and fly in the face of common sense."

So that is *that*, and Mr. H. J. Cash, whose work in connection with both registration and regulations is so well known, and which work gives his opinions peculiar weight, rubs it in by saying, in the same issue of the same paper, "To seek a remedy through compulsory registration is to follow a will-o'-the-wisp; that compulsory wiring rules are the only solution, and the E.C.A. should press for them on all occasions."

Registration Essential.

The reason given in the communicated article above referred to as to why compulsory registration cannot be effected without compulsory rules is that "no Government could possibly give authority to any professional organisation to add or delete a name to or from any compulsory register of installation contractors unless the rules to which registered men are required to work had first been agreed and officially imposed on the trade."

This I am not quite satisfied about. Do doctors, dentists, etc., have to conform to certain working rules in their profession? Do they not consider the spirit of things rather than the letter, and can we not visualise contractors, registered or licensed, under much the same conditions? It is generally conceded that registration is an absolute necessity in connection with the problem under consideration, but Mr. Morris, in his article mentioned above, goes further and says:—

> "It is of far more importance to life that electrical contractors should be registered than either architects or opticians. I contend that it is of far greater importance that we should be registered than members of either of these professions, and I submit that it is in the interest of the nation that electrical contractors should be registered, equally as much as dispensing chemists."

With this view I find myself in complete agreement, but I am authoritatively told that I am wrong, and that before anything can be done in this matter I must be saddled with a whole lot of compulsory wiring regulations.

Regarding the reason given above as to why compulsory rules must precede compulsory registration, does not the Register already possess this autocratic power? In some

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localities where assisted wiring schemes are in operation, registered contractors *only* are considered in connection with this work, and to all intents and purposes the Register operates as a compulsory measure in these districts for many contractors. Yet sufficient power is possessed under paragraph 10 (clause b) of the Register's Rules and Conditions to put men engaged in this work practically out of business: this paragraph states, "if it is proved to the satisfaction of the Executive Committee that he (the contractor) has culpably or negligently created a risk to life or limb, or serious fire hazard through the use of faulty or improper materials or by faulty workmanship" then his name shall be removed from the Register.

Knowledge the Best Standard.

This seems to me to be comprehensive enough, without any further detail or specifying exactly what may or may not be done. A man's training and knowledge should be sufficient to enable him to steer clear of any trouble. For a really competent contractor no rules or regulations are required, and surely we need not consider the other sort? The only standard demanded for registration should be knowledge, not mere blind compliance with rules and regulations, and registration made compulsory on those lines. However, here I come up against opinions that are weightier than my own, and I should be glad of further guidance.

Assume for the moment, however, that we accept the view that compulsory registration is not possible without compulsory rules, what is our objection to these compulsory rules? Why can we not all agree that they are desirable, and why should we not, as Mr. Cash advises, press for them on all occasions?

The objections are many and deep-rooted, but I propose to take only the more important in detail. The first objection that arises is the fear that compulsory wiring rules carry with them a risk of inspection, to which most contractors are bitterly opposed. The late Mr. A. H. Allen, for many years technical editor of the "Electrical Review," at an E.C.A. London Branch meeting last year, ". . . asked members to consider very carefully before asking for drastic regulations. Regulations involved inspectors, thereby imposing further burdens on an industry already overburdened in this respect." But Mr. H. J. Cash, in the letter previously referred to, assures us that we need fear no such thing, ". . . most emphatically that compulsory wiring rules neither connote the appointing of inspectors nor conferring powers of inspection on supply authorities or other officials."

We should be only too happy to accept this as final, but our fears are not completely allayed when we find that inspection is being openly advocated in some quarters. We all remember the speech of the then president of the E.C.A., Mr. W. A. Shaw, when he said at Cheltenham, in connection with wiring regulations:

> All sections of the industry should unite with a view to obtaining a compulsory code of wiring rules, providing a standard below which no work would be permitted to be connected to the public mains. Such a scheme would carry with it full authority to electricity supply departments to inspect installation work in progress and to refuse connections to any work below the given standard.

I submit that such a state of affairs as depicted by Mr. Shaw is absolutely unthinkable—in fact it is put very clearly and forcibly in the communicated article to which I have already referred, and from which I propose to quote further. It is stated:

> Is it to be imagined that electrical contractors would tolerate inspection by supply authorities—in many cases their immediate competitors in electrical installation work? Confusion would be the worse confounded if supply authorities were given individual power to give their own fads or fancies legal standing in their own areas; and in the same way, any inspection powers given to local authorities in general terms would be equally disastrous.

This is undoubtedly the opinion of the majority of contractors, but I should point out that not only is it "imagined" but definitely advocated by Mr. Shaw in his Cheltenham speech, and I can find no evidence that it was seriously objected to by contractors attending the Conference, either at the time or since.

I cannot do better than quote the comment of a leading article in "Contact" (July 1928) on Mr. Shaw's speech. The article says:

> We can hardly agree that Mr. Shaw's method of enforcing the wiring rules is ideal. Would it not be better if the National Register of Electrical Installation Contractors had the handling of such a problem? Agreed it would be necessary to induce the Electricity Commissioners to make the wiring regulations compulsory, but, having attained that, could not the N.R.E.I.C. combine its duties of watching over the workmanship of its members with the enforcement of recognised wiring regulations? The National Register should appoint its inspectors, who would have the right to inspect any installation work in progress, and to report any instances of bad workmanship or evasion of the rules, and on both counts the supply undertaking could be advised of the position.

This is an interesting suggestion, and will be referred to again later.

It will be noted that the inspection of installations in progress appears to be taken as a necessary adjunct to compulsory rules, and I think this would generally be assumed to be the case, but it will be remembered that Mr. Cash assured us that compulsory rules "neither connote the appointing of inspectors nor conferring the powers of inspection." Again, in the communicated article, already extensively quoted, we find "no routine inspection as such is called for; there is no manner of need for routine inspection by supply authorities (which is entirely unthinkable) or by the I.E.E., the E.C.A., the National Register, or any other body."

Apparently, then, these rules are to be compulsory, but not compelled; will not that leave the position much where it is to-day, in which the rules are already morally compulsory, and where definitely specified are actually so, and yet are more honoured in the breach than in the observance? If regulations are not compelled by inspectors, will they be observed by the unscrupulous contractor? Will not a demand for inspection arise from the industry itself to put an end to unfair competition?

A further instance of the assumption that compulsory wiring rules mean inspection is provided by another leader of the industry, Mr. Donald Smeaton Munro, who, in a lecture to the Edinburgh Insurance Students' Circle, emphasised the fact that the only official safeguards in Britain for the consumer were embodied in the wiring recommendations of the I.E.E., and in the constitution of the National Register. He suggested that the insurance companies should play a real part in protecting the public and their property by insistence on attention to rules, which in the meantime were adopted in name only, and by "paying the expense of systematic inspection." Again, Mr. E. R. Morris, in an article on "Compulsory Registration" ("Electrical Contractor," February, 1929) says: ". . . . for any 'so-called' compulsory wiring rules to be enforced would require an inspector to sit on every job."

Inspection in Other Fields.

In view of these opinions I think I might have been forgiven for having assumed that compulsory regulations would mean inspection, but I am again told in many quarters that I am quite wrong (and so, incidentally, are all these gentlemen whose opinions I have quoted!), and that my intelligence is not devastating. Here again I should be glad of assistance, as I find that we have building regulations and consequently building inspectors; Government and local authority regulations concerning water and drainage systems, and a standing army of sanitary inspectors; Home Office regulations for factories and workshops. and consequently inspectors. But I am most solemnly assured that electrical regulations will not mean electrical inspectors! That this question of inspection, even in its worst form, i.e., by local authorities, is not feared in some quarters is proved, firstly by Mr. Shaw's public demand for it, and secondly by the fact that the contractors of Leicester have already approached the Electricity Department to institute a system of inspection! Luckily for them, I think, the Department did not agree, not being prepared to accept this responsibility.

Then we have Mr. Penwill, the secretary of the E.C.A., at a meeting of the East Kent Branch, of which it is reported that "Mr. Penwill referred to an 'interesting' suggestion that an independent local inspector of wiring should be appointed by the magistrates of the area under their jurisdiction." It was not Mr. Penwill's suggestion, but neither was it condemned out of hand by the meeting, which is also interesting.

If compulsory wiring rules *should* imply inspection, let us at all costs keep such inspection more or less under our own control, somewhat on the lines suggested in the above-quoted criticisms from "Contact." But unfortunately we cannot look to the N.R.E.I.C. for the institution of such a system of inspection, for the Register does not at the moment agree to the imposition of any compulsory rules. In the report of the Executive Committee of the N.R.E.I.C. for 1928 we find the following:—

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The adoption of wiring regulations has been a constant subject of consideration and discussion, but your executive committee are still of the opinion that the time has not yet arrived for making compulsory a set of such regulations.

And yet on this executive committee serve the two gentlemen whose opinions I have already quoted as advocating compulsory regulations; in fact there should appear to be a majority on this committee in favour of compulsory regulations if they are really of the value that they are alleged to be, the composition of the committee being as follows: Representing I.M.E.A., 4; representing contractors, 4; representing consulting engineers, 1; representing I.E.E., 1 (chairman).

Although the Register is not prepared to tell me what I shall do, it will to a certain extent, enlighten me as to what I may *not* do; it is difficult to say how a thing should be done, but easier to say how it should *not* be done. A list of heinous crimes has, therefore, been issued to all registered contractors, the commission of any one of which will be sufficient to hurl them into outer darkness. One of these crimes (No. 3) is "leaving the ends of tubes at switch points, etc., without suitable bushings."

Now I am rather worried as to how the Register will know that I am, possibly, omitting bushings from my tubes, without coming and inspecting my jobs; we all know that the 30 years old jobs that we are pulling out to-day and rewiring possessed no bushes on the tubes (if any). Am I to wait for 30 years before I am removed from the Register because, with good workmanship, no trouble will result on the jobs, bushes or no bushes? In this connection another "interesting" suggestion was made in a letter to the "Electrical Review" (August 2, 1929) that the Register could be assisted in this direction by members of the E.T.U., who would presumably, being themselves without sin, report the wicked contractor to the Register. Words fail me as suitable comment here, but the writer of the letter was apparently quite serious in his suggestion.

I think the real reason, however, for the Register's refusal to countenance compulsory rules at a time when registration is purely voluntary is that it would handicap registered contractors from a competitive point of view. If this is so, this is a real argument as to the necessity for compulsory rules, although I shall quote Mr. Cash later as saying that standard rules will not increase wiring costs; also it is stated in "Electrical Security" (p. 24) "The Code (I.E.E.) does not increase the cost of a sound and dependable installation," and as presumably registered contractors already put in "sound and dependable" installations, it is rather difficult to see how the code, made compulsory, can do other than benefit those contractors.

Be the reason what it may, the Register will have no compulsory regulations, which, as pointed out above, is especially puzzling in view of the composition of the Executive Committee.

The Local Authority Position.

Coming back to the question of inspection, if we *still* fear, in spite of assurances to the contrary, that this may be carried out by local authorities, could we not persuade such local authorities to adopt some recognised code, say, the I.E.E. regulations, and enforce these only, leaving out of the question their own "fads and fancies"? But here again we appear to be stumped, for Mr. H. J. Cash, who speaks with authority from his long work on regulations, says in the "Electrical Contractor" for September, 1929:—

> I believe the supply authorities are for the most part in two camps on this matter of compulsory wiring rules. One section believes that it would involve the authorities in the responsibility of inspection, and they object to being so involved. The other section objects to being governed by any rules other than those drawn up by their own engineer, and believes quite erroneously that standard rules must inevitably increase wiring costs. Both these sections consequently are united in opposition (with a few exceptions) to a compulsory code.

I can well understand, for the reasons given, and many others, the supply authorities' opposition to compulsory regulations; after all, the "kerbstoner" is of just as much immediate use to them as the legitimate contractor, and possibly, in the mass, more so. I can also understand the N.R.E.I.C not giving this proposal their support, in view of the possible handicap to registered contractors, but I cannot understand why a bigger official push has not been made in this direction by the E.C.A., if compulsory regulations are such a desirable thing. Apart from Mr. Shaw's Cheltenham speech and Mr. Walton's reference at the E.C.A. dinner already referred to, when he mentioned "wiring rules to be observed, under penalty," the only things I have heard that it is considered necessary to make compulsory are certain earthing regulations.

Assuming that the inspection bogey has been killed once and for all, and I am willing to be convinced of this, are there any other objections to compulsory regulations alone as a remedy for the present state of affairs?

Vital Questions Untouched.

My own serious objection to wiring regulations alone is that they do not go nearly far enough, as they leave absolutely untouched the vital question of workmanship on the part of the mechanic, and of knowledge in the upper ranks of the contracting firm. This view is again supported by Mr. E. R. Morris, in the article previously referred to, when he says:—

> Compulsory wiring rules are all right as far as they go, but they do not go very far, in fact, they scarcely make a start. A man who is out to do shoddy work will take jolly good care to hide it under the floor boards, and make his "sore-finger" joints in tubes, etc., at the same time taking care that what small proportion of his work *is* visible shall come up to the requirements of any rules which may be in force.

This is perfectly true, and, further, the average grade of wiring material in use to-day is so good, not even excluding foreign cable, that this shoddy work will pass muster and tests, and probably be trouble-free for many years; the unscrupulous contractor will once again get away with it in spite of compulsory rules. I know of two cases near our own town: one, that of a jeweller who went into a radio side line at the time of the boom and is now an "electrical engineer"; and the other, that of an assistant in a purely radio business which failed, and who is also now an "electrical engineer," although his knowledge is such that he cannot correctly describe everyday materials that he occasionally requisitions from us. Compulsory rules alone will let both of these men in, although their electrical knowledge is of the most meagre description, and they will go on handling the domestic a.c. with the *assistance* of the regulations, which will be mainly news to them and of great help. This may make for the betterment of their individual work somewhat, but I fail to see how this can improve the general conditions of the industry; here again, perhaps, some of the enlightenment that I am craving may be vouchsafed to me. Neither of these cases could qualify for registration.

Good electrical installation work seems to me to be 80 per cent. workmanship and 20 per cent. material; the good mechanic will always beat the inferior for safety and reliability on his jobs, even if the odds are against him as regards the quality of material, or system employed. I should place the three main factors making for safety and reliability in electrical installations as follows: first, workmanship; second, lay-out; and third, material or system. As the first two really amount to the same thing—knowledge, surely any steps taken to improve the general quality of installation work should concentrate on these two main factors, and not merely on materials or systems, which is all that compulsory regulations can do.

This point of view is supported by a recent article in the "Electrical Review" ("Electricity in Holland," J. H. Mortimer, August 23rd, 1929), in which it is stated:—

> Slack though this attitude may appear to be, it places an onus on the consumer, the architect and the contractor, which induces far more careful consideration than do our somewhat overwhelming Rules and Regulations. The latter seem to lull us into a sense of false security from which our Dutch friends are entirely free. I do not for one moment suggest that we should do away with our rules, but I do feel that we need to realise that they cannot always be rigidly applied, and that in addition to them co-operation is vitally necessary, so that they may be obeyed in spirit oftentimes rather than in letter.

In other words, the less rules, the more brains.

This is undoubtedly, in my view, the commonsense attitude to take in regard to regulations; just imagine for one moment the Golden Rule made absolutely compulsory!

It will be noted that my own conclusions are that registration is imperative; without regulations, if possible; if not, then with regulations. The conditions of registration under the N.R.E.I.C. are undoubtedly on the right lines, stressing as they do the need for practical knowledge rather than merely blind compliance with regulations. *Cannot* we have this possession of knowledge made compulsory without having to conform to compulsory rules? "Yes," says Mr. Morris. "No," says Mr. Cash, "this is illogical." Very well, then, if we must have compulsory regulations as well, are we to suffer under inspection by supply authorities or other bodies?

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"Yes," says Mr. Shaw, Mr. Munro, the late Mr. Allen, and others. "No," again says Mr. Cash. Even if we do not suffer inspection, are compulsory regulations desirable? "Yes," say Mr. Cash and Mr. Munro (both on the same side now, and both on the N.R.E.I.C. executive); "No," say the N.R.E.I.C. executive, the supply authorities, and very many installation engineers.

It is all very confusing, and, so far, nothing has been said as to the possibility of finding a code of wiring rules that will be accepted without question by all contractors, seeing how widely wiring practice varies in different parts of the country. There is not much doubt that the code proposed for universal acceptance will be the Ninth Edition of the I.E.E. "Regulations for the Electrical Equipment of Buildings," but these would not find absolute acceptance in their entirety. That this is so is recognised in the latest E.C.A. publication, "Electrical Security," where it is stated, in a chapter on "Earthed Equipment," that :—

> At the present moment electrical engineers are not entirely agreed concerning the necessity to earth all domestic equipment, no matter in what part of the house such apparatus is used.

This rather understates the case, as there is active opposition to the earthing clauses in some quarters, and I do not propose to enter into this controversy here beyond stating that fact; but obviously this opposition will have to be overcome before any universal code of wiring rules can be imposed upon installation engineers. Should it be agreed, however, that compulsory rules *are* essential to our well-being, I do not look upon this divergence of opinion as a very serious matter, for probably most contractors would be willing to sink their differences as to detail for the general improvement of the industry. In any case, as regards the clauses around which controversy rages, these could probably be amended so as to suit both sides.

Anyone who has the patience to read through these notes will see how very perplexing the present position is, and how necessary it is for a clear policy to be formulated before any active steps can be taken to bring about the much-desired improvement in our industry. The average rank and file contractors are all pulling in different ways at the moment, but their efforts could be made very effective were they only co-ordinated. The individual contractors can do a great deal in this matter by working through their local Chamber of Commerce or Chamber of Trade, but chiefly, of course, by becoming themselves voluntarily registered. Until the Register can show that it comprises, say, 75 per cent. of the reputable contractors of the country, it will never be in a sufficiently strong position to consider compulsory proposals in any direction.

That contractors would respond with alacrity to any clear-cut policy, definitely formulated, is certain, and it appears to be essential that this policy be considered at the earliest possible opportunity. Individual efforts are simply being wasted at the moment owing to the chaotic ideas prevailing, and we should all welcome an electrical Mussolini who would, however drastically or autocratically, divert all our efforts into one main channel, even if it meant the complete extinction politically of the Bolsheviks in the industry, of which select body the present writer would undoubtedly be considered to be a member.

THE ELECTRICAL CONTRACTOR AND THE REGIONAL BROADCASTING SCHEME.

The Problem of Programme Separation—Questions the Contractor Will Need to Answer —Simple Methods for Improving Selectivity.

By "RADICON."

WHEREAS the aim of the British Broadcasting Corporation has hitherto been to provide a single programme service for each of a large number of transmitting stations situated in the various important centres of the United Kingdom, the regional scheme may be regarded as a more economical method of doing the same thing, with the difference that fewer stations of larger power will be operated. These stations will be erected at suitable distances from the large towns, and each will be provided with two transmitters radiating different programmes on wavelengths sufficiently different in amplitude to permit of either programme being received without interference from the other, subject to the receiver being reasonably selective.

The first of the regional stations, namely, Brookman's Park, has been carrying out tests for the last month, using only one transmitter and a wavelength of 356·3 metres. The second transmitter will come into operation shortly, and will be heard on a wavelength of 261·3 metres. Listeners within range of Brookman's Park will thus have the choice of two programmes, assuming, of course, that the receiver is not so flat in its tuning that both programmes are heard simultaneously.

In the present circumstances southern listeners have as their alternative programme that provided by 5GB, and though in the majority of cases it is possible to separate 2LO from 5GB, this does not signify that similar separation of the two Brookman's Park programmes is a foregone conclusion when using the same receiver.

In anticipation of this difficulty, it is proposed to discuss in detail a few simple methods of improving the selectivity of circuits which are likely to prove inadequate in the matter of sharp tuning under the new conditions, and to suggest to electrical contractors suitable alterations and additions which may be passed on in answer to the queries which are sure to arise.

In the first place, it may be taken that any valve receiver of modern design, or any published valve circuit of recent origin will, with very few exceptions, do the work expected of it. In cases where it does not, the fault is more likely to be a wrong adjustment or connection than a fundamental error in the apparatus or circuit.

The receivers which are likely to give most trouble are (1) crystal sets, (2) single valve sets, and (3) multi-valve sets using direct aerial coupling, a good many of which are still in use. Next on the list of doubtful equipment come (*a*) sets employing high-frequency amplification, and possessing large natural "pick-up" tendencies such as are found in the old tuned anode, potentiometer-controlled arrangement, (*b*) early type sets incorporating multi-wave tuning devices of the tapped inductance variety, for both aerial and anode circuit tuning, the whole being stabilised either by a resistance in the first grid circuit or positive bias being applied to the h.f. valve, and (*c*) sets incorporating a single untuned transformer-coupled high-frequency stage covering the 250–550 metre waveband and a variably coupled aerial circuit.

It will be appreciated that space will not permit of every improvement being given to each of the receivers enumerated, and we will take as the first examples the sets classed as (1), (2) and (3).

The majority of crystal sets use the circuit shown in Fig. 1, the inductance L1 being a plug-in coil, and C1 a variable 0·0005 μF condenser. With such a circuit the separation of two programmes emanating from a regional station is highly problematic and the arrangements of Figs. 2 and 3 are suggested, the original circuit retaining the same references as in Fig. 1. In the case of Fig. 2, the inductance L1 should be a No. 60 plug-in coil tuned by the same condenser C1, and L2 should be a No. 35 or 50 coil tuned by another 0·0005μF variable condenser, C2. The two coils, L1, and L2 should be variably coupled by means of a two coil holder, the wider apart the coils, or, in other words, the looser the coupling, the greater the chance of separating the programmes. The operation of this arrangement is obviously less simple than that of Fig. 1, but it will generally be found that, unless the receiver is very near the location of the transmitters, the two programmes may be separated without any great loss of signal strength. The coupling of L1 and L2 will vary with each wavelength, as well as with every alteration of the readings on the condensers, but once the optimum couplings for the two programmes are found, final adjustments of the condenser vanes are quickly made. Readjustment of the crystal setting

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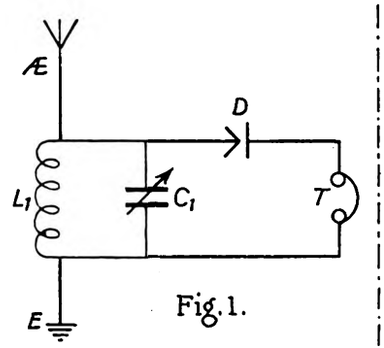

Fig. 1.

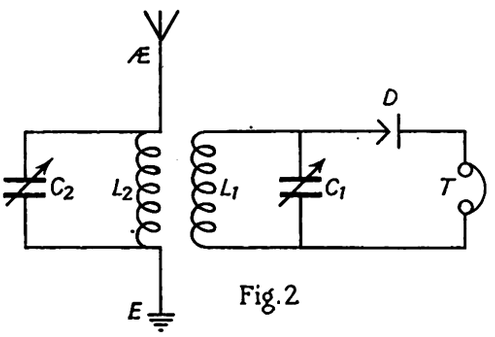

Fig. 2

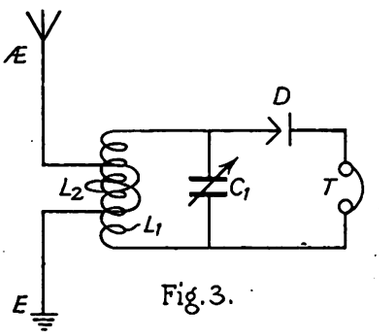

Fig. 3.

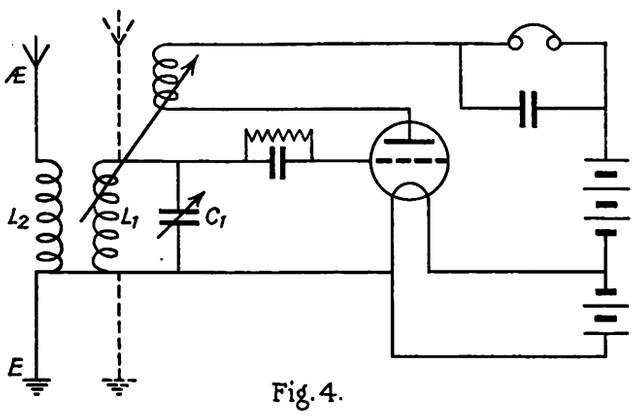

Fig. 4.

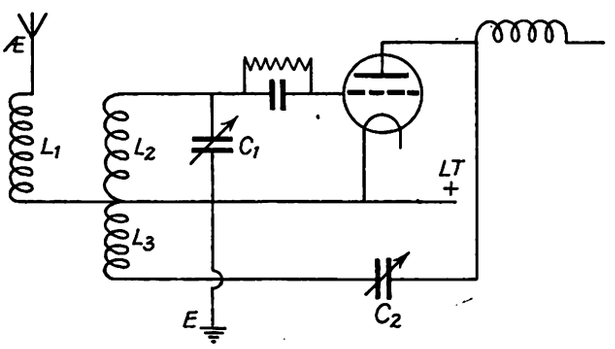

Fig. 4a

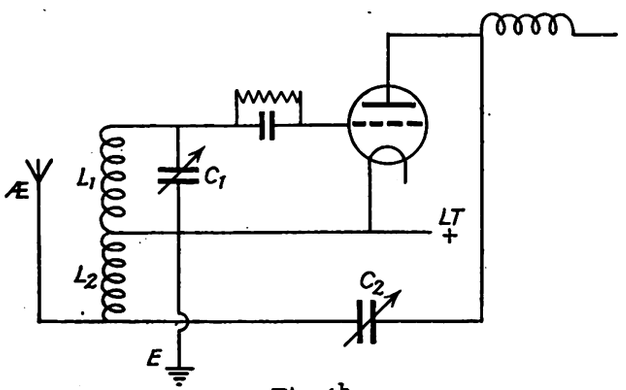

Fig. 4b

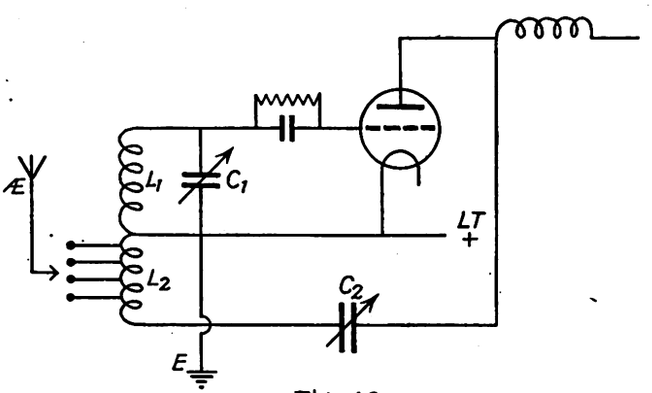

Fig. 4c

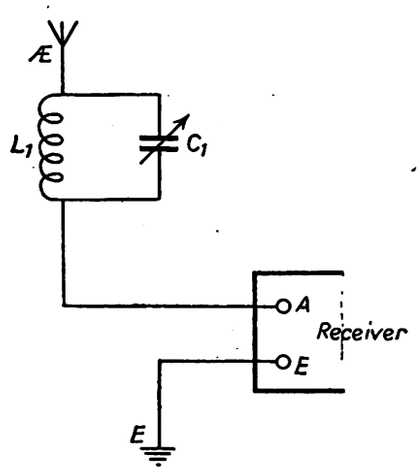

Fig. 5.

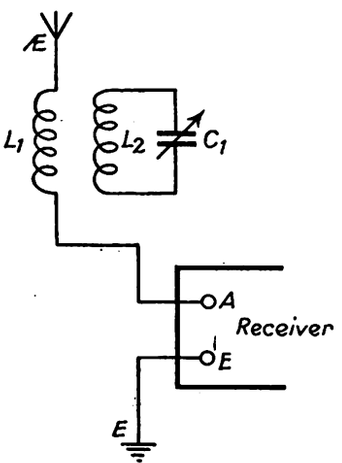

Fig. 6.

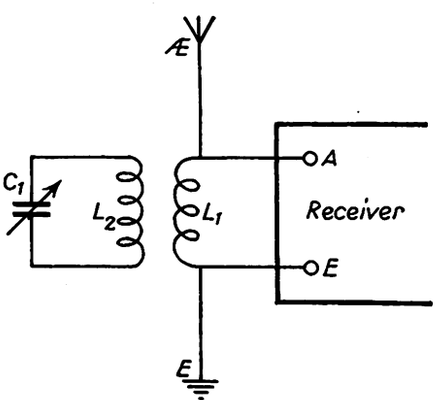

Fig. 7.

SIMPLE improvements and additions which may be made to early-type receivers in order that a higher degree of selectivity may be obtained to meet the new conditions brought about by the "regional" broadcasting scheme.

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again necessitates some slight tuning adjustment in most cases.

The circuit arrangement shown in Fig. 3 is another simple method of improving crystal set selectivity with the advantage that no additional tuning control is added. The coil L1 may be of the cylindrical type or it may be one of the popular plug-in series. In the case of the former it should consist of about 50 to 60 turns of No. 22 d.c.c. wire wound on a 3-in. former, or, if plug-in coils are used, a No. 60 coil will suffice. The inductance L2 consists of 10 or 20 turns wound over L1 in the case of a cylindrical coil, or as tightly coupled as possible in the case of a plug-in coil. The number of turns for the inductance L2 is best found by trial and error in order that the best compromise between loss of signal strength and selectivity may be reached.

Single Valve Circuits.

Receivers consisting of single valve circuits or rectifying valves followed by low frequency amplifiers are again likely to prove unselective if the set is of the old type. A circuit which was very popular a few years ago is shown in Fig. 4, and, though this is a single valve arrangement, many old designs added to this one on two low frequency stages. For the purpose of selectivity, however, these have been ignored for obvious reasons. The direct coupled aerial circuit is indicated by L1, C1 and the dotted lines, and in a very few cases will such an arrangement prove good enough under the regional scheme. The simplest way out of the difficulty is to try the addition of L2. Receivers using the Fig. 4 circuit more often than not utilise plug-in coils and, in order that the circuit may prove more suitable for modern conditions, it is suggested that L1 be a No. 60 coil and L2 a No. 35 or less, loosely coupled to L1 with the low potential end of L1 connected to L2 as shown. This arrangement will be effective in some cases though not in all, and, in the latter circumstances, a small fixed condenser (0·0001 μF) should be connected in series with L2 at the high potential end of the aerial-earth circuit, trying also the effect of a larger coil.

The operation of the set will be the same as originally, with the exception that the circuit will be more sensitive with respect to reaction coupling, and in most cases it will be found advisable to reduce the size of the coil so that adjustment is less " floppy " and " sticky." The coupling between L1 and L2 should be found by experiment, bearing in mind that the looser the coupling, that is the wider apart the coils, the greater the selectivity. It will generally be found, however, that an optimum coupling suitable for all wavelengths covered by the particular inductance and capacity is the most convenient.

Those receivers which incorporate the so-called " Reinartz " method of reaction and the inductively coupled aerial circuit of Fig. 4a can have their selective properties improved by a reduction, within limits, of the number of turns in the coil L1, or alternatively by varying the coupling between L1 and L2.

On the other hand, circuits of the type shown in Fig. 4b will probably require more attention, and the arrangement of Fig. 4c is suggested. The difficulty with the Fig. 4b circuit would lie in the coil L2, and any reduction in the number of turns with a view to improving selectivity would in all probability upset the reaction adjustments in such a way that the set would either not oscillate at all, or only on the lower wavelengths. Fig 4c shows a method of overcoming the difficulty, and though not perfect from a theoretical point of view, it nevertheless affords a means of reducing the aerial coupling with consequent improvement in selectivity without substantially altering the original arrangement. Sets using this form of circuit will generally be found to incorporate a cylindrical type of inductance, and it should prove a simple matter to make the tappings as suggested, every five or so turns.

Multi-Valve Receivers.

Multi-valve receivers incorporating high-frequency valves, with direct aerial coupling, and receivers utilising old type multi-wavelength tuners present a problem somewhat different from the cases previously dealt with. Early receivers employing high-frequency amplification would probably become unstable if any attempt were made at inductively coupling the aerial, and for this reason it is suggested that one of the three arrangements, Figs. 5, 6 or 7, be used.

In all three cases the additional apparatus is external to the set, and may, if desired, be housed in a small box near to the receiver. From the point of view of construction the first, Fig. 5, is the easiest, consisting as it does of a No. 50 or 60 plug-in coil with a 0·0005 μF variable condenser in parallel. The connections are made as indicated in the figure, and with the condenser C1 set to its zero reading the desired programme should be tuned in on the set in the normal way, irrespective of interference from other stations or from the other " regional programme." When the required signals have been tuned to their maximum volume, turning the C1 condenser slowly will soon result in a position being found where " the interfering programmes " either become inaudible or of such weak strength as to be " lost " in the more powerful signals of the wanted programme, whereupon the set should be retuned.

This addition will be found very useful in a number of cases, but not in all, for its success is largely dependent upon the aerial arrangements and the aerial-earth circuit of the receiver. It may, however, be tried with any receiver, irrespective of the number of valves used, where the first grid circuit is either directly coupled to the aerial, or where simple inductive coupling is used.

Another somewhat similar arangement is shown in Fig. 6, but in this case the coils will be required to be wound. L2, consisting of 40 turns of No. 26 d.c.c. wire, is wound on a 3 in. former with L1, consisting of 8 or 10 turns of the same gauge wire wound over it. The coil L2 is tuned by a 0·0005 μF condenser in parallel, and the connections are as in Fig. 6. The operation of both the added circuit and of the set itself is the same as with the Fig. 5 arrangement, tuning will, however, be more critical.

Still another form of additional circuit which may be used is that of Fig. 7, and as in the case of Fig. 6 this will require to be made. L2, consisting of 40 turns of No. 26 d.c.c. is wound on a 3 in. former, with L1, consisting of 4 or 5 turns of the same wire wound over it. L2 is tuned by a 0·0005 μF condenser connected in parallel as before, and L1 is connected directly across the aerial and earth terminals of the set. The operation of the Fig. 7 arrangement is again the same as Fig. 5, but it will generally be found that tuning is sharp and definite.

Proximity to Station.

It will be appreciated that the selectivity problem is largely wrapped up in the proximity of the set to the regional station, and though a listener, say, in South London is able to separate 5GB from Brookman's Park in the present circumstances, the fact that the two Brookman's Park programmes will be transmitted over the same distance and from the same direction may be sufficient to break down the selectivity enjoyed in the case of 5GB and 2LO. The wavelengths to be used by the London regional station are sufficiently wide apart to eliminate any difficulty with practically any modern receiver, and of sufficiently different amplitudes to enable the simplest of improvements to all apparatus to be effective, except in those cases where the transmitters are within the immediate vicinity of the receiver.

The suggestions given are purely in relation to programme separation, and will not in any circumstances permit of a regional station being received at greater volume. Where reception proves to be weaker under the regional scheme than at present, then contractors should advise the adding of a high-frequency valve to existing apparatus, providing that not more than one is already in use. Better still, the utilisation of a modern receiver should be recommended.

TELEPHONE PROGRESS IN IRELAND.

Rapid Growth in Internal and Cross-Channel Traffic.

THE following statistics relating to the growth of the telephone service in the Irish Free State have been issued. In 1922, 104 exchanges and 552 call offices were in operation. Local calls numbered 10 000 000 and trunk calls 77 700. By the close of 1928 there were 678 exchanges and 1 165 call offices in operation, while the number of local calls had grown to 19 265 000 and the number of trunk calls to 177 450. Dublin has now 5 000 automatic telephones in use, and arrangements have been made by the Post Office to have 6 175 installed, with 5 575 extensions, in the next few months. This increase in automatic telephones was decided on after subscribers with a lengthy experience of the system had been consulted as to whether the whole of Dublin should be turned over to automatic working. Sixty per cent. voted, and of these ninety per cent. were in favour. In 1925 there was only one trunk circuit to Cork ; now there are three. The telephone service to England has doubled, and about 15 calls are now put through between Dublin and Liverpool or London in a normally busy hour.

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ANIMATION IN SHOP WINDOW DISPLAY.

Some Hints for Electrical Contractors—Boomerang Effect of Fake Displays—Demonstrating Cooker Service—A Fire Display Scheme.

By CYRIL SYLVESTER, A.M.I.E.E., A.M.I.Mech.E.

THERE is something fascinating about movement. It is an indication of life, of activity. Its attractiveness is realised and exploited in almost every phase of commercial life. An animated sign of the simplest form, where electric light illuminates a sign for a few seconds through the medium of a thermo-flasher, will attract attention. The more elaborate signs, with animated figures and running borders, are so popular as to be termed " sights " ; Piccadilly Circus at night time is an example of this. Even in a shop window display a revolving dressed figure in a tailor's shop will attract more attention than a similar model which is lifeless.

In the electrical business, movement in a shop window display as an attractive medium is realised. In the summer time we see electric fans blowing balloons about in a window, and various coloured silk streamers move about in an attractive manner. A washing machine " in operation " has been proved to be a greater attraction than one which is just " on show " ; one upon which is fixed a card bearing the bald statement that a washing machine is a labour-saving device.

But we in the electrical business are faced with greater problems than many of those in other businesses. Our business is not of the same class throughout the year. A confectioner sells the same class of goods winter and summer. The tailor displays clothes in his shop window winter and summer ; his revolving figure is suitable as an attractive medium all the year round. All he has to do is to change summer garments for winter ones, and *vice versa*.

We, obviously, cannot display fans in the winter time ; in the same way we cannot very well display electric fires in the summer months. If, therefore, our shop windows are to be attractive through an animated medium, not only the class of display must be altered, but also the method adopted to draw attention to it must be changed.

To produce animation in a display of winter electrical goods is a problem, and one that is not too readily solved. Such domestic appliances as electric cookers, kettles and fires are unusually static in appearance. One thing is certain, and this is that the display must be genuine ; that is, not a stunt. By this I mean that the animation when introduced into the display must have some bearing upon the capabilities of the goods to which it is intended to attract attention.

Abroad, especially in America, methods are adopted to attract attention to a shop window display, which have no bearing whatever upon the goods to be sold. It is considered that once attention is drawn to a shop window the viewer becomes a potential customer. This may be so, but if the display is faked, it may have quite the opposite effect.

Misplaced Ingenuity.

To mention a case in point, I remember seeing in Pittsburg (Pa.) a display of electric lamps ; the method adopted to draw attention to this display was a fake. A large kettle was suspended in the middle of the display ; it was tilted at an angle, and an endless stream of water was *apparently* passing from the spout into a large basin located on the floor of the window. This was certainly an animated display and attention was attracted ; everyone was curious to know where the water was coming from, and this was about the extent of the value of the display. The solution of the illusion was simple. A small glass tube was connected between the spout of the kettle and a hole in the bottom of the basin ; the latter had a double bottom which contained water. A small pump forced the water from the basin up the glass tube into the spout of the kettle ; here it flowed over the top of the tube and down the outside, thus creating the illusion of a continuous stream. This display was out of place ; it was entirely unconnected with electric lamps.

It is not at all difficult to produce an animated display of the qualities of electric lamps. Lamps can be made into various designs and their circuits connected to flashers ; here we have animation at its best.

Again, colour is an excellent attractive medium. In Switzerland, some time ago, I saw one of the simplest and most effective displays that could possibly be devised to attract attention to the capabilities of coloured lamps. A number of coloured lamps, fitted in various reflectors, were connected to a flasher. In the centre of the display, upon a stand, was a piece of red velvet. Intermittent beams of coloured light were projected upon the cloth ; the attractive feature was that the material appeared to change in colour as the various coloured beams of light were intercepted by it. The object of this display was not only to show how some colours will enhance the appearance of coloured furnishings in the home, but to illustrate how the indiscriminate use of coloured light will detract from their appearance.

A Practical Cooker Display.

Referring to the more static of domestic appliances, say, an electric cooker and a kettle, these can be made the medium of an excellent animated display, and one which has a distinct bearing upon the uses of the appliances. To place a kettle upon a cooker has no attractive merits ; this is its usual place and, as such, would be passed unnoticed. If, however, the kettle is filled with water which has reached boiling point, the display immediately becomes an animated one. No person passing such a display could resist looking at the steam issuing from the kettle spout. Such a display shows the cause and effect of both the cooker and kettle. The cause is the " clean " heat, generated by electricity, transferred from the hotplate to the water ; the effect is the boiling water manifest in the form of steam.

Most winter domestic electrical appliances do not lend themselves to any form of animated display alone.

Let us take, for instance, the case of electric fires. These alone, whether in use or not, do not form a very attractive medium. An installation of a miniature cinematograph, however, can readily be made to form the connecting link between the display, the usefulness of the goods and their efficiency. I saw such a combined display in Paris a few months ago.

In a large shop window was a display of electric fires, both ordinary and ornamental. On the background was a small screen upon which animated pictures were projected at periods of about half a minute. The message of each picture was a different one. The chief points brought out were cleanliness, convenience and high efficiency. One picture would show a lady carrying a scuttle of coal to a fire ; as a contrast, the same lady was seen switching on the current to an electric fire.

Another picture would show a maid cleaning ashes from an ordinary coal fireplace ; the contrast was that she was seen merely dusting an electric fire. Another picture would show a maid looking up and down a snow-clad road waiting for the arrival of the coalman ; the contrast was the same maid closing the main switch of the electricity supply. Another picture would show the maid lighting coal fires in various rooms of the house ; the contrast was the maid carrying an electric fire from one room to another ; and so on.

During the projection of the pictures the lighting units in the window were dimmed. After each picture the bright lights upon the display emphasised in no uncertain manner the benefits of electricity as a heating medium. That the display was an attractive one there is no doubt ; this was manifest from the crowds which gathered round the window. And this is all that matters, since the sale of goods commences outside the shop—at the display window.

CONTRACTORS AND THE E.T.B.I.

WE are glad to draw attention to the effort which is being made by the London Branch of the Electrical Contractors' Association to help swell the funds of the Electrical Trades' Benevolent Institution. This will take the form of a Ball and Cabaret to be held at the Portman Rooms, 57, Baker Street, London, on Thursday, November 7th, at 8 p.m., at which it is hoped a large number from all sections of the industry will be present. Tickets are priced at 15s. each, but it is pointed out that dance tickets are usually sold in pairs. In addition to dancing, there will be some first-class cabaret turns, and a lucky number competition, for which interesting prizes are being given. Refreshments will be provided, and special garage accommodation has been arranged in close proximity to the hall. Tickets may be had from Mr. C. H. Flower, chairman of the London Branch, or from Mr. L. C. Penwill, at 15, Savoy Street, W.C.2.

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MODERN LIGHTING FITTINGS.

Notable Tendencies in Styles Available for the Autumn and Winter Season—Prevalence of Cubist and Cylindrical Forms.

READERS who have followed the numerous articles in these columns on modern lighting fittings design will be familiar with the general lines of present day development. The following notes are intended to give a general idea of tendencies noticeable in the productions available for the autumn and winter season.

In the first place it is becoming increasingly plain that the interdependence of two distinct sides of illumination—the engineering, which studies light distribution, diffusion, shadow elimination and efficiency, and the artistic, which deals with many visual problems not to be stated so concisely—is now realised much more definitely than previously.

The Geometrical Style.

Moreover, instead of designing fittings with one eye to the lighting qualities, and the other to appearance, as has frequently been done until recently, the latest practice appears to be to decide first just what lighting qualities are desirable, and then work from that, leaving the attractive appearance of the fitting to develop incidentally. Indeed, in many recent designs, there is more cleanness and originality than beauty in the sense of prettiness. It seems more to be the aim to startle and fascinate by novelty than to win by conventional loveliness. The cubist—or at all events geometrical—style is well to the front, and a particularly popular figure just now is the cylinder which enters into pendants and wall brackets with surprising aplomb. The cubist fashion has one great commercial advantage over other styles; the less elaborate fittings may be made up of several units, or of combinations of different units, and thus in the long run a great deal of expense may be saved.

The units may consist of glass boxes, cubic or rectangular, of spheres, cylinders, or even simple segments of geometrical shapes—to be adapted as afterwards desired.

In the case of pressed glass the monetary saving effected by this means is very great, as the principal expense in the production of pressed glass is the cost of the moulds. When the same design can be employed as the basis not only of numerous different types of pendants, but of pillar and cornice lighting also, the benefit to the slimmer-pursed sections of the community is obviously substantial.

As is well known, the drawback to some of the most beautiful modern fittings is often the very high price, which prevents such examples of the art being possessed by any but the favoured few; any device, therefore, that will make artistic fittings obtainable by the majority of electric light consumers is to be welcomed, even if it entails a certain degree of standardisation. It is hard indeed to have to return home from a showroom of tantalisingly attractive pendants to a crude bowl fitting—however much one used to admire the latter in comparison with the naked lamp of yesteryear.

Some months ago we gave a short account of the current designs of several well-known lighting specialists in London. It will probably interest contractors to hear something of the present tendencies in equipment produced by one or two of the same firms.

In some instances, as that of Best and Lloyd, Ltd., of 40, Great Marlborough Street, W.1, there has been little change since the spring. If anything, designs seem to be becoming more simplified, as the two illustrations (Figs. 6 and 8) may indicate. The pendant has a diameter of 18 inches, obscured rimpled plates and satined cylinder. Such metal work as shows is of brass. The wall bracket, which is stated to be a very popular example of the clean-cut type of mural lamp, is 15 inches long by seven and a quarter wide; many other sizes are, of course, available. The particular model illustrated is constructed with a triangular cross-section for fitting into a corner. These brackets can be had in either obscured rimpled or the firm's special "Firelight" glass. The latter is produced by a hand-spraying process on obscured rimpled glass, giving graduated tones merging from orange into pale yellow. The panes are removable.

On the opposite page will be seen several examples of the latest creations of Troughton and Young, Ltd., of 143, Knightsbridge, S.W.1. Fig. 2, which struck us as being one of the most generally useful pendants in the showrooms—although not the most beautiful—is a good example of the cylindrical note now so much in vogue. The semi-cylinders are in white porcelain, while the inverted pyramid in the centre (which is more like part of a French fitting) may be had in different colours. The decorative motifs at the corners are in this case green. Silvered metal is used for the apex applied to the pyramid, and it will be noticed that here again the pyramidic shape is introduced. The colouring of Messrs. Troughton and Young's pendants is so delightful that no black and white reproductions can do them justice, but a vague idea of the artistic level reached by some of the designer's attempts is given by Fig. 9, and, to a lesser degree, by Fig. 7. It should be noted that a pendant of the form used in Fig. 9 reflects light in every direction, while at the same time the rays are sufficiently broken up to ensure a soft light. When a really subdued light is wanted alabaster still serves a purpose, though the more translucent silica is as a rule a better substitute for glass. But usually pressed glass is the most useful for the semi-opaque type of fitting, and the almost infinite variety of hues possible enable the colour scheme of any room to be suited.

The glass used for many of Troughton and Young's productions is French, but it is shaped in this country, where the fittings are both designed and manufactured.

In order to furnish an impression of the numerous kinds of lighting fittings obtainable, we give short descriptions of some typical models which are not illustrated here:

An egg-shaped, brownish-tinted pendant, intersected at right angles by two planes of white glass. A pendant consisting of four vertical cylinders touching along the axis of the fitting; decorative metal on the outside between each pair of cylinders. A table lamp with a base of decorated porcelain, forming a prism. A red and white pendant; the large square panel, which is horizontal and takes the place of a bowl, is white, and all the decorative adjuncts are red. A wall bracket consisting of a fluorescent white semi-cylinder brought out from the wall by concave glass segments, with silvered metal bordering. A large square pendant suspended by the corners, with the lamps arranged on the arc of a circle; the diffusion is excellent, and the just perceptible extra brilliance under the lamps gives a very pretty effect.

These are a few of the most arresting designs. There are also some almost amusingly unconventional wall lamps, definitely asymmetrical in form. Two cylinders, for instance, side by side, but set unevenly, so that one is higher than the other, and another, similar, but with a third cylinder, external to the basic pair—as if trying to hide their unevenness.

The Use of Colour.

Table lamps are present in a variety of novel styles—some with crackleware bases and celastoid or nacrolaque shades. But, as far as pendants are concerned, "slat" construction predominates. The many coloured projecting "leaves"—and indeed some of these fittings have a sort of floral significance—break up the light indirectly, and only absorb very little of it. The rationale—so far as there can be a rationale in artistic matters—of Messrs. Troughton and Young's wonderful designing seems to be principally the clever application of permutations and combinations to the trinity of line and form—proportion—and material.

To judge by the imposing list of well-known buildings in London in which during the last year Sabino glass has been utilised for lighting fittings, the attention now being paid by architects to this make of French glass must now be considerable. Messrs. Borghys and Ling (of 4, Warwick Court, Holborn, W.C.1), who market Sabino glass in London and Paris, are notable for the wide field of demand catered for by their supplies, which range from luxurious and expensive super-fittings to small and very reasonably-priced pendants and brackets for the home. In the Café de Paris, which has recently been redecorated by Messrs. Waring and Gillow, 110 exquisite boat-shaped fittings have been installed. Each fitting appears to consist of numerous small irregular figures—solid in the geometrical sense—each containing a lamp, and so arranged that no joints or metal work are visible. But it is vain to attempt to give an idea of their beauty in cold print—it is only possible to mention the construction, which depends essentially on internal bronze bands, circular in form, with projecting arms gripping each of the manifold units. Another beautiful and massive type of fitting is the 3 ft. 6 in. diameter

(*Continued on page* 462.)

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bowl, with the convex surface divided into ten panels of pressed and engraved glass. These bowls, which weigh upwards of 15 lb. each, have welded wrought-iron frames, and are suspended by heavy chains.

In these showrooms some most effective ceiling lights are to be seen: one we particularly noticed had flat, parallel sides and semi-circular ends, giving a simplicity not too complete to be pleasantly soothing. Canopy fittings are also well in evidence, and different combinations give many variations in their appearance.

Some very attractive—and very modern—fittings are on view in the new showrooms of Lighting Trades, Ltd., at Oriel House, Farringdon Street. A "parallel octagon" pendant in delicate tones of pink or blue is typical: there are four horizontal panels, all but the lowest pierced to receive the lamp. The fitting folds for packing. The decorative mounts forming part of the supporting frame are of sprayed metal. Wall brackets of sheet glass are somewhat similar to the pendants; a good feature is the interchangeability, which makes it possible for the owner to adapt his brackets to new whims or to harmonise with new decorations. Whatever the shape of the upper part of each glass slot, the width of the lower part gripped by the frame is always the same—hence colours and styles can be changed at will.

A NOVEL COOKER COMPETITION.

Exhibition Visitors asked to Estimate Cost of Electric Cooking for Set Menu for a Week—Joint Enterprise of Manufacturers and Contractors.

IN the selling of domestic electrical appliances in this country we have avoided the startling stunt methods so generally adopted in the United States of America, and consideration of the differences in the psychological make-up of the inhabitants of the two countries suggests that the avoidance of blatant stunting is a desirable feature in British electrical-selling methods.

But in our anxiety to avoid the ill effects of over-selling we are prone to go to the other extreme, and fail to make use of any "stunt," however good it may be.

Cooking one of the meals included in the competition described in the accompanying notes.

The scheme we are about to describe, which was carried out by Messrs. Galliers, of Brighton, in co-operation with the Credenda Conduits Co., Ltd., was more an educational than a directly selling "stunt," but the interest which it has aroused among the visitors to the Brighton Electrical Exhibition during the past few days clearly shows the attractive value of out-of-the-ordinary methods in selling domestic electrical appliances to the general public.

How It was Done.

On Messrs. Galliers' stand at the Exhibition was fixed a standard "Creda" cooker of a size suitable for from two to four persons. The cooker was connected up to the mains, and after the meter had been read by Mr. J. Christie, the borough electrical engineer of Brighton, the meter was specially sealed and the dial obscured.

Arrangements were made for the cooking in this cooker of meals typical of the requirements of an average middle-class family, every day for one week. The menus for the week were exhibited, and the food, all of which was actually cooked in the Exhibition, was displayed each day for public inspection.

Visitors to the stand were invited to estimate the total cost of cooking the whole of the food for the week, given a supply of energy at 1d. per kWh. At the conclusion of the Exhibition to-morrow (Saturday) the meter will be read, and the competitor whose estimate is nearest to that actually recorded will be awarded the cooker, which is listed at £12 5s.

In addition to the valuable publicity for electric cooking and the contractors and manufacturers who were jointly responsible for its promotion, the competition also assured that a very practical test of the actual cost of electric cooking—upon which so curiously misinformed ideas prevail—should be brought before the visitors.

Convincing Data.

In view of the practical aspect referred to above, we reproduce the week's menus in full. If these are utilised in conjunction with the cost figure, which we hope to announce next week, they should provide convincing data for those who desire to support their arguments that electric cooking is not expensive, by the incontrovertible evidence which this interesting competition furnishes.

The menus for the week were as follows:—

FRIDAY, OCTOBER 11TH.—*Breakfast:* Porridge, bacon, toast. *Lunch:* Steak and kidney pie, potatoes and cabbage, Queen pudding. *Tea:* Swiss roll, toast. *Supper:* Cheese and biscuits, tomatoes, cocoa. Hot water, 7 pints; hot milk, 1½ pints; hot water (washing up), 1 gallon.

SATURDAY, OCTOBER 12TH.—*Breakfast:* Force, bacon and tomatoes, toast. *Lunch:* Roast beef, baked potatoes, beans, lemon pie. *Tea:* Sandwiches, sponge cake. *Supper:* Cold beef, pickles, hot milk. Hot water, 7 pints; hot milk, 2 pints; hot water (washing up), 1 gallon.

SUNDAY, OCTOBER 13TH.—*Breakfast:* Grape Nuts, eggs, toast. *Lunch:* Cold beef, boiled potatoes, cauliflower, chocolate pudding. *Tea:* Fruit salad, cake. *Supper:* Cauliflower au gratin, cocoa. Hot water, 7 pints; hot milk, 1½ pints; hot water (washing up), 1 gallon.

MONDAY, OCTOBER 14TH.—*Breakfast:* Porridge, fish, toast. *Lunch:* Rissoles, chops, potatoes, turnips, fruit tart, custard. *Tea:* Hot toast, sponge cake. *Supper:* Cheese and biscuits, hot milk. Hot water, 7 pints; hot milk, 2 pints. Hot water (washing up), 1 gallon.

TUESDAY, OCTOBER 15TH.—*Breakfast:* Force, sausages, toast. *Lunch:* Fish, sauce, potatoes and beans, Leicester pudding. *Tea:* Boiled eggs, cake. *Supper:* Fish pie, cocoa. Hot water, 7 pints; hot milk, 1½ pints; hot water (washing up), 1 gallon.

WEDNESDAY, OCTOBER 16TH.—*Breakfast:* Grape Nuts, bacon, toast. *Lunch:* Mixed grill, chips, cabbage, pineapple pudding. *Tea:* Fruit tart, tea. *Supper:* Sandwiches, hot milk. Hot water, 7 pints; hot milk, 2 pints; hot water (washing up), 1 gallon.

THURSDAY, OCTOBER 17TH.—*Breakfast:* Porridge, fish, toast. *Lunch:* Liver and bacon, grilled tomatoes, potatoes, cauliflower, rice pudding. *Tea:* Sandwiches, small cakes, hot toast. *Supper:* Cold meat, pickles, cocoa. Hot water, 7 pints; hot milk, 1 pint; hot water (washing up), 1 gallon.

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ADVERTISING FOR ELECTRICAL CONTRACTORS.

Preparing the "Copy"—The Opening Sentence—The Question of Type—Making the Most of Manufacturers' Sales-Aids in Local Campaigns.

By "PUBLICITY CONSULTANT."

"THE main thing is to get a really snappy phrase to start off an advertisement and so compel the interest of casual readers." So said an advertiser who ought to know better. A compelling opening is naturally desirable in everything that is expressible in words. In books and in conversation the picturesquely pertinent beginning that promises real and interesting information is a most desirable thing. In advertisements which are intended to reach the eyes of many who are not particularly anxious to read anything of the kind, the strong opening is all the more desirable.

Too many advertisers find extreme difficulty in getting down to their subject and in framing a telling phrase with which to start. The tendency to write a sort of introduction before launching out with the real purpose of the advertisement is far too noticeable in retailers' advertising to-day. Advertising space is too valuable to waste in this way. How can this unnecessary introduction be avoided? Chiefly, I have found, by first clearing the mind of any idea that the message is a piece of writing. Think, instead, that you are talking directly to a customer in the shop or showrooms. Think out and jot down roughly on paper the main arguments you would use to sell, say, an electric fire. Critical examination of these points will probably show, among the strong points, others which are either relatively unimpressive or mere repetitions of others. Rigorous pruning will reduce the lines of attack to the minimum, and upon this framework can be built up a forceful piece of copy shorn of the usual irrelevancies.

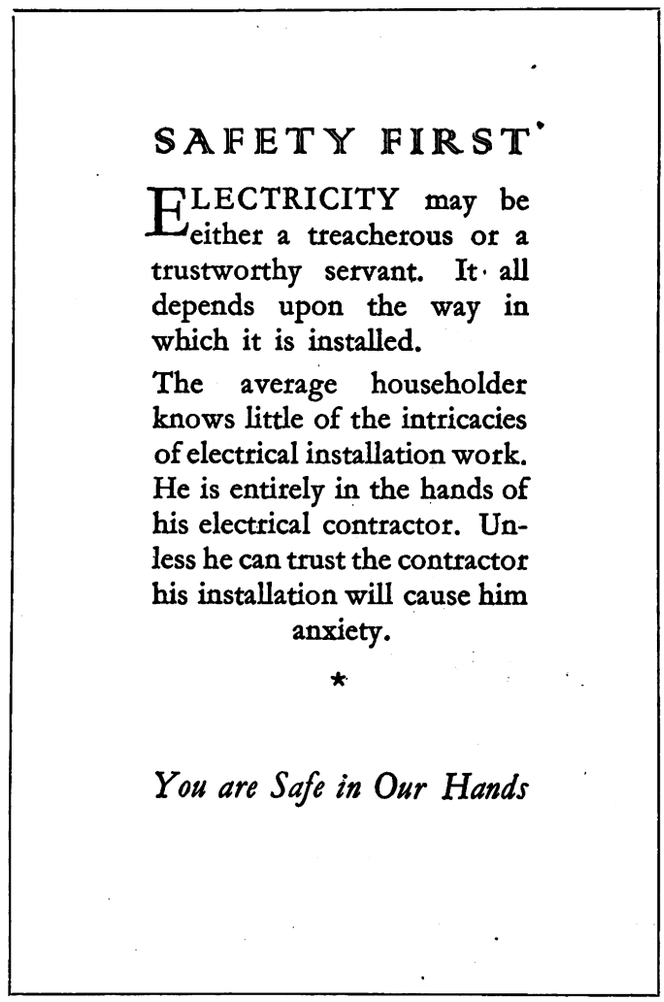
Some of my readers will have been wondering why I said that the author of the opening sentence in this article "ought to know better." Simply because he had sufficient experience of business and of advertising to know that a mere device to catch attention is valueless unless it is backed up by something that will hold that attention. He relied upon a merely clever phrase to bludgeon the unwilling reader, and then gave him nothing better than a string of inanities by way of consolation, and thus tended to create an attitude of distaste for that advertiser's products.

There are other dangers in the clever opening line or phrase, not the least of which is the ever-present possibility of an unintentional inversion of the idea that the advertiser has in mind. A typical instance was noticed in an exhibition catalogue the other day. An advertisement opened with the words "You cannot afford to leave the Exhibition without seeing the —— Electric Circulator." In this passage the first three words and the last three were printed in much larger type than the others, so that the natural tendency on the part of a casual reader would be to assume that he could not afford a —— electric circulator. Similar examples could be quoted, *ad nauseam*, so common is the habit of striving for initial effect without careful attention to the effect of the entire announcement.

In some of these cases it is not so much the wording as the incorrect use of different type sizes which causes the trouble by over-emphasising certain features and under-emphasising others. For instance, even in the example just referred to, the effect would have been less unfortunate if the large type passage had read "You cannot afford to leave the —— Electric Circulator."

The safest course to follow, however, is to avoid the use of phrases which, if read apart from their context by a hasty reader will link up negative or definitely bad qualities with the advertiser's name. A positive and unequivocal statement, even if it is not particularly smart or original, may frequently create a better impression in the mind of the headline reader. The eye is naturally attracted first by the strongest type and readily passes from one such emphasised portion to another which is similarly outstanding. It is therefore desirable that such deliberate underlinings should be planned so that even the most fleeting of readers will gain from it some definitely favourable impression.

I have stressed in earlier articles the very great advertising assistance which the electrical contractor may derive at little or no cost to himself from most of the electrical manufacturing firms. Well-produced booklets and folders, overprinted with the retailer's name and address, are a valuable aid in a local publicity campaign. Some can be handed to callers whether they make a purchase or not—for nobody should leave the shop without taking away some reminder of its existence and readiness to serve—while others can be enclosed with statements, quotations and circular letters. Proper distribution of these sales-helps is all too rarely encountered, and a little extra care in seeing that copies reach actual and potential customers,


SAFETY FIRST

ELECTRICITY may be either a treacherous or a trustworthy servant. It all depends upon the way in which it is installed.

The average householder knows little of the intricacies of electrical installation work. He is entirely in the hands of his electrical contractor. Unless he can trust the contractor his installation will cause him anxiety.

*

You are Safe in Our Hands

Fig. 1.—A page from a booklet issued by Thorpe and Bosco, Ltd. The type and layout are particularly good.

and are not wasted in street-corner distribution, is well worth while.

These productions cost the electrical manufacturers a considerable sum of money. Naturally, they are not philanthropists, and their proffered co-operation with the retailers is quite frankly for the purpose of selling more of their goods. By making it easier for the retailer to sell, the manufacturers act in the best interests of both.

Outstanding among recent efforts of this kind is a campaign for Siemen's radio batteries which has been planned in co-operation with Messrs. Industrial Publicity Services, Ltd. Apart from its practical value to co-operating retailers, the plan is of technical interest to students of advertising, and therefore warrants brief notice here. The scheme is based upon a cheery personage called Mr. Full O'Power, who, while possessing a normal human head, has a radio cell for body, and flex for arms and legs. This gentleman appears as the author of an attractive booklet giving "Inside Knowledge on the Correct Use of Radio Batteries," copies of which are available to retailers.

As the giver of useful information about the goods he has been created to sell, he is appearing in a series of Press advertisements, on the showcard illustrated in Fig. 2, and on a

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window bill. In each case he offers copies of his informative booklet. An idea of the lines on which the Press advertising is proceeding may be gathered from the miniature reproduction seen in the Fig. 2. The use of these advertising figures has often been overdone ; many of them have been mere buffoons without a purpose in life. Mr. Full O' Power, however, performs a useful service, and his career during the next few months will be followed with interest.

Fig. 2.—A miniature reproduction of a newspaper advertisement incorporating Mr. Full O' Power.

Apart from newspaper advertising and booklets definitely intended to sell certain kinds of goods, many electrical contractors will often feel the need of a small brochure which will give to customers some idea of the business which issues it, and of its capability to do the work. Such a production is well worthy of careful designing, for upon its appearance much may depend. A good-looking booklet may suggest to the customer a good-looking job, carefully done, while thoughts of the opposite kind may easily be engendered by a mediocre production.

One of the best booklets of this kind that I have seen is one issued by Thorpe and Bosco, Ltd. Printed on cream matt paper, 5¾ in. deep by 3¾ in. wide, with a cover of ivory card, it is a model of good typography and concise but well-turned expression. On the inside pages of the cover, and on each left-hand page of the eight which comprise the booklet, are pasted half-tone reproductions in a sepia finish of notable installations carried out by the firm. Fig. 1 is a reproduction of one of the right-hand pages in the booklet, and from this I think that readers will agree that the copy is excellent and the typography of a high order.

The quality of the text is good throughout, but two outstandingly good examples may be quoted here as models of clear exposition in very small compass.

One, entitled "Good Materials," points out that "The materials used in electrical installations may be of good quality or they may be of bad quality. It is our practice to use British materials not only in the interests of national prosperity, but because their superior quality, in combination with the best craftsmanship makes it possible for us to guarantee all our work." Then, at the foot of the page, comes the italicised phrase, "Our Guarantee costs us nothing."

The second example is headed "Forethought," and goes on to say that "There are few trades in which lack of forethought has such aggravating results as in that of the electrical contractor. It is too often easy to suggest improvements to an existing installation. It requires much greater skill and experience to produce a design which does not need to be improved at a later date, but which nevertheless permits of extensions where they may be desirable. We deal with problems before and not after."

The mark of the National Register of Electrical Installation Contractors appears in a prominent position on the front cover, while the back cover contains in facsimile handwriting the suggestion "that you slip this behind your fuse board for future reference." This is a clever touch, especially as it is followed by the firm's name and telephone number.

From a recent study of newspaper advertising conducted by electrical contractors and electricity supply authorities it is apparent that a large proportion of these announcements lose most of their potential effect because they are not properly balanced. The copy may be good, and the type and illustrations may not in themselves offend the most fastidious eye. But a disregard of the fundamentals of good balance often produces an effect quite the reverse of what was intended. Many people have an instinctive sense of balance, but those who find it missing when they come to the planning of advertisements—and many must surely experience this loss—should cultivate the necessary sense by concentrating for a time on planning advertisements which are exactly balanced. This arrangement, though lacking variety, is neat, and does not offend the eye.

There are, theoretically, three essential points of balance, i.e., top, centre and bottom, the centre being the most usual. In preparing a centre-balanced announcement the advertiser has to guard against making the layout top or bottom heavy. Then, with the top balance, one has to aim for an effect comparable with that of a hanging curtain ; allowing considerably more white space at the bottom than at the top tends to heighten the illusion of suspension. By transferring the "white" to the top of the announcement, the right atmosphere for the bottom balance layout is created and the text rests firmly, like a building on the base line.

In an exactly balanced advertisement every component part—illustrations, boxed-in portions of the copy, type masses and white space—has its exact opposite, but in practice the monotony of such an arrangement is apt to pall ; in any event it restricts the display possibilities of many promising announcements.

Numerous ways of obtaining good, but not exact balance will suggest themselves to the advertiser. Illustrations can, for instance, be balanced by boxed-in pieces of copy, and components can be set off against others differing from them in detail or character, so long as the "weight" of the contrasted elements is the same or similar. Attention to details of this kind will soon help to make advertisements which are not only right, but look right.

When a busy electrical contractor has to plan and write his own advertisements and keep pace with a busy season, there is some excuse, though not much, for commonplace advertisements. But during the past two months or so there has not been that excuse. The electrical contractors who stopped advertising during that time did so because in their own words "trade was slack," or "it was the slack season."

Leaving aside the obvious rejoinder that advertising is more than ever necessary in a slack period, it is surely not unreasonable to expect that a small portion of this interval should be devoted to the planning of really effective advertisements for use when the busy season begins. Judging by what has appeared in the newspapers so far, this idea has not appealed to many retail advertisers of electrical goods. It is easy to say what should be done—by someone else—but when it is realised that advertising space costs just as much when it is filled with full, stodgy material that sells nothing, as it does when packed with interesting and sales-promoting copy, the little extra effort needed is really a very small price to pay.

A very pleasing performance of the modern farce, "The Whole Town's Talking," by John Emerson and Anita Loos (the famous authoress of "Gentlemen Prefer Blondes") was given by the M.-V. Dramatic and Operatic Society in the Club Theatre on October 9th. The acting was first rate and the audience very appreciative. The performance was repeated on the three succeeding evenings with equal success.

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HOME LIGHTING.

Opportunities for Contractors in £1 000 Competition.

BRIEF details have already been given in these columns of the £1 000 competition for British architects, decorative artists and electrical contractors which is being organised by the "Daily Mail" in conjunction with the General Electric Co., Ltd., and it has been explained that its objects are: (1) To produce and further the use of the most modern ideas in connection with artistic electric lighting and heating in the home; (2) to demonstrate the important part which lighting plays in the home and to show its true relationship to architecture and decoration, and to encourage the development of artistic utility in the presentation of electric lighting and heating; and (3) to encourage the use of British ideas and British manufacturers.

According to fuller particulars just received, the General Electric Co. will erect at the forthcoming Ideal Home Exhibition a "Pavilion of Light," including six rooms, the lighting, heating, decorating, furnishing and electrical equipment of which will be the basis of the competition.

When the results of the competition have been decided by the assessors they will be incorporated in the "Pavilion of Light," in which each room will be erected, equipped, furnished and decorated in accordance with the winning designs.

The rooms to be included in the "Pavilion of Light" will be a lounge, dining room, bedroom, nursery, kitchen and bathroom. A plan has been prepared showing definite sizes for the respective rooms, which must be adhered to. Competitors may employ any treatment desired for the walls, floors and ceilings, and doors and windows may be placed to suit the competitor's scheme. The maximum height available in all rooms is 12 ft., but rooms need not necessarily be as high as this.

Subjects of Competition.

The lounge, dining room, bedroom and nursery are the subjects of the competition for architects alone, or artists collaborating with architects, a special section of the competition is open to artists and art students competing alone, and the kitchen and bathroom will be open to competition among electrical contractors. The assessors for all sections of the competition (which has the approval of the President of the Royal Institute of British Architects) will be:—Sir Edwin Lutyens, Sir Duncan Watson, Mr. Philip Connard, Mr. Oliver P. Bernard, Mr. Douglas G. Tanner, and Mr. Grey G. Wornum. The prizes will be distributed as follows:

ARCHITECTS AND COLLABORATING ARTISTS: For each of the four rooms in the Architects' and Artists' section, viz.: Lounge, dining room, bedroom and nursery, a first prize of 100 guineas will be awarded. For each room a second prize of 25 guineas will be awarded. For each a third prize of 20 guineas will be awarded.

ELECTRICAL CONTRACTORS: For each of the two rooms in the Electrical Contractors' Section, viz.: Kitchen and bathroom. A first prize of 50 guineas will be awarded for each room, and 10 consolation prizes of 10 guineas will be awarded for the next best schemes.

ARTISTS AND ART STUDENTS: There will also be 10 prizes of 10 guineas each, open for competition among artists and art students, for the best designs of electric light fittings for the home, in the form of: Electroliers, standard lamps, brackets or other lighting devices. And 10 prizes of 5 guineas each will be awarded to the best period designs of electric light fittings suitable for the home. Artists and art students may enter without collaborating with an architect.

The conditions of the competition provide that competing electrical contractors must submit a schedule of the electrical appliances which it is proposed to instal, and a plan showing the wiring system, together with a complete specification.

Drawings are to be made on one sheet of unmounted paper (22 in. by 30 in.) per room, the larger way of the paper to be horizontal.

The copyright of winning designs will become the property of the General Electric Co., Ltd., but the copyright of unsuccessful designs will remain the property of the competitor.

Any questions must be addressed to "Electrical Competition," "Daily Mail," Carmelite House, London, E.C.4, and must reach that address on or before October 26th. These questions will not be answered individually, but the answers will be circulated to competitors who apply for them.

The closing date for the receipt of entries is December 14th.

OVERSEAS TRADE.

Nine Months' Electrical Exports Exceed Imports by Nearly 8½ Million Pounds.

EXPORTS of electrical machinery, apparatus and material from the United Kingdom during September last amounted to £1 330 540, or £148 038 less than for the same month of 1928. Electrical exports for the nine months of 1929 amounted to £14 070 198, as against a total of £13 703 466 for the same period last year, the increase being £366 732. Imports of electrical goods during September, 1929, amounted to £782 931, as compared with £479 318 for the same month last year, representing an increase of £303 613. Similar imports for the nine months of this year amounted to £5 583 291, as against £4 506 311 for the corresponding period last year, the increase being £1 076 980.

These figures show that September exports were £547 609 in excess of imports for the same month, while for the nine months of this year the excess of exports over imports was £8 486 907.

Export items which showed improvement during September last, when compared with the same month of 1928, were, among others, motors and generators other than railway and tramway motors, increase, £34 653; various other motors, increase, £9 980; rubber insulated wires and cables, other than telephone and telegraph, increase, £52 780; and telegraph and telephone wires and cables, other than submarine, £20 337.

Imported items which were responsible for the increase in the figures for the month included, electrical machinery, increase, £40 218; and telegraph and telephone instruments, excluding wireless valves, increase, £146 497.

The following are detailed figures:—

	Month of September,		Nine Months,	
	1928	1929	1928	1929
IMPORTS.	£	£	£	£
Electrical Machinery	97 649	137 867	1 283 737	1 347 831
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	12 944	22 728	121 899	185 309
Insulation other than rubber (not being Telegraph or Telephone Wires or Cables)	38 323	59 402	427 399	457 716
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	6 777	4 012	62 258	38 868
Submarine Telegraph and Telephone Cables	—	—	—	—
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	55 899	202 396	447 432	1 106 379
Carbons, Electric	9 636	7 684	92 990	116 311
Electric Lamps and Parts thereof—				
Electric Glow Lamps	34 282	34 685	353 032	274 750
Arc Lamps and Electric Searchlights	316	630	5 206	6 049
Parts thereof (except Carbon Rods)	2 308	443	22 030	5 927
Batteries and Accumulators (including parts)	78 477	96 270	436 224	522 178
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (excluding Ammeters, Voltmeters, etc.), House Service Meters, and Scientific	19 863	40 234	205 795	262 634
Switchboards, other than Telegraph and Telephone	12	139	792	1 717
Electrical Goods and Apparatus, all other Sorts	122 832	176 441	1 047 517	1 257 622
Total of Electrical Goods and Apparatus	479 318	782 931	4 506 311	5 583 291
EXPORTS.	£	£	£	£
Railway and Tramway Motors	28 150	17 041	377 277	234 218
Other Motors and Generators	135 423	170 076	1 817 184	1 639 119
All other Sorts	235 451	245 431	2 783 275	2 821 010
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	101 835	154 615	1 028 841	1 247 665
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	105 568	86 470	1 089 921	1 142 553
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	51 161	71 498	664 064	817 595
Submarine Telegraph and Telephone Cables	373 058	45 612	530 205	233 937
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	128 481	167 027	2 002 513	2 092 814
Carbons, Electric	2 699	1 942	12 218	8 108
Electric Lamps and Parts—				
Electric Glow Lamps	42 181	39 380	376 737	464 292
Arc Lamps and Electric Searchlights	463	1 069	9 773	7 529
Parts thereof (except Carbon Rods)	39	246	5 598	7 965
Batteries and Accumulators (including parts)	68 435	86 371	814 666	746 718
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific)	17 787	25 521	282 642	291 732
Switchboards, other than Telegraph and Telephone	2 876	2 989	58 387	46 153
Electrical Goods and Apparatus, all other Sorts	184 971	215 252	1 850 165	2 268 790
Total of Electrical Goods and Apparatus	1 478 578	1 330 540	13 703 466	14 070 198

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Cooker Hotplates.

[To the Editor.]

Sir,—I think you will agree with me when I say that the boiling plates of the modern electric cooker are not so efficient as the corresponding portion of a gas cooker, although the oven is infinitely superior, and that it is this fact that causes so many prospective users finally to decide against the electric cooker.

I realise that immense strides have recently been made in boiling plate design, but still we are a long way behind.. In view of this I think that if someone were to turn his attention to the utensil this gap might be partially or wholly bridged.

During my travels I have seen many instances of totally unsuitable utensils in use, such as kettles and stewpans with warped or curved bottoms, and particularly, utensils that did not totally cover the boiling plate, thus allowing a very large percentage of heat to be wasted.

I consider that if manufacturers or suppliers of electric cookers would also supply 100% efficient utensils, a lot of the present prejudice against electric cookers would be overcome. —I am, etc.,

J. D. McRae.

54, Clifford Gardens,
London, N.W.10.
October 9th.

[While we do not agree with our correspondent on several points, we think that greater attention to the types of boiling utensils for use with electric cookers would be a useful aid to development.—Ed.]

Trade with Argentina.

[To the Editor.]

Sir,—Lord D'Abernon's trade mission to this country has been the greatest success of recent times. Apart from practical results achieved (orders for £8 000 000 from the Argentine Government) British "stock" or optimism has gone up, which if maintained is worth many more millions.

As one who has had long practical experience abroad, I should like to call attention to the absolute necessity of home manufacturers only supplying the very best goods to Argentina. Too often slackness is noticeable, and, if the antiquated idea that anything is good enough for a new country still persists, the eventual results of these contracts will negative Lord D'Abernon's efforts. This country is accustomed to selecting the handiest and most efficient material the world produces.

The Americans who have taken over the British telephones here are giving universal satisfaction (also in Chile) by installing only the pick of the world's manufactures, be they Swedish, American, or British; and not what they want to get rid of, or what is "good enough."

Even the staunchest of "Buy British" advocates out here have to admit nowadays that "Made in U.S.A." is more often a guarantee of efficiency than "Made in England."

Moreover, among what might be termed the "Smart Set," anything pertaining to Britain is treated with derision and anything Yankee "worshipped" (almost). The old-fashioned Briton who bought only British goods seems to be disappearing.

However, the average Argentine will buy British every time, if given a fair deal; sentiment is definitely in our favour.—I am, etc.,

"Mend."

Mendoza, Argentina.
September 12th.

"Where *Is* That Battery?"

[To the Editor.]

Sir,—As one who has endeavoured to improve the design and construction, and mileage of the electric road vehicle during the past 30 years, I am interested in the letters which have been appearing lately in your valuable journal concerning the merits of various storage batteries. It certainly would appear that the merits of the steel type cell warrant further attention. It is now 21 years since Mr. Edison first enlightened the world as to his investigations, and he has unquestionably evolved the most satisfactory type of battery on the market to-day. As time rolls on, however, one still sees the old-fashioned type motors and control-gear in use, and no serious attempt is made to improve the operating efficiency.

In a system which I have developed, however, a departure has been made from the orthodox, in the way of infinitely variable vehicle speed, and up-to-date regenerative control, and by its use a substantial reduction in storage battery capacity has been brought about, per given ton-mileage of transportation duty performed.

I think that it is a great pity, when there are such big potential opportunities, that some real attempt is not made to reduce the price of the storage section of this gradually improving industry, as I feel sure that the manufacturers would reap a great reward in consequence of the larger demand which would arise from their well made and reliable apparatus.

For short-haul work there is, of course, no more economical vehicle than the "pure" electric, but, for both short-haul and long distance work, there is nothing I have seen so useful, and independent, as the thermo-electric vehicle, because of its embodiment of both the thermal efficiency of high-class internal-combustion of fuel, and the variable speed, regenerative operation of the variable voltage control system of vehicle propulsion. The coming heavy road vehicle in my opinion must burn the cheap heavy fuel oil, and I think it will be acknowledged that my system, in which the storage of energy as a fundamental feature, is at least a contribution to the proper solution of this great transportation problem.

A thorough investigation of the possibilities of electric road traction in this country is very much overdue.—I am, etc.,

William P. Durtnall.

23, Bessborough Street,
London, S.W.1.
October 8th.

INCREASED GENERATION.

Commissioners' Returns Show Increase of Nearly 10% in Generation.

If evidence were needed of the steady development that is being made in the use of electricity in this country it is clearly visible in the latest analyses and summaries of the returns of fuel consumption and units generated by authorised undertakings during the year ended March 31st last. These returns, which have been issued by the Electricity Commission (H.M. Stationery Office, 1s. 6d. net) show a further increase in generation of 9·58 per cent. on the figures of 1928, the total in units being 10 878 980 925. Compared with recent years annual increases in the neighbourhood of 1 000 000 000 units are not very spectacular, but it must be remembered that the phenomenal percentage increases recorded in the years immediately following the war were largely arrears and the number of existing consumers was relatively small. A better idea of the progress made since that time is gained by contrasting the 1928-29 figure with the figure of just over 3 500 000 000 units which represented the total sales to consumers in 1922. It is notable that the increased production in the year under review was achieved with the small extra fuel consumption of 3·66 per cent. The returns cover 564 generating stations, a reduction of six as compared with the previous year. The difference was accounted for by the permanent closing of 27 stations before April 1st, 1928, by the putting into commission of ten new and three existing stand-by stations during the year; and by the inclusion in the return of eight other existing stations which had previously been operated on a non-statutory basis, but became part of authorised undertakings during the year.

BOOKS RECEIVED.

"Short Stories in Science." By J. G. Crowther. (London: G. Routledge and Sons.) Pp. viii+213. 5s. net.

Year Book and Diary (1929–1930 Ed.) of the Electrical Contractors' Association of Scotland. 3s. 6d. post free.

"First Year Electrical Engineering." By D. J. Bolton. (London: Edward Arnold and Co.) Pp. xi+260. 5s. net.

"Private Automatic Branch Exchanges." By R. T. A. Dennison. (London: Sir Isaac Pitman and Sons.) Pp. ix+291. 12s. 6d. net.

Journal of the Institution of Electrical Engineers. Vol. 67, No. 393. September. (London: E. and F. N. Spon.) 10s. 6d. net.

"Problems in Electrical Engineering, with Answers." Edited by S. Parker Smith. (London: Constable and Co.). Pp. viii—206). 6s. net.

Science Abstracts, Secs. A and B. Vol. 32, No. 381. Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s.; annual subscription 30s., or 50s. for both sections.

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NEWS IN BRIEF.

Cardiff Engineering Exhibition—Meetings of Electrical Women—Lighting at Piccadilly (London) Tube Station—Manchester and the Lighting of Schools—The Advertising Dramatic Society—New Electrical Showrooms.

TENDERS are invited for alterations and additions to East Ham electricity station.

The Borough Engineer of Colchester is to submit a scheme for the adaptation of premises in Oxborne Street for electricity offices and storerooms.

Manchester Education Committee has granted facilities to the electricity department to undertake a series of special lighting investigations in selected schools.

It is expected that Gravesend Electricity Department's offices and showrooms will be ready on October 23rd and the Mayor has been asked to open the premises.

Leafield (Oxfordshire) Parish Church is to have an electric light installation.

The annual Engineering Exhibition at Cardiff will be held from November 27th to December 7th.

Mr. V. W. Dale, of the E.D.A., lectured last week to the Oxford Chamber of Trade on "Selling by Electric Light." He stated that the appeal of a lighted display of an evening was especially valuable, for when the day's work was done the public would be in a more receptive frame of mind. Poor lighting cost money, good lighting made money.

A successful meeting was held by the Birmingham and Midlands Branch of The Electrical Association for Women on October 10th, at Walsall, under the presidency of the Mayor of Walsall. Mr. Francis, of the British Electrical Development Association, gave a lecture on "Modern Tendencies in Architecture, Furnishing, and Lighting Designs, and the Part Electricity Plays Therein." The slides were excellent, and they revealed the great possibilities of electricity in artistic lighting.

LOOKING BACKWARD

FIFTY years ago, according to THE ELECTRICIAN, *dated October 18th, 1879 :—*

Para rubber was quoted at 3s. 2d. per lb.

Several American railways discarded the telegraph in favour of the telephone.

Germany was using the electric light for naval and military purposes, notably for lighting up the ground in front of a besieged fortress.

* * *

TWENTY-FIVE years ago, THE ELECTRICIAN *of October 21st, 1904, reported that :—*

Mr. Desmond G. Fitzgerald, one of the founders of THE ELECTRICIAN *in 1861, had died.*

Following objections by Brentford District Council, an arbitrator decided not to permit the Postmaster-General to erect overhead telephone wires along Ealing and Hanwell Roads.

* * *

FIFTEEN years ago it was stated in THE ELECTRICIAN *dated October 16th, 1914, that :—*

British electrical exports for the nine months to September totalled £2 384 390.

* * *

TEN years ago THE ELECTRICIAN *of October 17th, 1919, stated that :—*

Mr. H. J. Cash, president of the E.C.A., was to take the chair at the E.T.B.I. annual dinner, which was revived after an interval of five years.

Metal prices showed further increases. Electrolytic copper was £121 and tin £283 15s. per ton.

The 1929-30 session at University College, University of London, opened on October 7th. Among the public lectures arranged are three by Mr. E. T. Elbourne on "Engineering Management," on November 12th, 19th and 26th, and one by Col. D. C. Cameron on "Some Administrative Difficulties of Mechanisation," on November 19th.

Large electric light standards are now replacing the smaller type of standard on the lower landings at Piccadilly Circus (London) Tube Station. Each standard gives a total of 500 c.p., against 200 c.p. given by the older type. The new standards are of bronze, and they broaden into a basin at the top, surmounted by a large reflector. The lamps are contained in the basin, and the light is thrown upwards and outwards.

The Institute of Metals has just issued its programme for the coming session. This includes over 40 meetings to be held in metallurgical centres throughout England, Scotland and Wales. The subjects dealt with are of an essentially practical character, and include papers on "Metal Melting by Electricity"; "Chromium Plating," "Electric Heat-Treatment Furnaces," and "The Effect of Some Impurities in Copper."

On October 10th a large party of London Members of the Electrical Association for Women, visited the showrooms of Messrs. Kelvinator Ltd., 29, Kingsway, London, W.C.2. The members were received by Mr. Browne, who afterwards gave an interesting lecture on "Electrical Cold that Keeps." It was evident from the questions asked that women are keenly aware of the importance of refrigeration in connection with the preservation of food.

Smethwick Education Committee has decided that their Uplands school be heated by electricity.

Bangor (co. Mayo) T.C. has decided to become a contributor to the E.D.A.

The Borough Engineer of Ilford is preparing plans for new electricity offices and central showrooms and storerooms at the junction of High Road and Clark's Road.

At the request of the Education Committee, Hull Electricity Committee has agreed to instal electric cookers at three domestic economy centres for trial purposes for three months.

The North Wales Branch of the Electrical Association for Women visited the Bangor electricity works on October 10th. In the course of an address of welcome, the Mayor, Mr. W. R. Jones, spoke of the drudgery of household duties. The E.A.W., he said, fulfilled an eminently useful purpose in suggesting ways and means by which that might be overcome. He was of opinion that electricity prices should be reduced until they were within the reach of working-class people. The members of the branch took the opportunity of visiting the Penrhyn Quarry, where they were entertained by the management.

The inaugural address of the president, Col. Sir T. F. Purves, which will be delivered on Thursday, October 24th, is to be simultaneously relayed, by means of microphones working over telephone trunk lines, to special local meetings of members of the Institution of Electrical Engineers at the Midland Institute, Birmingham, ; South Wales Institute of Engineers, Park Place, Cardiff; the Royal Technical College, Glasgow; the Hotel Metropole, Leeds; Liverpool University, Liverpool; the Engineers' Club, Manchester; Armstrong College, Newcastle-on-Tyne; the Municipal College, Portsmouth; and University College, Southampton.

The Bristol and District Branch of the Electrical Association for Women held the first meeting of the session on October 8th. Miss C. Haslett, director of the Association, said a handbook had been published by the Association dealing with electrical matters and suitable for the use of children, and there was no doubt it would be included in the syllabuses of schools in future. Mechanics was not a subject beyond the intelligence of girls.

The Advertising Dramatic Society will present "The Best People," David Grey and Avery Hopwood's famous comedy, at the New Scala Theatre, London, on Monday and Tuesday next (October 21st and 22nd), at 8.30 p.m., for the benefit of the National Advertising Benevolent Society. The prices of admission range from 10s. 6d. to 1s. 2d., and tickets can be obtained at the Box Office. Arks Publicity, 63, Lincoln's Inn Fields, W.C.2, are the business managers.

The calendar of Heriot-Watt College, Edinburgh, for the 1929-1930 session contains interesting information regarding day, evening and Saturday classes in electrical and mechanical engineering, etc. Particulars are given regarding fees, scholarships, bursaries and prizes, syllabuses of the classes, including those dealing with electrical theory and application, electric light installation, telegraphy and telephony, electrical machine design, etc., and the electrical engineering and other laboratories are described. The book contains nearly 300 pages, and its price is 1s.

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PERSONAL.

MISS D. HORSBY has been appointed assistant in the Welfare Department of Siemens Brothers and Co., Ltd.

Mr. J. R. Barrett has joined the sales staff of the Horstmann Gear Co., Ltd., as representative in the Midlands.

Mr. H. H. Berry, who is a member of the Electrical Section Advisory Committee of B.I.F. See page 472.

Mr. John Mitchell Cusack, chairman of the Electricity Committee, has accepted the Mayoralty of Workington.

Guildford Town Council has appointed Mr. W. F. May, assistant mains superintendent, as mains superintendent.

Sir Felix Pole, chairman of Associated Electrical Industries, Ltd., sailed for America last week by the s.s. "Homeric."

Cheltenham Electricity Committee has appointed Miss D. Blaker of Portsmouth, as electric cooker demonstrator.

Ald. A. J. West, who has accepted the mayoralty of Taunton, is partner in the firm of Henry West and Son, electrical engineers.

Alderman H. R. Nuttall, chairman of Burnley Electricity Committee for many years, has been selected as Mayor for next year.

The marriage has been solemnised at St. Paul's Church, Colwyn Bay, of Mr. Wallace Meyrick Lywood and Miss Margaret Lord.

Mr. B. A. Martin Cooper, for six years mains superintendent at Blackburn electricity works, has been appointed chief assistant engineer at Worcester.

Mr. G. V. Stanley, who has since July, 1928, been acting tramways manager at Croydon, has been appointed as tramways manager at a salary of £600 per annum.

At the opening session of the Liverpool Engineering Society last week the presentation of a gold medal was made to Mr. H. E. Dance for his paper "Electricity Supply Contracts."

Bedford Electricity Committee recommends the appointment of Mr. W. Tait, mains engineer, Winchester, and Mr. N. Boydell, assistant mains engineer, Southport, as district engineers.

Mr. Robert Illingworth, of Cardiff, has been appointed deputy electrical engineer to Plymouth City Council, at a salary of £555 per annum, rising by annual increments of £15 to £600 per annum.

Fulham (London) Electricity Committee recommends that the designation of Mr. H. Clarke, now engineering assistant, be in future constructional engineer and that his salary be increased to £475 per annum.

Mr. W. Ibeson, charge engineer, at the Longroyd Bridge electricity works, Huddersfield, has secured a position at the Widnes Technical Institute, and the Town Council has appointed Mr. E. B. Haigh as his successor.

At the first meeting of the new session of the Institute of Transport, on Monday, Mr. A. A. Jackson, of Nottingham, received the Institute graduate silver medal for his essay on "The sphere of the railless trolley vehicle system."

Mr. R. E. Livesley, chief electrical assistant to Aylesbury Corporation, has been appointed borough electrical engineer to Newark-on-Trent T.C., in succession to Mr. A. J. Waring, at a commencing salary of £400, rising by £25 a year to £500.

Mr. R. Birkett, borough electrical engineer and manager of Southend-on-Sea Electricity Department for the past 24 years, has retired in consequence of continued ill health. The Town Council has fixed his superannuation allowance at £600 per annum.

Croydon Electricity Committee recommends that Mr. Hosking, now assistant power station superintendent, be designated engineering assistant to the borough electrical engineer, and that Mr. Hockley, the senior charge engineer, be appointed generating engineer.

Mr. C. W. Reeve, who has recently been acting as assistant to the chairman of the Associated Equipment Co., has been elected to the board and appointed managing director. In his earlier business life Mr. Reeve was for three years with the British Westinghouse Co. at Trafford Park, Manchester.

Mr. A. P. Young, manager of the Rugby works of the British Thomson-Houston Co., Ltd., read a paper on "Rationalisation of Industry," before the Rugby Engineering Society, last week, at the Benn Buildings, Rugby.

Amongst those upon whom the associateship of the Manchester College of Technology has been recently conferred are Sir Robert Hadfield and Sir Charles A. Parsons, but, unfortunately, they were both unable to attend, the former suffering from the results of an accident, and the latter also being in ill-health at the time.

Mr. Lanham, assistant chemist at the Ribble power station, Preston, son of Mr. E. H. Lanham, one of the engineering staff at Preston electricity undertaking, has been awarded the associateship of Manchester College of Technology and the second prize for his work during the advanced course of mechanical engineering.

Mr. G. A. Struthers, who has for the past 18 months been in charge of the beam station at Bodmin, has been appointed engineer in charge of the Post Office radio station at Hillmorton, Rugby. He succeeds Mr. H. Faulkner, who has been transferred to the headquarters of the Engineer-in-Chief of the G.P.O. in London.

Lord Birkenhead (chairman of the Greater London and Counties Trust, which is controlled by the Utilities Power and Light Corporation), Sir Laming Worthington-Evans, and Sir Harry McGowan, arrived at Southampton on Tuesday, after a visit to the United States, in order to examine electrical development and distribution in that country.

Although their two years' term of office as members of the Irish Free State Electricity Supply Board expired recently, Dr. Henry Kennedy, Irish Agricultural Organisation Society; Mr. P. J. Egan, Tullamore, and Mr. J. C. Foley, Cork, are continuing to hold office. The board, which was constituted on August 11th, 1927, includes, in addition to the three members above mentioned, Mr. J. J. Murphy, former Town Clerk of Dublin, who acts as chairman, and Dr. T. A. McLaughlin, formerly Irish manager of Messrs. Siemens-Schuckert, who is now managing director of the board. Mr. Murphy and Dr. McLaughlin were appointed to hold office for five years.

The results of the 1929 competition for the W. E. Highfield Shield and prizes recently held under the auspices of the Association of Supervising Electrical Engineers are now to hand as follows:—MEMBERS' SECTION—1ST PRIZE, value £5 5s., presented by British Insulated Cables, Ltd., awarded to Mr. D. J. Williams, Pontllanfraith, Mon., for his paper, "Public Lighting." 2ND PRIZE, value £3 3s., presented by Berry's Electric Co. (1928), Ltd., awarded to Mr. E. E. Gammon, London, for his paper, "Light: Dominating Influence of Window Display." 3RD PRIZE, value £2 2s., presented by Turner Bros. Asbestos Co., Ltd., awarded to Mr. G. Kirk, London, for his paper, "Advancement in the Application of Electricity." ASSOCIATES' SECTION—1ST PRIZE, value £4 4s., presented by Ferranti, Ltd., awarded to Mr. F. Anderson, Windygates, Fife, for his paper, "Control Boards for Super-power Stations." 2ND PRIZE, value £2 2s., presented by the editor of "Electricity," awarded to Mr. A. Simpson, Sunderland, for his paper, "Advantages of Interpoles on D.C. Generators." Mr. D. J. Williams, as winner of the first prize in the Members' Section, also wins the Highfield Shield, which he holds for one year. The Shield has now been won as follows:—England, three times; Scotland, twice; Ireland, once; and Wales, once. The examiners in this competition were Mr. S. B. Donkin (President), Mr. W. E. Highfield (Past President), Mr. W. Lang (Past Member Board of Control), Mr. T. H. Windibank (Past Chairman).

A NEW HOUSE ORGAN.

The latest addition to engineering literature, entitled "The Walder," comes from Alloy Welding Processes, Ltd., Ferry Lane Works, Forest Road, London, E.17. It is stated that the chief object in publishing "The Welder" is to propagate a knowledge of welding amongst those who are likely to be interested in a process which substantially reduces the cost of production on almost every industry. The first issue is now available and includes an open letter from the chairman of the company, Major James Caldwell, and a review of progress made in America in connection with the use of electric arc welding for steel constructional work on buildings.

There is also an article dealing with electric arc welding in the locomotive shop and one on arc welding in bridge construction, illustrated by photographs of work carried on at Lowicz, near Lodz, Poland. Other contents include a review of the A.W.P. Electric Arc Welding Operators' Handbook, and a comprehensive list of publications on welding.

Readers of THE ELECTRICIAN can obtain copies of "The Welder," on application to the editor, at Ferry Lane Works, Forest Road, London, E.17.

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BRIGHTON EXHIBITION.

Brief Descriptions of Some of the Outstanding Exhibits at the Corn Exchange—Many Demonstrations of Varied Interest.

THE Brighton Electrical Exhibition which opened at the Corn Exchange and Dome last week concludes to-morrow, Saturday, after a very successful ten days. The exhibition is one of the best local displays we have yet seen and, we give below brief descriptions of some of the main items of interest.

BELLING AND CO., of Enfield, Middlesex, show fires fitted with the multi-parabola firebar, electric cookers, grillers, boilers, water heaters and other domestic appliances. They are issuing a very interesting free booklet containing much valuable information and many hints on electricity in the home, besides a full description of all their products.

BERRY'S ELECTRIC (1928), LTD., 85, 86, Newman Street, Oxford Street, W.1, display various types of "Magicoal" fires and particular attention is directed to the new 1929–1930 range. These incorporate a new flame effect of striking character, which is unaffected by external brilliant lights. In addition to a display of Berry McClary cookers, there are exhibited, for the first time, water heaters of the storage type, suitable for baths and lavatory basins. The heaters embody some unique features.

The BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, 15, Savoy Street, London, W.C.2, in addition to co-operating with the Brighton Corporation Electricity Department in the organisation of the exhibition, has arranged to present a series of spectacular electrical tableau demonstrations at 3.30, 5, 6.30 and 8 p.m. daily during the exhibition.

CARRON COMPANY, of Carron, Falkirk, gives a display of modern cooking equipment of various capacities and types suitable for every domestic requirement.

The CREDENDA CONDUITS CO., LTD., Oldbury, Birmingham, show in the water heating section examples of the latest types of "Creda" water heaters for wash basin or bath use. Two types are made, the ordinary "push through" pattern and another type having its own self-contained ball valve cistern. The finish, white cellulose enamel with gold and scarlet lining, is particularly smart. In the cooking section examples shown are of the popular "Creda" electric cookers, while in the general section examples of fires, kettles, irons and many other domestic appliances are staged.

DRAKE AND GORHAM WHOLESALE, LTD., 67, Long Acre, W.C.2, feature "Inventum" hot water cisterns in sizes ranging from 1½ gallons capacity up to 55 gallons. The 1½ gallon size is suitable for kitchen use, and will supply all the hot water required for a day's use, for a consumption of approximately 2½ units. The 15 gallon size is suitable for bath use and will give two baths, each of 22 gallons at 100 deg. F. The "Barber's" cistern is a complete hairdresser's equipment mounted on a polished back board, complete with piping, shampoo spray and mixing tap to give any desired water temperature. "Inventum" fires, "Two-Twelve" and semi-automatic boilers, refrigerators, "Rotarex" gyrator washers, etc., are other exhibits.

The EDISON SWAN ELECTRIC CO., LTD., 123–5, Queen Victoria Street, E.C.4, show, in addition to a range of kettles, fires, and other household appliances, representative examples of B.T.H. refrigerators for domestic use, the "Thor" No. 1 washer, complete with wringing and ironing attachments, the "Thor" ironing machines, while, in addition, demonstrations are given daily,

The E.L.M.A. Stand.

The stand of the ELECTRIC LAMP MANUFACTURERS' ASSOCIATION OF GREAT BRITAIN, LTD., Lighting Service Bureau, 15, Savoy Street, London, W.C.2, is intended to demonstrate very forcibly the difference between good and bad lighting. The background of the exhibit comprises a display of lamps ranging from 15–1 000 W. A particular feature of this display is the introduction of glareless pearl and opal lamps to the exclusion of all clear lamps of the 100 W size and under. The side panels contain small models of interiors of rooms which provide a fascinating realism by virtue of the exactness of their detail. The exhibit tells its own story by means of flashing opal signs above and below each model, which change simultaneously with the lighting of the interior indicating the new and old ways of lighting.

ELECTRIC FIRES, LTD., Norwich, exhibit electric heating apparatus, including an electric water heater giving a continuous and abundant supply of hot water. Several different patterns are shown, each having its own particular application. For instance, there is a "Heatrae" F.B. type tank which is shown working in conjunction with a bath and lavatory basin, provision also being made for a supply to the kitchen. There is also an example of a tank of the R.T.B. type, which is suitable for direct connection to the water supply without the intervention of a ball valve cistern. This tank is suitable for supplying hot water to one point only. There is another example which shows a R.T.A. pattern, complete on stand and arranged so that those interested can readily inspect all the working parts. There is a demonstration model of a "Heatrae" wash boiler. This has a glass top so that the action of the spraying device can be seen under actual working conditions.

An Electric Geyser.

A 4 kW size nickel plated geyser is shown with interlocked handle and water valve. This is intended for giving small intermittent supplies of hot water, such as would be required by dentists, doctors, etc. Immersion heaters are shown in large variety, while another useful demonstration is given of an immersion heater fitted into the top of a tank, part of which is cut away, and shows the action of the immersion heater. There is another tank demonstrating the method of fitting an immersion heater and automatic temperature regulator.

ELECTROLUX, LTD., 153–155, Regent Street, London, W.1, make a special show of their already well-known cleaners, refrigerators, water softeners, and floor polishers.

Messrs. E. E. FELLINGHAM, 116, North Street, Brighton. This local firm is exhibiting in the Water Heating Section (Corn Exchange) a range of "Margo" water heaters which have now incorporated many interesting improvements, while, in the Dome, is made an excellent display of modern lighting fittings and other electrical appliances, including electric fires, tubular heaters, etc. Special demonstrations are given with the "Hotpoint Premier Junior" vacuum cleaner.

FERRANTI, LTD., Hollinwood, Lancs., specialise in showing the advantage of water heating and point out that there are now many places in Great Britain where a correctly designed and well installed electric water heating equipment affords to the average householder the cheapest means of obtaining his hot water service without even making allowance for the very considerable saving in the cost of labour which is entirely eliminated. Radiant heat is dealt with in the exhibit of Ferranti fires.

Messrs. H. J. GALLIERS, 32, St. James's Street, Brighton, point out that in electrical matters, there is always something new to be learned; and the three stands of the House of Galliers provide a liberal education in the latest applications of electricity to domestic work, wireless, motoring, and particularly to hygiene. Exhibits include a special display of "Litlux," the new non-glare bedlight, a demonstration of "Thermega" electric blankets and pads, "Cosmos" domestic appliances, including the new automatic safety electric kettle, "Magnet" electric household appliances, including the "Minor" cooker and "Magnet" sewing machine motor, "Creda" hot water systems and cookers, the new "Magicoal" electric fires, the "Magnet" electric vacuum cleaner, and the electric floor polisher, "Orion" electric washers, new model electric fires, the "Crypto" battery charger, "Exide" batteries for wireless, radio gramophones, all-electric and portable wireless, the new "Amplion 1930" loud speakers, "Gallia" fittings and wall brackets, and "Kelvinator" refrigerators.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, shows, in the Dome, household appliances and an exceptionally fine and comprehensive display of lighting fittings. The appliances include a range of fires of entirely new design, amongst which may be particularly noted a reflector fire of 1½ kW loading. In the Corn Exchange Building are exhibited domestic and industrial cooking apparatus of all types. "Magnet" electric water heaters are demonstrated, while visitors to the exhibition have an unique opportunity of judging the comparative excellence of meals cooked entirely by electricity, the Corporation having installed in co-operation with the G.E.C. an electric kitchen equipment which is employed in the preparation of all meals served in the restaurant. The G.E.C. equipment includes the following apparatus:

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DOMESTIC ELECTRICAL APPLIANCES.

Gramophone Company Enters Radio Field—A New L.F. Coupling Device—A Further Lamp Campaign.

ON October 10th a demonstration of the "His Master's Voice" radio-gramophone was given by Captain P. P. Eckersley. The demonstration took place at the Oxford Street branch of THE GRAMOPHONE CO., LTD. (363, Oxford Street, London, W.1) and the firm's head office is at Hayes, Middlesex. In his remarks introducing the instrument, which marks the début of H.M.V. in the radio field, Captain Eckersley said that his firm was concentrating on a radio-gramophone which would give perfect reception of certain stations rather than on a set which would reach out all over Europe in search of howls and squeaks. That is to say, while the H.M.V. radio will obtain a good deal more than the local programmes, the Gramophone Co. considers simple reception and good reproduction the prime essential.

The H.M.V. radio-gramophone, model 520, is a handsome piece of apparatus, the lines chosen for the cabinet being extremely graceful. Inlay and "cross-grain" combine to give a striking effect of perfect finish. The dimensions of the cabinet are: height 41½ in., width 19 in., depth 20¾ in.; it can be had in oak, walnut, or mahogany. On the gramophone side the instrument is equipped with "His Master's Voice" electrical soundbox No. 7A, and a new type of induction disc turntable motor. An H.M.V. automatic brake stops the motor at the end of each record. On the radio side the chief point of interest appears to be the simplicity of control, which makes it unnecessary for the ordinary user of the set to touch more than one knob in any circumstances; for those who insist on trying their hands at distance reception an edge-control for adjusting the aerial coupling and a reaction coupling are provided. The aerial is normally rather more loosely coupled than has been usual. The set is not self-contained where the aerial is concerned. A.C. all-mains drive is employed.

The built-in loud speaker is of the latest H.M.V. moving-coil type, and special attention has been paid to avoiding harshness at the middle frequencies. Several records were played at the demonstration, and in spite of the relatively small size of the reception room, the reproduction was undoubtedly remarkable, even to one familiar with the high quality yielded by electrically recorded music when played by an electrical gramophone. As the demonstration was held at 6 p.m., radio reception consisted chiefly of the news bulletin and market prices for farmers from 5GB without any trace of London coming in, a good test of selectivity in view of 2LO being just across the road.

The new poster in connection with the lamp campaign of the Edison Swan Electric Co., Ltd.

While dealing with the subject of domestic electrical appliances, mention should be made of the fact that the EDISON SWAN ELECTRIC CO., LTD., of 123, Queen Victoria Street, London, E.C., has now launched its lamp sales campaign. In this connection a varied and attractive series of counter folders, leaflets, showcards, etc., has been prepared, together with comprehensive catalogues of domestic, motor car, coloured spray lamps and Christmas tree sets. Arrangements have been made for displaying the "Ediswan" poster in nearly 300 districts throughout the country, and the campaign is already beginning to play its part in increasing sales.

The "C.A.C." low frequency coupler is stated to be one of the best methods of l.f. amplification for uniformity at all audible frequencies. It is marketed by GRAMO-RADIO AMPLIFIERS, LTD., 1A, New London Street, London, E.C.3. The coupling unit has no rising or falling characteristic and we understand that a flat response from 30 to 10 000 cycles is assured. The external field is stated to be almost negligible, owing to the small winding diameter, and to the high damping of the wire. While special valves are not required, moderately high voltages are desirable.

The latest product of the Gramophone Co., Ltd.

The substantial and convenient terminals of the coupler are arranged so that it can be wired into a set in a few minutes. It is only necessary to connect the plate of the preceding valve to the terminal on the coupler marked "A." The remaining terminals are connected direct to the batteries and loud speaker. The coupler should commend itself to makers of portable sets: a complete 3-stage coupler weighs 10 oz., and the overall dimensions are 5$\frac{9}{16}$ in. by 4$\frac{3}{16}$ in. by 1$\frac{3}{4}$ in. high. It is stated to be particularly suitable for use with a pentode valve in the last stage. It is also recommended for amplification from gramophone pick-ups, the arrangement of the windings resulting in effective scratch-filtering.

A new type of junction box for use with the "Magnet" wiring system has just been introduced by THE GENERAL ELECTRIC CO., LTD., of Magnet House, Kingsway, London, W.C.2. It is moulded from G.E.C. "Wittonite" composition and fitted with bakelite moulded terminal heads. This construction is claimed to be suitable both for tropical situations, where insects and condensation have to be contended with, and for home requirements. Either "Magnet" bond lead covered or C.T.S. (tough rubber) cables may be used with the box, which is circular in shape with a smooth "Wittonite" cover having a centrally situated recessed thread for screwing to the base. The centre screw of the base is slotted, and carries a milled nut so that a bonding wire can be rigidly gripped. There are also four slotted wiring terminals, the terminals being fitted with bakelite moulded heads to avoid live points being exposed in the event of the cover being removed and not replaced. Eight inlets are provided so that eight twin cables up to 3/.036 S.W.G. can be accommodated after removing the guarding webs. Round the top of the base is a channel to take a plastic sealing compound, for use when it is considered advisable to seal the box.

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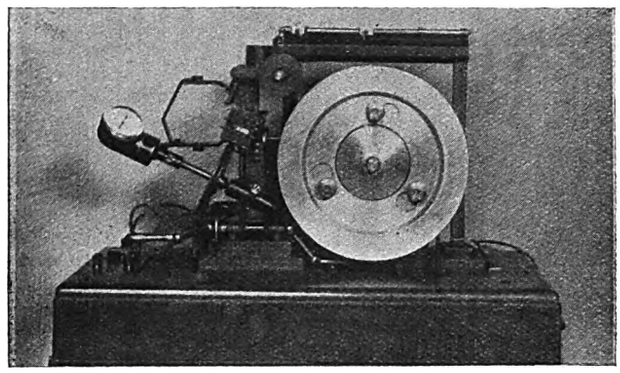
SOUND RECORDING.

The Blattner System of Electro-Magnetic Recording and Reproduction.

A SYSTEM of making and reproducing sound records, which seems to be destined to supersede the old system employing discs or cylinders, was demonstrated last week to pressmen and others, by Mr. Louis Blattner, at the Blattner Colour and Sound Studios, at Elstree. The nucleus of the new system, which is now ready for commercial exploitation, was discovered some forty years ago; Dr. Kurt Stille began to work



A close-up of the new recording apparatus.

upon it 25 years ago, and the Ludwig Blattner Picture Corporation, of London, and the Telegraphie Patent Syndikat, of Berlin, have recently conducted laboratory and studio work which has resulted in bringing the system to a stage which indicates that the invention will probably revolutionise present-day practice.

The process is as follows. The sound waves are impressed on to a microphone, which converts the acoustic vibrations into electrical vibrations, and these are conducted into the coils of electro-magnets. Past the cores of these electro-magnets a thin steel tape or wire is made to move at a constant speed. The electrical vibrations are recorded and fixed as magnetic vibrations on the tape or wire. Reproduction is effected by the reverse process. The different magnetic values of the steel tape or wire influence the small cores of the electro-magnets, giving rise to current impulses, which are made to influence a loud speaker or telephone diaphragm, and are thus converted into sound.

This method obviously effects economy of space and increases portability, in comparison with discs and cylinders, and enables records to be of almost unlimited lengths. Records giving three hours' continuous reproduction have already been used. Another advantage of these steel records is that they can be reproduced an infinite number of times.

The items in the demonstration referred to included a reproduction of a monologue recited by Mr. Henry Ainley, whose enunciation was faithfully reproduced, and a "talkie" picture of Miss Ivy St. Helier, who sang, to her own piano accompaniment, and concluded her performance with an amusing talk. This picture was very realistic, and the sound record was distinct and well synchronised.

The most intriguing application of the invention demonstrated, however, was its use as a recorder of telephone conversations. A conversation through the Post Office exchange system was recorded, and afterwards heard, completely and clearly, through the hand-set attached to the instrument.

Records can be repeated in this manner immediately after the short interval necessitated by the running back of the wire.

Performances of instrumental music were also given in the studio, and the advantages afforded by the ability of the apparatus to give an accurate and immediate play-back were again realised.

Many uses of the recording telephone will readily suggest themselves, such as its utility as a dictating machine, a recorder of messages in the subscriber's absence, a "file" of conversations for use as evidence, and the teaching of languages and scientific and other lessons in schools.

It is stated that research work in progress at the Stille Laboratories, Berlin, includes the electro-magnetic fixing and reproducing of optical signs on steel tape as a substitute for television.

The commercial control of the undertaking is in the hands of the Ludwig Blattner Picture Corporation, Ltd., 35 and 36, Little Newport Street, London, W.

BRITISH INDUSTRIES FAIR.

Advisory Committee for the Electrical Section—Work of the E.D.A.

THE Advisory Committee for the Electrical Section of the 1930 British Industries Fair will consist of Lt.-Col. K. Edgcumbe, Messrs. F. Anslow, E. G. Batt, A. G. Beaver, H. H. Berry, J. K. Brydges, D. N. Dunlop, H. Willoughby Ellis, Dr. S. Z. de Ferranti, Lt.-Col. W. J. Kent, Messrs. T. R. Martin, Dr. A. H. Railing, Messrs. C. W. Sully, J. Wilson, Lt.-Col. W. A. Vignoles, Messrs. V. Watlington, and E. J. Jennings. See pages 468 and 477.

At a meeting of the Committee on October 1st, Mr. T. R. Martin was elected chairman and Mr. H. H. Berry vice-chairman. Mr. Jennings was pressed to continue as honorary secretary, on the understanding that the E.D.A. would assist in the work incidental to the organisation of the Electrical Section of the Fair. The E.D.A. is taking a prominent part at the next Fair, and is erecting a kiosk in the centre of the Section, which will be an outstanding feature, and the design of which is now under consideration. The E.D.A. will also issue a more complete separate guide to the Electrical Section, as well as a railway and road service time-table, for the convenience of the visitors to the Fair. The question of a distinctive colour scheme for the Electrical Section is being actively pursued, and it is hoped that the co-operation of exhibitors will be secured, in order to make this a feature of the show.

The lay-out of the whole of the buildings will be considerably improved, wider gangways being allowed for, and these will be in alignment from one end of the building to the other. The electrical exhibitors at this year's Fair have re-booked for 1930 to the extent of 95%, and a number of new exhibitors are coming in.

The work of the Advisory Committee will be continued between now and February next by a small Executive Committee, consisting of Messrs. Martin, Berry, Railing, Vignoles and Jennings.

THE SOCIAL SIDE.

THE 26th A.A. Battalion, R.E. (London Electrical Engineers), has acquired a football ground at Wembley, in Preston Road, and has joined the Chiswick and District League. The fixture list and full details showing routes to the battalion ground will be posted on Mess notice boards. It is hoped that all members of the unit will support the team at as many matches as possible. There are still vacancies for playing members, and names should be given to Sergt. F. Welton or to company representatives. The battalion meets Christchurch Greyfriars in the 3rd round of the Amateur Junior Cup L.F.A. on October 26th at Edgware. During November battalion H.Q. messes and billiard room will be open on Wednesday evenings from 7.30 to 10.30 pm. The Recreations Committee hopes to arrange a billiard tournament and similar competitions on these evenings. Full particulars will be published on Mess notice boards. If the attendance during November warrants it, "Club" nights will be continued throughout the winter. Full particulars of dances will be available on Bounty night. If the Mess dances arranged for November are well supported, it is hoped to arrange for others to follow.

The General Electric Co., Ltd., held a swimming gala under the auspices of the Magnet Social Club recently at the Holborn Baths. The two main events were competitions between various G.E.C. London establishments for cups presented for team events by Mr. and Mrs. L. C. Gamage. Mrs. Gamage's cup was won by the G.E.C. Research Laboratories, who beat Magnet House, and the L.C. Gamage cup was won by Fraser and Chalmers, Erith.

ELECTRICITY IN COLLIERIES.

In a lecture to the students at the Glamorgan County Council Summer Mining Engineering and Social Science School, at University College, Swansea, recently, Major E. Ivor David said any scheme which would increase the sale of saleable coal at the expense of unsaleable coal was worthy of consideration. He dealt with all aspects of the generation and distribution of electricity in mines and showed lantern slides of colliery power stations. He said the production of electricity had expanded until, at the present time, the production of energy at collieries constituted one of the greatest industrial activities in the whole of the country.

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CONTRACTORS' YEAR BOOK

A Record of the Progress of the Electrical Contractors' Association.

THE "Electrical Contractors' Year Book" for 1929-30 has just been issued by the Electrical Contractors' Association, 15, Savoy Street, Victoria Embankment, London, W.C.2, price 5s. The book shows a considerable increase in bulk compared with its predecessors, and it now extends to 500 pages. It contains geographical and alphabetical lists of the Council, officers and members of the Electrical Contractors' Association, the N.E.C.T.A., Ltd., and the National Federated Electrical Association, an indication being given of those who are on the National Register of Electrical Installation Contractors.

Amongst other interesting contents are the annual report, which was submitted at the annual meeting of the E.C.A. and Allied Associations at Bournemouth in June last; Mr. W. H. Walton's presidential address; information as to qualifications for membership, entrance fees and subscriptions; a useful guide to architects and the public regarding wiring specifications; E.C.A. conditions of tender and contract for electrical work; the recommendations of the special committee appointed to formulate a trading policy to be followed by the N.E.C.T.A., Ltd.; a summary of the law for electrical contractors; information relating to the Electrical Trades' Benevolent Institution, the National Register of Electrical Installation Contractors, the British Electrical Development Association and the British Engineering Standards Association; a list of central stations of the United Kingdom, giving the names of the chief or resident engineers, the voltages and systems of supply; details regarding the National Joint Industrial Council and District Joint Councils for the Electrical Contracting Industry; the National Standardised Wages Agreements; the working agreement with the N.A.S.E.E.; working rules for various districts; a copious classified index to advertisers, etc. The volume is of handy size, and is well printed and neatly bound.

THE NATIONAL REGISTER.

Further Additions to the List of Registered Contractors.

AT a meeting of the National Register of Electrical Installation Contractors on October 4th, the Executive Committee considered ten applications from electrical installation contractors for registration, seven of which were accepted and three were declined.

The names of the successful applicants, together with their addresses, are given below:—

Ryder, C. B., and Co., Ltd., High Street, Heathfield, Sussex.

Heptonstall and Connell, Somerset Hotel Yard, Parliament Street, Harrogate.

Trojan Electrical Co., 12, Alexandra Road, Manchester.

Hall, Thomas J., 74, Malden Road, Cheam, Surrey.

Dunn, Wm. B., Front Street, Bedlington, Northumberland.

House, Alec W., 19, Blake Street, York.

Brewer and Phillips, 66, Regent Street, Plymouth.

ELECTRIC TRACTION.

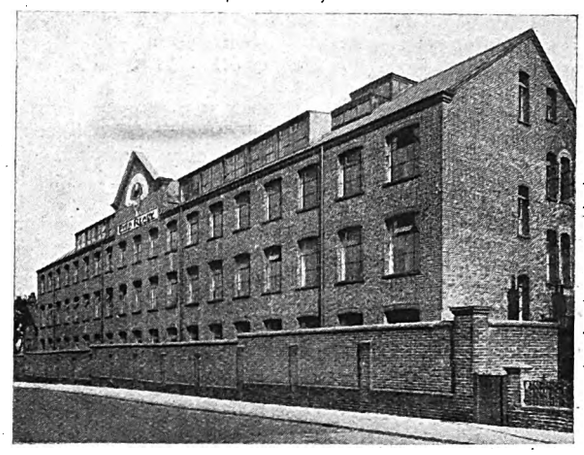
Scheme for Completing Electrified Line Between London and Brighton.

THE Southern Railway Co. has decided to extend the d.c. third-rail system from London to Brighton and Worthing. It is hoped to complete the scheme in two or three years. This will be the first main line to be completely equipped for electric traction. Work on the scheme will be begun during the next two or three months. Of the main line from London to Brighton the fourteen miles to Purley are already electrified, and the new scheme includes the remaining 37 miles and the line from Preston Park to Hove and Worthing, a distance of 11 miles. The line from Redhill to Guildford, via Reigate and Dorking Town, a distance of 20 miles, will also be electrified. Up to the end of 1928 the Southern Railway had expended over £10 000 000 on electrification.

The Minister of Transport, on October 10th, met representatives of London County Council and the Underground Group, and the subject of improvement of traffic facilities in the London area was discussed. It was agreed that the interests concerned should bring before the Ministry schemes of extension and development.

BUSINESS ITEMS.

PHILIPS LAMPS, LTD., demonstrated the efficiency of their latest travelling broadcast van at Hull during Civic week recently, when the speech of Prince George, on the occasion of the opening of the new aerodrome, was relayed to over



A view of the factory of the Ever Ready Co. (Great Britain), Ltd., at St. Ann's Rd., Harringay, London, N.

50 000 people. In addition to the microphone used by Prince George, other microphones were scattered about the aerodrome for the use of officials. A 500 W amplifier supported by a smaller microphone-gramophone amplifier was used, and the plate voltage of 4 000 V used by the former was derived from current generated on board the van. In the evening "Philips" received a call to the Hull Guildhall, where amplification of important speeches delivered at the University College of Hull Banquet was required. In a short time an amplifying system was installed in the Guildhall, so that every guest was able to follow the speeches in comfort. The day previous a duplicate installation was placed in the City Hall for the relaying of the R.A.F. Band to the Hull Old Art Gallery.

A system of auxiliary turbo-electric drive for vessels with steam-reciprocating engines has recently been installed in the Ellerman Liner, "City of Hong Kong." The system has been developed by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD. in co-operation with Mr. Hinchcliffe, superintendent engineer of Ellerman Lines, Ltd., and the alterations to the vessel have been carried out by WORKMAN CLARK (1928), LTD., of Belfast. This is claimed to be the first application of auxiliary turbo-electric drive to ship propulsion. Trials were carried out in the Irish Sea, on October 10th and 11th, and an exhaustive investigation of the performance of the machinery over a wide range of operating conditions was made. Included amongst the tests were a series of full speed and slow speed reversals of the reciprocating engine and electrical machinery together. The simplicity with which the control of this new system is carried out received particularly favourable comment.

A paragraph recently appeared in the daily press commenting on the opening from Sevilla by General Primo de Rivera of the new Spanish-Argentine radio link. This new service, which will connect the Spanish telephone system through the International Telephone and Telegraph Corporation's network in Sevilla to the Argentine, Uruguay and Chili, marks a further advance in radio telephony, in that complete privacy is claimed for it. Overhearing by unauthorised listeners is stated to be no longer possible, as the waves are transmitted in a distorted form so as to be unintelligible to the ordinary radio receiving station. Except for the one working between Great Britain and the United States, this radio telephone link of 9 600 kms. (the longest of its type yet in existence) is the only one that is connected with the ordinary public telephone systems at both ends, permitting distant subscribers to converse from their ordinary telephones without either of them having to go to a central station cabin. It is interesting to note that the subfluvial cable under the River Plata connecting the Argentine and Uruguayan telephone systems, and the transmitting and receiving stations for this new link, were supplied by STANDARD TELEPHONES AND CABLES, LTD., and manufactured at Woolwich and Hendon.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

INVERNESS COUNTY EDUCATION AUTHORITY.—Electric lighting work of new school at Inverlochy, near Fort William. Schedules, etc., from the Master of Works Office, 11, High Street, Inverness.

BELFAST CORPORATION, October 21st.—Supply of circulating water pipes, for the electricity department. Specification (W.97) from Mr. F. H. Whysall, city electrical engineer and general manager, East Bridge Street, Belfast; deposit, £2 2s.

BELFAST CORPORATION, October 21st.—Manufacture and erection of h.t. armour-clad switchgear. Specification (No. W.98) from Mr. F. B. Whysall, city electrical engineer and general manager, East Bridge Street, Belfast; deposit £2 2s.

CARDIFF CORPORATION, October 21st.—Supply and erection of (1) water-tube boiler and mechanical stokers; and (2) fuel economiser. Specification, etc., from the City Electrical Engineer, Central Offices, The Hayes, Cardiff. Only contractors on the King's National Roll are invited to tender.

EASTBOURNE CORPORATION, October 21st.—Electric lighting of grammar school extension. Specification, etc., from the Borough Engineer.

GLASGOW PARISH COUNCIL AND DISTRICT BOARD OF CONTROL, October 21st.—Six months' supply of electrical fittings to the institutions and offices. Form of tender (No. 62) from Mr. M. A. Reynard, inspector and clerk, 266, George Street, Glasgow, C.1.

STAINES RURAL DISTRICT COUNCIL, October 21st.—Construction of sewers and electrical and other equipment for pumping stations. Specification, etc., from the Engineer, Council Offices, London Road, Ashford, Middlesex.

CLACKMANNAN MATERNITY AND CHILD WELFARE COMMITTEE, October 22nd.—Electrical installation in connection with additions and alterations at Alloa Day Nursery. Tenders to Mr. J. Reed, 2, Candleriggs, Alloa.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., October 22nd.—Steel conduits and fittings for electric wiring. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, London S.W.1.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., October 22nd.—Supply of electric cable and wire. Forms of tender, etc., from the Controller of Supplies, H.M. Office of Works, etc., King Charles Street, Westminster, London, S.W.1.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 22nd.—Twelve months' supply of electric cables. Further particulars from the Electrical Engineer, Penrose Street, Walworth Road, London, S.E.17.

WARDLE (LANCS) INDUSTRIAL CO-OPERATIVE SOCIETY, LTD., October 22nd.—Electric light installation in shop. Particulars from the Manager.

GLASGOW EDUCATION AUTHORITY, October 23rd.—Electric lighting installation in Springburn (New) H.G. School. Specifications from the Education Offices (Property Department), 129, Bath Street, Glasgow; deposit £1 1s.

HASTINGS CORPORATION, October 23rd.—(*a*) 22 000 V, three-phase overhead lines and underground cables, Crowhurst section, No. 7 (about 7 000 yds.); (*b*) 400 V, three-phase, 4-wire, overhead lines and underground cable, Crowhurst section, No. 7 (about 4 200 yds.); (*c*) 400 V, three-phase, 4-wire, overhead lines and underground cable, Whatlington Road section, No. 8 (about 1 000 yds.). Specifications (deposit £1 1s. for each) from Mr. A. J. Ryan, borough electrical engineer.

MANCHESTER CORPORATION, October 23rd.—Supply and erection of four 33 000 V, 500 000 kVA rupturing capacity, metal-clad, compound filled switch units, etc. (specification No. 256); and two 10 000 kVA, 33 000/6 600 V, self-cooled, oil immersed, indoor type transformers (specification No. 257). Specifications from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s. for each.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, October 25th.—One 130 ton, 4-motor, electric, engine room crane, one 15-ton 3-motor, electric, auxiliary bay crane, and one 10-ton, 3-motor, circulating pump house crane, at Ironbridge power station. Specification (No. 6) from Mr. E. F. Hethern-gton, chief engineer and manager; deposit £1 1s.

WEST RIDING EDUCATION COMMITTEE, October 28th.—Electric light installation at Whitwood Mining and Technical. Institute. Specification, etc., from the Education Officer, County Hall, Wakefield.

METROPOLITAN ASYLUMS BOARD, October 30th.—Central battery telephone system at South-Western Fever Hospital, Landor Road, Stockwell, London, S.W.9. Specification from the Board's Office, Victoria Embankment, E.C.4; deposit £1.

STAFFORDSHIRE EDUCATION COMMITTEE, October 31st.—Electric light installation in two new elementary day schools in Brettell Lane, Brierley Hill. Specification from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

BRADFORD CORPORATION, November 9th.—Twelve months' supply of stores to the tramways department, including electrical fittings for tramcars, insulating material, insulated bolts, copper controller contacts, etc. Schedules, etc., from Mr. R. H. Wilkinson, general manager, 11, Forster Square, Bradford.

CENTRAL ELECTRICITY BOARD, November 9th.—Supply and erection of overhead 33 000 V transmission lines in South Lincolnshire, in connection with Mid-East England scheme. Specification (No. M.E.E.—S.L.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, November 15th.—Supply and erection at Ironbridge power station of (*a*) two 6 000 kVA, 33 000/3 300 V, 50 cycle, indoor type transformers, with off-load tap changing switches; (*b*) two 1 200 kVA, 3 300/400/230 V, 50 cycle, indoor type transformers, with off-load, tap changing switches; (*c*) two 150 kVA, 3 300/400/230 V, 50 cycle, indoor type transformers, exclusive of tap-changing switches. Specification (No. 7) and form of tender from Mr. E. F. Hetherington, at the offices of the Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

EAST RETFORD CORPORATION, November 19th.—Electrically driven centrifugal borehole pump (60 000 gall. per hour). Specification from Mr. S. O. Pacey, Gas and Water Electricity Offices, East Retford; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

ROUMANIAN GENERAL POST OFFICE, October 18th.—Supply of 31 500 kilos of 3 mm. h.d. copper wire. (Reference A.X. 8 551.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 21st.—Supply of switchboard cords (P. and T. No. 151/1813). (Reference B.X. 5 715.)

WELLINGTON CORPORATION, October 21st.—High and low tension switchgear (contract No. 449). (Reference B.X. 5 649.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 22nd.—Supply of 100 buzzers, with high-wound coils and approximate resistance of 20 Ω. (P. and T. No. 151/1 852.) (Reference B.X. 5 787.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Supply of insulated wire (schedule C. 475). (Reference B.X. 5 580.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 22nd.—Telephone transformers (schedule C. 474). (Reference B.X. 5 581.)

VICTORIAN RAILWAY COMMISSION, October 23rd.—Dry-core telephone cable (contract No. 43 384). (Reference B.X. 5 638.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 28th (extension of time).—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B. 5 758.)

INDIAN STORES DEPARTMENT, October 28th.—House service meters for one year (order No. N. 10 282.) (Reference B.X. 5 749.)

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NEW ZEALAND POSTS AND TELEGRAPHS, October 29th.—Telephone cable (specification No. 256). (Reference B.X. 5 788.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, October 29th.—Railway traction motor testing equipment, comprising electric motor, booster, main field excitation generator and short field exciter (quotation No. B.E. 508). (Reference B.X. 5 693.)

POSTMASTER-GENERAL'S DEPARTMENT, Melbourne, October 29th.—Supply of v.i.r., lead covered cable (schedule C. 510). (Reference No. 5 759.)

INDIAN STORES DEPARTMENT, November 12th.—Battery charging motor generators, transformer and oil switch, for Simla wireless station (order No. N.10 159). (Reference B.X. 5 774.)

CHILEAN STATE SUPPLY DEPARTMENT, November 14th.—Telegraph material. (Reference B.X. 5 746.)

INDIAN STORES DEPARTMENT, November 14th.—Supply and erection of crude oil engine-driven d.c. generating set, motor generator set and switchgear, for Military Engineering Services, Razmak (order Nos. N. 9 886 and 10 075). (Reference B.X. 5 744.)

INDIAN STORES DEPARTMENT, November 18th.—Supply and erection of two 20 kW oil engine driven d.c. generators, etc. (order No. N. 10 253). (Reference B.X. 5 757.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92.) (Reference B.X. 5 614.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Vitreous resistances, each consisting of wire element wound in vitreous spool, for telegraph battery feeds (schedule C. 489). (Reference B.X. 5 696.)

VICTORIAN RAILWAY COMMISSION, November 27th.—Indication transformers for railway signalling (contract No. 43 412). (Reference B.X. 5 737.)

VICTORIAN ELECTRICITY COMMISSION, December 9th.—Supply of 3 000 kVA transformers and spares (specification No. 29/119.) (Reference B.X. 5 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Switchboard keys and parts (schedule No. C. 496). (Reference B.X. 5 776.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Electric lamps, lamp caps and sockets for telephone purposes (schedule C.497). (Reference B.X. 5 783.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Secondary batteries (schedule C.505). (Reference B.X. 5 777.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of testing instruments (schedule C.504). (Reference B.X. 5 786.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of timing clocks (schedule No. C.507). (Reference B.X. 5 762.)

Tenders Accepted.

HOLBORN (LONDON) GUARDIANS.—C. E. Keates, fire alarms, at institution, £135.

WOODHOUSES CHURCH SCHOOLS.—Caton and Sons, electric light installation, £70.

EDMONTON GUARDIANS.—Edison Swan Electric Co., Ltd., supply of electric lamps.

ILFORD CORPORATION.—Crompton Parkinson, Ltd., supply of kiosks and transformers, £971 6s.

HULL CORPORATION.—A. Shaw and Sons, electric light installation at Hall Road School, £329.

SHOREDITCH (LONDON) GUARDIANS.—Metro-Vick Supplies, supply of electrical goods for six months.

BEXHILL CORPORATION.—H. W. Elsworth, electric lighting installation at Polegrove Pavilion, £19 5s.

GAINSBOROUGH URBAN DISTRICT COUNCIL.—Worthington Simpson, Ltd., electric motor and pump.

KETTERING URBAN DISTRICT COUNCIL.—Union Cable Co., Ltd., supply of h.t. armoured cable, £866.

MATTIMORE HOUSE, HOLBEACH.—W. and R. Tombling, electrical installation, £50 plus £10 for bells.

SWINDON CORPORATION.—British Thomson-Houston Co. Ltd., two h.t. switchgear cubicles, £1 604.

LEXDEN AND WINSTREE GUARDIANS.—S. Bailey and Co., wiring Children's Home for electric light, £30.

CROYDON CORPORATION.—A. E. Farr, erection of cooling tower (in place of tender withdrawn), £18 753.

OLDHAM CORPORATION.—Tudor Accumulator Co., Ltd., periodical examinations of battery at new power station.

CHESTERFIELD CORPORATION.—Macintosh Cable Co., Ltd., cables for miscellaneous extensions, £902 7s. 3d.

DUDLEY CORPORATION.—Cook and Son, electrical installation at 564 houses on Priory Estate, £2 566 4s.

"MAZDA" Pearlies. An ingenious fancy dress designed and worn by Miss Mellor, of Derby Street, Bolton.

ENNISKILLEN URBAN DISTRICT COUNCIL.—H. R. Higginbotham, electric light installation in Town Hall.

MANCHESTER EDUCATION COMMITTEE.—John Adams, Ltd., electrical installation at Aspinal Municipal School.

ANDERSON UNITED FREE CHURCH, BLANTYRE.—Johnstone, Park and Co., electric light installation in new hall.

PORTLAND URBAN DISTRICT COUNCIL.—Pirelli-General Cable Co., Ltd., laying services, at schedule prices.

BRIGHTON CORPORATION.—A. Reyrolle and Co., Ltd., supply of h.t. switchgear, £650. (Recommended.)

BURTON-ON-TRENT CORPORATION.—Pirelli, Ltd., laying cable from Tutbury to Marchington, £4 301 12s. 9d.

ESSEX COUNTY COUNCIL.—General Electric Co., Ltd., ten standards and lanterns for Black Notley sanatorium.

FALKIRK EDUCATION COMMITTEE.—J. Scott and Co., electric lighting work in new school. (Recommended.)

BEDFORD CORPORATION.—Robert M. Russell, erection of overhead lines to Ridgmont, £498, and to Lidlington, £355.

HACKNEY (LONDON) BOROUGH COUNCIL.—Electricars, Ltd., supply of seven electric vehicles for refuse collection, £605 each.

WESTMINSTER CITY COUNCIL.—Speedy and Eynon, electric light installation at Canal Buildings, £182. (Recommended.)

OLDHAM CORPORATION.—Ferguson, Pailin, Ltd., supply of special coupling gear in connection with Slacks Valley main feeders.

NEWPORT (MON.) EDUCATION COMMITTEE.—W. H. Bawn and Co., electric light installation at Alexandra and Eveswell Schools.

ARDING AND HOBBS, LONDON.—Electrical Installations, Ltd., lighting installation in connection with extensions of premises.

BROMLEY (KENT) CORPORATION.—General Electrical Maintenance Co., electric wiring of 63 houses on Southborough estate, £350.

BOLTON CORPORATION.—Corporation Electricity Department, electric light fittings, and boiler and cooker at new 'bus garage.

TYNEMOUTH CORPORATION.—Drysdale and Co., Ltd., installation of electrically driven portable pump at bathing pool, £196 2s. 6d.

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METROPOLITAN WATER BOARD.—English Electric Co., Ltd., supply of electric motor to drive a pump at Hampton waterworks, £129.

STOKE-ON-TRENT CORPORATION.—Barnett and Soans, wiring and fittings for lighting and motors at Central Power House, Hanley, £971.

EATON BRAY RURAL DISTRICT COUNCIL.—Griffin Bros., wiring 34 houses for electric light at Stanbridge and Eaton Bray, £214 10s.

CARNARVON CORPORATION.—Electric Construction Co., Ltd., mains extension from Hampton Road around houses at Maes Cadnant, £136.

MOLD EDUCATION COMMITTEE.—G. F. Tristam, painting, electric light wiring, etc., of County Education Offices, £145. (Recommended.)

Electrically-Driven Oil Filter.

COLCHESTER CORPORATION.—Davey, Paxman and Co., Ltd., electrically-driven oil filter, for tramway department, £74 15s. (Recommended.)

DEPTFORD (LONDON) BOROUGH COUNCIL.—S. Jones, renewals of cables and supply and fixing of fittings at swimming baths, etc., £378.

COUNTY DOWN EDUCATION COMMITTEE.—J. Somerville, electric lighting and plumbing works at Newcastle (co. Down) Technical School.

HULL CORPORATION.—Hall and Stinson, Ltd., electrical work in 148 houses in course of erection on Derington Bank Farm housing site.

BURTON LATIMER URBAN DISTRICT COUNCIL.—A. J. Tarrant and Co., electric light wiring of 41 Council houses on Station Road estate, £205 8s.

CROYDON CORPORATION.—Kingsdown Electrical Co., electric light installation to blocks D. and E., and laundry at hospital, £206 (recommended).

LIVERPOOL CORPORATION.—E. Green and Sons, Ltd., renewal of 384 tubes of No. 1 economiser, at the Lister Drive power station, £1 329.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—T. H. Smerdon, electric wiring and fitting of block E on Wolcot Street housing estate, £375.

THIRSK PARISH COUNCIL.—Northern Electricity Supply Co., public lighting, with 108 lamps, from September 8th to April 12th next, £406.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—T. H. Smerdon, electrical installation at tenements in Wolcot Street, £375. (Recommended.)

DEPTFORD (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., supply of electric light fittings at Borough Hall, £414. (Recommended.)

METROPOLITAN ASYLUMNS BOARD.—S. Reed and Sons, wireless installation at Princess Mary's Hospital for Children, £246. (Recommended.)

FULBOURN MENTAL HOSPITAL COMMITTEE (CAMBRIDGE).—Siemens-Schuckert (Great Britain), Ltd., installation of automatic telephones, £186.

HULL CORPORATION.—Credenda Conduits Co., Ltd., supply of "Creda" cookers for the purposes of the cooker hiring scheme, for 12 months.

LANARKSHIRE MIDDLE WARD DISTRICT COMMITTEE.—A. Robertson, electric lighting work in 52 new cottages at Overton Road, Cambuslang, £272.

REIGATE CORPORATION.—Callender's Cable and Construction Co., Ltd., supply and laying of h.t. feeder from the electricity works to Redhill, £1 574 6s. 3d.

METROPOLITAN ASYLUMS BOARD.—Fuller Accumulator Co., Ltd., installation of storage battery at the "Exmouth" training ship, £293 10s. (Recommended.)

BEBINGTON AND BROMBOROUGH URBAN DISTRICT COUNCIL.—A. Hallam electric light installation at the Victoria Hall, £39 5s., and at the Council Offices, £33 2s. 6d.

BIRKENHEAD CORPORATION.—Supply of cable: W. T. Glover and Co., Ltd., £889; Hackbridge Cable Co., Ltd.; £349; Liverpool Electric Cable Co., Ltd., £141 5s.

EASTBOURNE CORPORATION.—General Electric Co., Ltd., switchgear and transformers (£7 127 13s.), and Pirelli, Ltd., cable (£8 130) for extensions to Lower Willingdon, etc.

GLASGOW CORPORATION.—W. C. Yuille and Co., Ltd. pinions; Edgar Allen and Co., Ltd., manganese steel points; C. Churchill and Co., Ltd., portable electric tool post grinder.

SCUNTHORPE AND FRODINGHAM URBAN DISTRICT COUNCIL.—Adams Hydraulics, Ltd., sewage pumping machinery, comprising centrifugal pumps, electric motors, control panels, etc.

DUBLIN CORPORATION.—Mather and Platt, Ltd., electrically driven, automatically controlled pumps, with necessary fittings and auxiliary machinery, in three pumping stations, £3 635.

BEDFORD CORPORATION.—Pirelli-General Cable Works, Ltd., construction of six-wire overhead line, in connection with the extension from Kempston to Wootton Pillinge, £2 843. (Recommended).

SOUTH SHIELDS BATHS COMMITTEE.—Chas. Ramsay and Son, electric lighting repairs at baths, £48 18s.; British Insulated Cables, Ltd., supply of 60 kVA condenser, with switchgear, £225.

GENERAL POST OFFICE.—Telephone exchange equipment: Lee Green, Ravensbourne (Bromley) and New Cross, Automatic Telephone Manufacturing Co., Ltd.; Hindhead (Surrey), Siemens Bros. and Co. Ltd.

SLEAFORD URBAN DISTRICT COUNCIL.—Callender's Cable and Construction Co., Ltd., supply and laying of 550 yds. of four-core 0·5 and 500 yds. of four-core 0·06 lead-covered, double steel tape armoured cable, etc.

SOUTHEND CORPORATION.—Union Cable Co., Ltd., copper trolley wire, £409; British Insulated Cables, Ltd., h.d. copper trolley wire, £241; British Mannesmann Tube Co., Ltd., 36 medium and six heavy traction poles, £376.

SWINDON CORPORATION.—British Thomson-Houston Co., Ltd., two h.t. switchgear cubicles, with corresponding control panels and metering panel, £1 604 15s.; C. Churchill and Co., Ltd., equipment for the fitting shop at Moredon generation station, £321 18s. 3d.

BUENOS AYRES CENTRAL RAILROAD AND TERMINAL CO.—Metropolitan-Cammell Carriage, Wagon and Finance Co., Ltd., rolling stock for underground electric railway now under construction. The contract comprises 56 electric motor bogie coaches of all-steel construction. The contract for the electrical equipment of the coaches has been sublet to the General Electric Co., Ltd.

DEVIZES RURAL DISTRICT COUNCIL.—A. R. Fox, provision of electrical installation in cottages at Easterton, Great Cheverell, Market Lavington, West Lavington and Worton, £189. Also tendered: W. L. Simmonds, £189; W.E.S. Co., £215; G. W. Cross, £218; James Bros., £230; Howson, Jones and Co., £232; W. F. Hill, £240; V. H. Dipple, £268; General Installation Co., Ltd., £276.

BARKING URBAN DISTRICT COUNCIL.—Siemens Bros. and Co., Ltd., supply and laying of cable from Axe Street to the sewage works, £2 779. (Recommended.) Also tendered: Callender's Cable and Construction Co., Ltd., £2 851; Standard Telephones and Cables, Ltd., £2 872; W. T. Henley's Telegraph Works Co., Ltd., £2 875; Johnson and Phillips, Ltd., £2 884; Enfield Cable Co., Ltd., £2 919.

Signalling Equipment.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY.—Westinghouse Brake and Saxby Signal Co., Ltd., Supply of power signal material for the re-signalling, on the electro-pneumatic principle, of Bombay Central Station. The material includes a 119-lever power locking frame, a strip light type illuminated diagram, 35 a.c. track circuits, with track transformers, relays, impedance bond layouts, reactances and rail insulations, 34 electro-penumatic facing point layouts with point indication relays, compressors, switch-gear, etc.; 16 three-aspect colour light signals, and 21 two-aspect globe type shunt signals, with posts and fittings, two 7-way route indicators, 10 apparatus cases for relays, feeds, etc., and two 2-slide lever frames, for control of shunting yards. The actual installation will be undertaken by the railway company's signal department.

LONDON COUNTY COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., supply and installation of one rotary convertor at a tramway sub-station, with supervisory control, £5 568, remote automatic control, £5 168, remote semi-automatic control, £4 848 (accepted). Also tendered: Oerlikon, Ltd., supervisory control, £4 255, alternative £4 515 (tender incomplete); British Thomson-Houston Co., Ltd., £5 568; English Electric Co., Ltd., £5 568; British Brown-Boveri, Ltd., £6 299 (mercury arc rectifiers); Harland Engineering Co., Ltd., £6 467; General Electric Co., Ltd., £5 568, £5 168, £4 848; Bruce Peebles and Co., Ltd., remote semi-automatic control, £4 848; Mather and Platt, Ltd., £4 848; A. Reyrolle and Co., Ltd., £4 848; Electric Construction Co., Ltd., £5 200; Hewittic Electric Co., Ltd., £6 637 (mercury arc rectifiers); Crompton Parkinson, Ltd., supervisory control £6 558, remote semi-automatic control, £4 985 (alternative).

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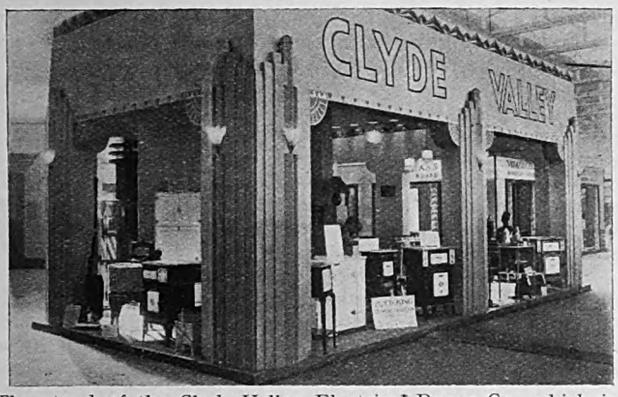
NEWS IN PICTURES

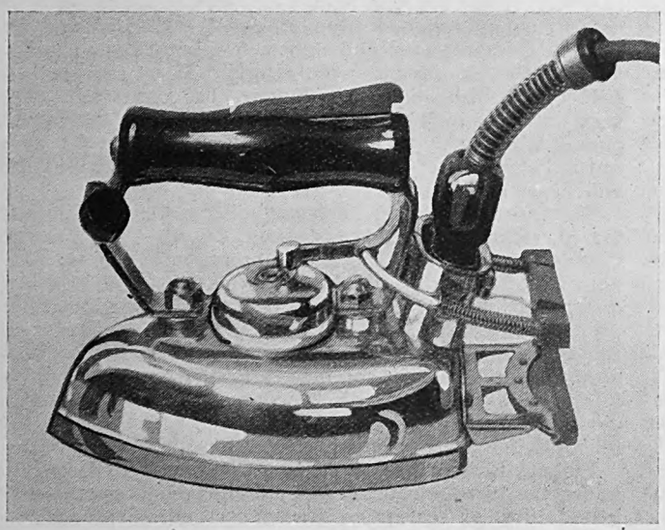
Mr. T. R. Martin, who, as announced on page 472, has been elected chairman of the Advisory Committee of the ElectricalSection of the B.I.F.

The striking window display, featured by Currys, Ltd., wireless dealers, of 20, St. Botolph's Street, Colchester, in connection with their Ever Ready Week display, which was held from October 7th to 12th. At the time of going to press the names of the prize-winners in the competition were not known.



The stand of the Clyde Valley Electrical Power Co., which is playing such an important part in the Housing and Health Exhibition at the Kelvin Hall, Glasgow. The show closes to-morrow, Saturday. One of the important functions of the Clyde Valley Co. is the supply of current in outlying districts, and assisting in the industrial development of rural areas by making available an adequate source of electrical energy.

A general view of one of the aisles at the Brighton Electrical Exhibition, which concludes to-morrow, Saturday. The exhibition is voted to be one of the most popular "local" shows so far held in this country, and considerable business is reported to have been done. A brief review of the exhibits and details of the competition held in connection with the exhibition are given on pages 462 and 469.



As will have been gathered from our description last week, a number of new items of electrical interest were shown at the International Exhibition of Inventions, which concluded last week. Among these was the device, seen above, for incorporation in electric irons, to switch the current off automatically when the irons are left flat on the ironing board. At the top of the handle is a lever. When the iron is in use and the handle gripped, the lever is depressed and a connecting rod throws the tumbler switch to the "on" position. When the iron is released, the switch is turned "off" by a spring.

It will be remembered that in THE ELECTRICIAN of September 13th, we gave particulars of a new force called "Chromadyno" which is claimed to be ten times more powerful than electricity. We have received this week a number of photographs from New Zealand illustrating some of the apparatus used in connection with this force. Of these we believe the above, of the main switchboard, to be most interesting. Note the "slow-motion" condenser dials left and right of the board.

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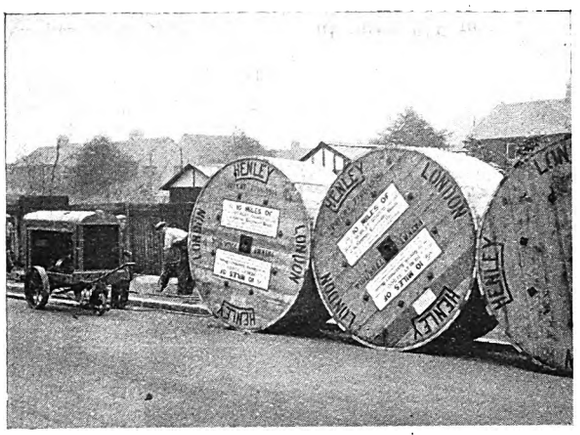
ELECTRICITY SUPPLY.

Loans for Mains, etc.—Clitheroe's Application for Wayleaves—Assessment of Electricity Undertakings—Increase of Domestic Load at Liverpool.

OLDHAM Electricity Committee has received sanction to borrow a further £50 000 for mains.

Plymouth Electricity Committee seeks sanction to borrow £65 000 for new mains and services.

Huddersfield T.C. is to seek sanction to the borrowing of £60 000 for mains, services and transformers.



IN connection with the cable installation work recently carried out in the Croydon area under the Central Electricity Board's scheme, "Henley's" achieved some good publicity by using each of the large drums as a poster hoarding. The posters read "Part of 10 miles of Henley 33 000 volt cable for the Central Electricity Board. Manufactured by W. T. Henley's Telegraph Works Co., Ltd., makers of the famous Henley Wiring System." As there were altogether about eighty drums used on the five-mile route, the publicity was fairly extensive. The illustration shows some of the drums, and a "Spiros" compressor at work.

East Ham Electricity Committee has passed an estimate of £3 308 for distributor cables in various streets.

Eastbourne Electricity Committee has decided to seek sanction to borrow £16 000 for the provision of a new 2 500 kW turbo-alternator and £16 000 for a new boiler.

Tonbridge U.D.C. has agreed to delete the clause in the assisted wiring scheme, "that consumers in the rural area pay one-third of the cost of installation in advance."

Col. T. C. Ekin, on behalf of the Electricity Commissioners, will hold an inquiry on November 13th, into the application of Barnes U.D.C. for consent to the extension of the Council's generating station.

Wimbledon Corporation is to seek sanction to borrow £30 000 for mains and services.—Sanction to borrow £15 000 for domestic apparatus for hire and £2 500 for sub-station equipment has been obtained.

Brighton Corporation has decided to proceed with part of the street lighting scheme to Patcham Place, at a cost of £700.—The Electricity Committee has obtained sanction for a loan of £12 200 in connection with the alteration of the system and pressure in the Patcham area.

Gravesend Corporation Housing Committee has received an application from 11 tenants in Sun Lane, on the King's Farm Estate, asking for permission to put in further electric lighting points in their houses. The Committee recommends that permission be granted on certain conditions.

The erection of the new sub-transformer station in connection with the Shannon electricity supply in Fleet Street, Dublin, is being rapidly pushed forward. Some British transformers have been installed. It is hardly likely there will be any transmission from the Shannon system to Dublin before next March.

Wellington (Somerset) U.D.C. has given its consent to an electricity scheme submitted by Whitehall Securities, which has taken over the undertaking of the Wellington and District Electricity Supply Co. It is proposed to lay a transmission line from Exeter, where energy will be taken in bulk from the Corporation works.

The Ministry of Transport's inquiry into Clitheroe Corporation's application for compulsory wayleaves for cables from Chatburn to Grindleton has resulted in granting them for five years, on the terms of the Corporation, 2s. 6d. per pole in meadowland; 1s. in hedgerow or pasture; and 1s. per 100 yds. of cable underground.

Sunderland Electricity Committee recommends the T.C. to carry out various schemes, estimated to cost £33 000, and including the equipping of additional sub-stations, the laying of new mains, and the replacing of obsolete switchgear.—The Committee is to consider the provision of fresh accommodation for meter testing apparatus workshops, etc.

Dorchester Electricity Committee expresses the opinion that the present method upon which electricity undertakings are assessed is unfair, and recommends that a letter be written to the I.M.E.A. stating that the Council considers that the question should be considered by the association, with a view to securing a revision of the method and basis of such assessments.

Portsmouth Electricity Committee is to seek power for an extension of the electricity supply area to the parish of Hambledon. The cost of mains, etc., is estimated at £5 100, and the extension would make a supply available to 169 existing premises.—The Committee has obtained sanction to borrow £8 000 for mains in connection with the bulk supply to the Petersfield Electric Light and Power Co.

Liverpool Tramways and Electric Power and Lighting Committee, last week, authorised a decrease of ¼d. per kWh in the flat rate charges for electricity, which has brought the tariff down to pre-war level. A corresponding decrease has been made in the maximum demand charges.—The Committee decided to recommend the adoption of an assisted wiring scheme.—The domestic load is increasing rapidly, electric cookers now in use numbering about 3 700.

Prof. Roberts, the Liverpool city analyst, and Mr. F. G. Martin, a Liverpool chemist, have expressed the opinion that the device of Mr. P. J. Robinson, the city electrical engineer, for abating the smoke nuisance of power stations will do what is claimed for it. The device is to be used at the new Clarence Dock power station. Details of the invention cannot yet be published.—Sanction has been obtained by Liverpool Tramways and Electric Power and Lighting Committee to the borrowing of £300 000 for prospective expenditure on unspecified electricity mains and services.

Electricity from the Irish Free State Electricity Supply Board's system is now being supplied in Portlaoghise. The majority of the business houses electrically lighted have been using current supplied from Messrs. J. J. Aird and Sons' Central Garage plant, and only a few houses were prepared to take the Shannon scheme supply. Many private householders are disinclined to complete the connections at present, as they would then become responsible for the valuation charge while using little or no current. They prefer to wait until the return of the long evenings, when early lighting will become necessary.

Sir Andrew Duncan, chairman of the Central Electricity Board, recently informed Stranraer T.C. that the Electricity Commissioners would shortly be preparing a scheme for the South of Scotland, and although this would not deal with distribution directly, it was hoped that it would stimulate proposals for large-scale distribution along lines favoured by the Board. In any case, so far as generation was concerned, a station at Stranraer for merely local purposes should not, in the view of the Board, be contemplated. The T.C. has decided to grant the Holderness Trust permission to apply for an Order to light Stranraer streets at 2½d. per kWh.

Fulham Electricity Committee recommends that consumers under the hired-wiring scheme be allowed to purchase their installations at cost price, less 5 per cent. depreciation for each year during which the wiring and apparatus have been installed.—Under the scheme, which was adopted by the Council in December, 1927, 1 303 premises in the borough have been wired. Eight contractors have been employed, and the work in all cases has been satisfactory.—It is proposed to experiment upon Harwood Road, at an estimated cost of £554 10s., by the provision of eleven public lighting points, comprising four special K and M arc lamps and seven lantern gasfilled lamps.

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COMPANY NEWS.

Appreciation of Manufacturing Companies' Shares—Hurst, Nelson & Co.'s Hopeful Prospects—Directors' Reports and Dividend Announcements—New Company to Exploit Stille Inventions—Other New Companies.

CABLE manufacturing shares have been in demand during the past week, and British Insulated ordinary at 81s. 3d., Callender's at 80s., and W. T. Henley's at 131s. 3d. are all quoted 1s. 3d. higher. British Thomson-Houston shares have advanced from 22s. 6d. to 23s., and Ever Readies from 19s. to 19s. 6d. Cables and Wireless "A" and preference stocks have put on 2½ points, to 85 and 96 respectively. Marconi's Marine shares are 2s. 6d. lower, at £2 10s. Charing Cross and Metropolitan Supply preference shares, and County of London ordinary are all 6d. lower. Metropolitan and District Railway ordinary stocks are slightly better.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
(*d*)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	,, ,, ,, 4½% C.P. (£1)	17/-	17/6	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	,, ,, ,, ,, 6% C.P...	22/6	22/-	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	54/-	54/6	68/6	25/9
6	,, ,, ,, ,, 6% C.P.	22/6	22/6	24/-	21/3
(*e*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/6	27/6	37/6	23/-
1/9½	Metro. Elec. Sup. Ord.	46/3	46/3	53/-	24/9
4½	,, ,, ,, 4½% C.P. ..	17/-	17/6	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	29/4½	29/4½	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	26/3	26/3	30/3	19/3
6	N. Metro. Elec. 6% C.P. ..	21/6	21/6	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	21/-	21/-	—	—
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/-
4½	,, ,, ,, 4½% C.P. (£1)	17/-	17/-	17/10½	16/7½
8	Yorks. Elec. Power Ord. ..	35/6	36/-	38/9	24/6
6	,, ,, ,, 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	122½	152	117
7·67	,, ,, ,, ,, 6% Pf. Stk.	124½	124½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4	,, ,, ,, 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	77½	77½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	,, ,, ,, ,, 4% Pf. Stk.	71	71	77	68
4	,, ,, ,, ,, 4% Deb. ..	76	76	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½*	95½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	,, ,, ,, 5% Deb. ..	68½	68½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	62	61	81	54½
3½	,, ,, ,, 3½% Pf. Stk. ..	61	61	76	60½
3½	,, ,, ,, 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk. ..	73	72½	77½	52½
4½	,, ,, ,, 4½% 1st Pref. ..	79½	79½	84	74½
6	,, ,, ,, 6% Perp. Deb. ..	112½	112½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
7	Underground Electric Rlys. Ord.	22/6	22/6	28/2	11/-
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	,, ,, ,, 1st Deb...	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.—	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	81/3	80/-	86/3	56/-
6	,, ,, ,, 6% C.P.	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref...	23/-	22/6	24/9	19/7
7	,, ,, ,, 7% Deb. ..	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	130½	153½	120
15	Callender's Cable Ord.	80/-	78/9	91/3	66/-
6½	,, ,, 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	,, ,, 7½% B. Pref. ..	27/6	27/6	28/3	25/-
8	Crompton-Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	,, ,, 6% Cum. 2nd Pf.	18/-	18/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	,, ,, ,, 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	,, ,, ,, 7% C.P. ..	21/3	21/3	22/9	21/-
—	English Elec. Ord.	8/1½	8/1½	15/9	5/-
—	,, ,, 6% C.P.	8/9	8/9	18/9	7/-
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord...	19/6	19/-	92/3	18/1
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	,, 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	52/6	52/6	46/6	26/6
25	W. T. Henley's Ord.	131/3	130/-	120/-	69/3
10	Johnson & Phillips Ord... ..	40/	40/-	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref.	23/9	23/9	25/-	22/3
7½	Siemens Bros. & Co. Ord. ..	28/9	28/9	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½*	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	85	82½	—	—
	"B" Ord. Stk.	57½	57½	—	—
	5½% Cum. Pref. Stk. ..	96	93½	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	,, 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Great Northern Telegraph (£10)	30½	30½	43½	26
10	Indo-European (£25)	47½	47½	48½	30
25	Marconi's Int. Mar.	50/-*	52/6	90/-	16/6
4	Western Tel. 4% Deb. Stk. ..	75	74	82	76

(*a*) 19¼d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. * Ex dividend.

URBAN ELECTRIC SUPPLY CO., LTD.—An intm. div. at the rate of 6% is announced.

TATA POWER CO., LTD.—Transfer books of 7½% "B" deb. sterling stk. are closed from Oct. 18 to 31, inclusive.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—Usual intm. div. of 15s. p. sh., less tax, for qrtr., will be payable on Nov. 1.

RICHARD JOHNSON, CLAPHAM AND MORRIS, LTD.—Paymt. of div. due on 5% cum. pref. shs. is to be deferred, pendg. publicatn. of the accts.

PHILIPS GLOWLAMPWORKS, LTD.—An extraordinary mtg. will be held on Nov. 4 to consider proposal to increase cap. by £12 500 000 to £21 000 000.

BRITISH COLUMBIA TELEPHONE CO.—London register of 4½% 1st mtge. deb. stk. is closed until Nov. 1, inclusive, for preparing warrts. for half-year's int. due Nov. 1.

EASTERN TELEGRAPH CO., LTD.—Paymt. of int. for half-year ending Oct. 31 on 4% mtgge. deb. stk. will be made by warrts. on Nov. 1. Transfer books will be closed from Oct. 26 to 31 inclusive.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—Intm. div. of 5% (1s. p. sh.), less tax, has been declared on acct. of year endg. Dec. 31, 1929. Warrts. will be forwarded on Oct. 26.

CLAUD HAMILTON, LTD.—Pft. for year to April 30, 1929, £2 097, less pref. div., £800, leavg. £1 297. Addg. £6 441 brt. in, makes total £7 738. Div. on ord. shs. 5%, less tax (same as last year). Fwd., £6 418.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Qrtrly. div. of 50 cents p. sh. on ord. shs. of no par value will be payable on Dec. 2. The London agents are the Canadian and General Finance Co., Ltd., 3, London Wall Buildings, E.C.2.

TRAFFORD PARK ESTATES, LTD.—Income for year to June 30, 1929, £105 539, includg. net pft. on electric tramways, 'buses and motor cars, £4 962. Pft. and loss acct. shows blce. £34 068, plus £45 185 brt. in. Div. of 5% p.a. recommended. Fwd. £46 753.

CHEAP ELECTRIC POWER CORPORATION, LTD.—It is announced that a mtg. of deb. hldrs. will be held to-day (Oct. 18) at 4 p.m. at the offices of Mr. Walter Thompson, 64, Cheapside, London, E.C.2, to consider serious position *re* British and Foreign Lime and Power Corporation, Ltd.

METDURO, LTD.—It is announced that, in view of the fact that the cash resources are ample for present requiremts., it has been decided to postpone further the paymt. of the first and final call on the pref. shs. until dates early in 1930, of which at least one month's notice will be given.

AGAR, CROSS AND CO., LTD.—Fin. div. on ord. cap., 6%, plus bonus of 5%, makg. 16% for year, tax free (same as preceding year). To res. £100 000, agst. £135 000. Fwd. £53 289, agst. £40 736. Ord. sh. transfer books are closed until Oct. 30, inclusive, for preparatn. of div. warrts.

INDO-EUROPEAN TELEGRAPH CO., LTD.—Intm. divs. for half-year ended June 30, 1929, at rate of 5%, tax free, will be payable on Nov. 1. Coupons (No. 119) of shs. to bearer will be payable on and after that date at the rate of 12s. 6d. per coupon, tax free, at Barclays Bank, Ltd., 54, Lombard Street, London, E.C.3.

EDISON ELECTRIC ILLUMINATING CO., BOSTON.—The Massachusetts Public Utility Commission has refused to permit the Edison Electric Illuminating Co. of Boston to split its stock four for one. The Commission said the company, instead of splitting its stock and leading shareholders to expect larger dividends, had better reduce the selling price to the consumer.

NEW YORK TELEPHONE CO.—Proposals will be received until noon, Nov. 1, at the office of the City Bank Farmers Trust Co., 22, William Street, New York City, for the sale to the trustee, in accordance with the provisns. of the mtge. dated Oct. 1, 1909, at not exceedg. par and int., of a sufficient number of bonds to invest the sum of $750 000 of the sinkg. fund.

GERMAN ELECTRICAL COMPANIES AND AMERICAN CAPITAL.—The "Financial Times" publishes a message from Berlin to the effect that Herr Von Siemens, head of the concern bearing his name, referred on Tuesday to the policy pursued by the A.E.G. (Allgemeine Elektrizitaets Gesellschaft) in reaching an agreement with the General Electric, which is now participating with the American Telephone Trust in a

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merger of several German firms in the low current electrical industry. He commented on the need for German industry at present to obtain the support of foreign capital, but he was of opinion that this foreign money was watching for the moment when it could seize control.

GERMAN TELEPHONE MERGER.—A merger of the Mix and Genest Telephone and Telegraph Works Co., the Ferdinand Schuchard Telephone and Telegraph Co., and the South German Telephone Apparatus Co. is announced. It is stated that the majority of the shs. will be acquired by a holdg. co. in which the American International Telephone and Telegraph Co. will have a controllg. int. The cap. to be provided by the American co. will amt. to approximately £1 500 000.

PUEBLA TRAMWAY, LIGHT AND POWER CO.—Net pfts. for 1928, $1 256 247 (Mex.), agst. $1 372 278 (Mex.), equivalent to £128 242. Provisn. has been made for doubtful debts and contingencies, and after charging all exes., int. and sinkg. funds on prior lien and 1st mtgge. bonds and 8% note service, there is a deficit of £2 076. Gen. depresn. in industry of country, particularly in cotton, resulted in decreased earngs. from electric power and light, compared with 1927. Operatg. exes. were slightly higher than in precedg. year. Agreemt with Municipality of Puebla. providg. for regular paymt. of electric power and light accts. has not worked out as anticipated and is now in litigatn. Meanwhile, indebtedness of Municipality for power and light service is increasg.

AMERICAN AND FOREIGN POWER CO.—Gross earngs. of subsidiary companies for year ended June 30, 1929, $45 554 230, agst. $24 177 970; net earngs., $23 502 743, agst. $12 806 158; other income $2 679 481, agst. $1 487 935. Int., $2 170 273, agst. $1 630 604; pref. divs. $1 825 460, agst. $1 568 162; to renewal and replacemt. funds $1 562 232, agst. $1 436 346; proportn. applicable to minority int., $224 862, agst. $25 495; blce. $20 399 027, agst. $9 633 486. To this sum, wh. is taken into the American and Foreign Power Co's. accts., is added other income, $776 871, agst. $272 532, and from the total are deducted exes. and int., $1 921 577, agst. $588 766, div. on $7 pref. stk. and div. on $7 2nd pref. stk. series "A," leavg. blce. $5 104 066, agst. $1 459 781.

Company Meeting.

HURST, NELSON AND CO., LTD.—Mr. R. F. W. R. Nelson, presiding at the meeting on October 10th, said the year that they had passed through had undoubtedly been exceptional; in fact, it had been most abnormal. He had been asked at the works on the previous day how far they had to go back to find such a depression in the trade, and they found it was nearly 25 years. So far as the present was concerned—he would not say the future—he was very hopeful. Their order-book was more satisfactory to-day than it had been for a long time, and they were hoping and anticipating that the railway companies would have a bigger programme. As the shareholders knew, it was hoped at their meeting last year that the negotiations with other companies would terminate in amalgamation. These negotiations were, of necessity, very protracted, very difficult, and very delicate. These negotiations, carried on until summer time of this year, unfortunately had broken down, but they did not break down because of any feeling or any difficulty between the companies. All was agreed excepting the values of the various shares, and they felt that, despite the savings which could be effected by amalgamation, the capitalisation of the new company would be too great. The negotiations broke down entirely for that reason, but the companies got so close together at that time that they had been and were working more closely together than they had done before. The report and accounts were adopted and the dividends recommended therein were approved.

New Companies.

SAFAC ACCUMULATOR CO., LTD.—Cap., £500. Manufacturers of and dealers in accumulators, etc. Solicitors: W. R. Bennett and Co., 74, Great Russell Street, London, W.C.1.

FRED W. WOOD, LTD.—Cap., £1 500. Wireless engineers, dealers in apparatus for reception and transmission of pictures, and television, and wireless transmission, electricians, etc. Reg. Office: 24A, Bull Ring, Grimsby.

EMKABE RADIO CO., LTD.—Cap., £100. Manufacturers of and dealers in wireless and electrical goods, etc. Reg. Office: 47, Farringdon Road, London, E.C.1.

RADIO RECORDION, LTD.—Cap., £500. Manufacturers of, agents for and dealers in gramophones and phonographs, either separate or combined with cinematograph, wireless and/or television apparatus, etc. A provisional director: H. B. Pritchard, 19, Kingsland, Newcastle-on-Tyne.

UNIVERSAL CONSULTING PATENT, LTD.—Cap., £200. To acquire patents, rights, etc., to manufacture machinery, to carry on the business of mechanical, consulting and electrical engineers, manufacturers of electrical lamps and apparatus, etc. Reg. Office: Aldwych House, Aldwych, London, W.C.2.

JOHN RICHARDS AND CO. (LONGTON), LTD.—Cap., £1 500. To acquire business of electrical engineer and wireless dealer recently carried on by J. Richards at Longton, Stoke-on-Trent, as "John Richards and Co." Reg. Office: Stafford House, Trentham Road, Longton, Stoke-on-Trent.

POSTERMATIC, LTD.—Cap., £5 000. To acquire from Electric Mirrors, Ltd., an invention for automatic poster advertising and to carry on the business of advertising contractors and agents, manufacturers of and dealers in electrical and other signs, etc. Reg. Office: County Chambers, Corporation Street, Birmingham.

SUPER RELAY SERVICE, LTD.—Cap., £250. To construct and maintain wireless signal stations and all other stations for the reception and distribution of wireless or radio signals or waves, to carry on business of consulting wireless experts, manufacturers of and dealers in wireless appliances, etc. Reg. Office: 2A, Forehill, Ely.

LEROY AND RICHARDSON, LTD.—Cap., £3 500. Wireless and electrical engineers, dealers in wireless, electrical instruments and fittings, loud speakers, valves, accumulators, television instruments and apparatus, and all accessories used in connection with the wireless and electrical industries, etc. Reg. Office: 170, High Street, Lewes.

STILLE INVENTIONS, LTD.—Cap., £5 000. To adopt agreement with Ludwig Blattner Picture Corporation, Ltd., W. Dawson and L. Blattner, and to carry on the business of dealers in, manufacturers, factors, agents and licensees of television and electrical and wireless apparatus, etc. Reg. Office: Trafalgar House, Waterloo Place, London, S.W.1.

COLUMBIA PICTURES CORPORATION, LTD.—Cap., £100. Producers, distributors and renters of and dealers in cinematograph films, and mechanical, electrical and other devices and apparatus, whereby sound or sight are synchronised, transmitted, produced or reproduced, manufacturers of and dealers in electrical and acoustic cameras and appliances, etc. Reg. Office: 18, Bloomsbury Square, London, W.C.1.

KEW ENGINEERING CO., LTD.—Cap., £15 000. To adopt agreement with Cowey Engineering Co., Ltd., and L. E. Cowey, and to carry on business of manufacturers and constructors of and dealers in substances, articles and apparatus for use in connection with transmission, emission or reception of sound, pictures, light, heat and power, etc. Solicitors: Gilbert Clarke and Gilbert, 14, Queen Victoria Street, London, E.C.4.

METAL AND CHEMICAL PRICES.

TUESDAY, October 15th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£78 5 0	10s. od.	—
Electro Wirebars	,,	£84 10 0	—	5s. od.
H.C. Wires, basis	per lb.	11⅛d.	—	⅛d.
Sheet	,,	11⅜d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis ..	per lb.	1s. 2⅛d.	—	⅛d.
Brass 60/40—				
Rod, basis	per lb.	9d.	—	—
Sheet ,, ...	,,	10⅛d.	—	—
Wire ,, ...	,,	11⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£24 15 0	—	—
Foreign or Colonial	,,	£23 7 6	2s. 6d.	—
Tin—				
Ingot	per ton	£189 17 6	—	£8 17 6
Wire, basis	per lb.	2s. 6½d.	—	1d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£23 5 0	—	12s. 6d.
Mercury	per bottle	£22 10 0	5s. od.	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £20 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¼d.
Sodium Bichromate—Per lb. 3½d.
Rubber—Para fine, 9½d.; plantation, 1st latex, 10⅛d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

James Forster and Co. report that slightly better demand from consumers has given a firmer tone to the market, and prices have advanced, although they are still below the association's idea of values. The firmness has also been assisted by a temporary shortage of arrivals. The future is obscure, and depends on the tactics employed by the Producers' Association. Under present conditions there seems little justification for any higher prices than those ruling, while, should demand ease off again, a lower market level may be expected. Closing prices on October 11th were £23 7s. 6d. for October and November, £23 8s. 9d. for December, and £23 10s. for January, 2s. 6d. per ton higher on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BARDWELL, SYDNEY H., 20, Church Street, Basingstoke (trading as BENNETT BARDWELL AND CO.), electrical engineer. £26 12s. 6d. September 10th.

COOK, M. R., AND SONS, 13/15A, Southchurch Road, Southend-on-Sea, wireless dealers. £16 13s. 8d. August 12th.

DOUTHWAITE, J. R., 9, Pilgrim Street, Newcastle-on-Tyne (trading as J. R. DOUTHWAITE AND CO.), electrical contractor. £12 15s. 11d. September 12th.

ELECTRAMONIC CO., LTD., Bear Gardens, 20, Park Street, S.E., wireless engineers. £19 12s. 10d. September 3rd; £13 7s. 4d. September 9th.

FENNEMORE AND CO., Market Square, Sandy, wireless engineers. £15 2s. 4d. September 6th.

FRANKLIN, Mr. A. J. E., Great Kingshill, High Wycombe, wireless dealer. £10 16s. 9d. August 12th.

HALL, CYRIL A., Wireless Supply Stores, Towcester, radio dealer. £12 12s. 7d. September 9th.

ICKLETON ELECTRIC SUPPLY CO., Ickleton, Great Chesterfield, electrical engineers. £16 9s. 3d. September 10th.

KING, Mr. R., High Street, Solihull, radio dealer. £28 18s. September 9th.

PALMER, W. J., Alexandra Works, Brent View Road, Hendon, (trading as BRITISH ELECTRICAL MANUFACTURING CO.) £16 19s. 1d. September 6th.

PARSONS, Mr. E. M., 57, Paragon Street, Hull, electrical contractor. £19 15s. 8d. August 7th.

SOMERFORD, 59, St. James's Road, S.W.9, electricians. £17 15s. 11d. August 30th.

TOPPING, Mr. S. G., West Street, Harrow (trading as GEORGE FLETCHER), electrical engineer. £22 0s. 4d. September 4th.

WESTON ELECTRICAL CONTRACTS CO., 17, George Street, Euston, dealers. £11 7s. 10d. August 9th.

Deeds of Arrangement.

BARSON, Alfred, 36B, Granby Street, and 124, Kimberley Road, Leicester, radio and electrical engineer. Dated October 11, filed October 14. Trustee, N. Alton, Morley House, London Road. Leicester, C.A. Liabilities unsecured, £1 603; assets, less secured claims, £620.

FURNESS, William Kates, 585A, Wilbraham Road, and 193, King's Road, Chorlton-cum-Hardy, wireless electrical engineer, Dated October 7, filed October 10. Trustee, G. H. Blair, 44, Brazennose Street, Manchester, I.A. Liabilities unsecured, £958; assets, less secured claims, £70.

SIMPKIN, Norman Jonathan, 5, Exchange Street and 55, Bromwich Street, Bolton, electrical engineer. Dated October 7, filed October 9. Trustee, A. T. Eaves, 47, Mosley Street, Manchester, C.A. Liabilities unsecured, £510; assets, less secured claims, £289.

Receivership.

FULL LIGHT ANTI-DAZZLE LAMP CO., LTD.—P. Mordant, F.I.C.A.; of 115/117, Cannon Street, E.C., was appointed receiver and manager, on October 2nd, under powers contained in debenture dated June 19th, 1929.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

HUNTER, Sidney Alfred, trading as the ELECTRO GENERATOR COMPANY, 5, Uxbridge Road, London, W. A meeting of the creditors of the above was held recently at the offices of Cohen, Dunn, Page and Moore, solicitors, Audrey House, Ely Place, E.C. A statement of affairs was submitted which showed ranking liabilities of £674, including trade creditors for £494, and net assets expected to produce £254, or a deficiency of £420. The debtor's accountant reported that his client had been in business for more than twenty years, and had never previously been in difficulties. During the last year or two, the debtor had suffered through lack of capital, and a short time ago writs were issued against him by two creditors for substantial amounts. The debtor then entered into arrangements to sell his stock, and he was able to dispose of it to advantage, realising more than £900. That money was utilised in discharging the claims of pressing creditors, and paying off an overdraft at the bank. When the debtor disposed of the stock, he was under the impression that the assets would realise more than sufficient to pay the whole of his liabilities in full. An offer was made of a composition of 6s. 8d. in the £, which was subsequently increased to 10s. in the £. A resolution was passed agreeing to accept the amended offer.

PARSONS, Edward M., electrician and wireless dealer, 57, Paragon Street, and 58, Princes Avenue, Hull. A meeting of the creditors of the above was held on October 11th, at the office of Dawson and Lancaster, Hull, when a statement of affairs was submitted which showed liabilities of £4 562. Of that amount, £4 442 was due to unsecured creditors, and £120 to partly secured creditors, the total claim of the latter being £170, while they held security of the estimated value of £50. The assets consisted of cash in hand, £20; stock at cost, £659, valued at £450; trade fixtures, fittings, utensils, etc., £35; furniture, £150; work in progress, £50; shares, £5; Morris car, £50; good book debts, £467; and doubtful and bad debts £49, expected to produce £23. The total assets were £1 250, from which preferential claims of £149 had to be deducted, leaving net assets of £1 101, or a deficiency of £3 461. It was reported that the unsecured creditors' claims included cash creditors for £2 695, who had agreed to withdraw their claims in the event of the estate being wound up under a deed of assignment. After discussing the position, the creditors resolved that subject to the cash creditors withdrawing their claims, the deed of assignment, executed by the debtor in favour of Mr. J. J. Campbell as trustee, be confirmed.

London Gazette, etc.

Bankruptcy Information.

CAMEROFF, Joseph, 147, Spencer Place, Leeds, electrical engineer. Receiving order, October 11th. Debtor's petition.

COTTRELL, Thomas Chapman, 31, Autumn Street, Burley Lodge Road, Leeds, electrician, trading as THOMAS COTTRELL. Receiving order, October 12th. Debtor's petition.

DAFT, Hugh Edgar, Gloucester Place, Monument Street, Peterborough, Northampton, electrical engineer. First meeting, October 18th, 12 noon. Public examination, October 25th, 10.45 a.m., The Law Courts, Peterborough.

PHILLIS, William James, 87, Overton Road, Leicester, electrical engineer. First meeting, October 18th, 3 p.m., Official Receiver's Office, 1, Berridge Street, Leicester. Public examination, November 1st, 11 a.m., The Castle, Leicester.

SANDS, Chaloner Wilkinson, High Street, King's Langley, Hertford, electrical and wireless contractor. Receiving order, October 9th. Debtor's petition. First meeting, October 22nd, 2.30 p.m., 29, Russell Square, London, W.C.1. Public examination, November 27th, 10.30 a.m., Court House, St. Albans.

Notice of Dividend.

LITTLER, John, 9, Hoghton Street, Southport, electrical and radio engineer. First and final dividends, 2s. 6d. per £, payable October 25th, at the offices of the trustee, Arthur T. Eaves, 47, Mosley Street, Manchester.

Notices of Intended Dividends.

BRAYSHAW, Dunwell, 78, Granby Street, Liverpool, Electrician. Last day for receiving proofs, October 30th. Trustee, J. Allcorn, Government Buildings, Victoria Street, Liverpool, Official Receiver.

JOLIVARD, Kenneth Paul James, described in the Receiving Order as K. Jolivard and Co., 66, Victoria Street, London, S.W., electrical engineer. Last day for receiving proofs, November 2nd. Trustee, E. Parke, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver.

LAWRENCE, Louis Haydn (in the Petition and Receiving Order described as Henry Frederick Lawrence), 43, Canterbury Road, Margate, Kent, trading as Henry F. LAWRENCE, electrical engineer. Last day for receiving proofs, October 26th. Trustee, C. S. Scarlett, 5, Cecil Square, Margate.

Applications for Discharge.

KELLY, Morris, 12, Jackson's Row, Manchester, radio apparatus dealer. Hearing, November 4th, 10.25 a.m., The Court House, Quay Street, Manchester.

LANGLOIS, Herbert Augustus, trading in co-partnership with Daniel Timothy Donovan under the style of THE LONDON ELECTRICAL COMPANY, 119, St. Mary Street, Cardiff, formerly 124, Queen Street, Cardiff, electrical engineer. Hearing, December 3rd, 10.30 a.m., Law Courts, Cathays Park, Cardiff.

Order Made on Application for Discharge.

WOOD, Norman Hurst, lately 38, St. Charles Square, North Kensington, W.10, electrical engineer. Adjourned generally, February 21st, with liberty to restore.

Partnerships Dissolved.

ELEKTRA SUPPLIES (Joseph LANGDORF and James Garnet IVORY), importers and distributors of wireless and electrical components, 43, Grafton Street, Tottenham Court Road, London, W.1. By mutual consent as from September 30th, 1929. Debts received and paid by the partners.

REDCLIFFE RADIO MANUFACTURING CO. (Leslie Edward HICKS and Robert George HAWKINS), radio apparatus manufacturers, Phœnix Works, Temple Gate, Bristol, by mutual consent as from September 16th, 1929. Debts received and paid by R. G. Hawkins, by whom the business will be carried on.

WOODHOUSE AND MELLANBY (Philip Marshall WOODHOUSE and John MELLANBY), electrical engineers, Landbeach, Cambridge. By mutual consent as from April 24th, 1929. Debts received and paid by J. Mellanby, who continues the business.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

316 642 L. King and L. C. King. Apparatus for use with telephone systems. (2/5/28.)
316 643 Standard Telephones and Cables, Ltd., and G. H. Nash. Telephone sets. (2/5/28.)
291 740 Standard Telephones and Cables, Ltd. High frequency signalling. (7/6/27.)
316 651 Automatic Telephone Manufacturing Co., Ltd., and R. Taylor. Telephone systems. (2/5/28.)
290 567 Electrical Research Products, Inc. Talking motion picture apparatus for the synchronous recording or reproduction of sounds and pictures. (14/5/27.)
291 787 Electrical Research Products, Inc. Material forming apparatus. (9/6/27.)
316 688 Siemens Bros. and Co., Ltd., W. H. Grinsted, and S. A. Byard. Electric signalling and control systems. (8/5/28.)
316 690 F. W. W. Baker and C. E. Green. Methods of and means for the telegraphic transmission of pictures, diagrams, and other impressions. (8/5/28.)
316 694 A. Carpmael (I.G. Farbenindustrie Akt.-Ges.). Amalgam cells for electrolysis. (8/5/28.)
293 788 British Thomson-Houston Co., Ltd. Apparatus for amplifying electrical energy. (12/7/27.)
316 708 C. F. Burton and H. Burton. Holders for thermionic valves and the like. (16/5/28.)
316 711 T. J. Lattimer. Electrical heating devices. (18/5/28.)
316 712 T. J. Lattimer. Electrical immersion heating devices. (18/5/28.)
316 721 H. H. Long and Associated Electrical Industries, Ltd. Suspension of electrical apparatus, such as electric light pendants, ceiling fans, and the like. (24/5/28.)
292 142 National Carbon Co., Inc. Electric torch or flashlight. (15/6/27.)
291 455 P. E. Bunet and Acieries de Gennevilliers. Magnetic core induction furnaces. (2/6/27.)
291 456 P. E. Bunet and Acieries de Gennevilliers. Induction furnaces. (2/6/27.)
316 730 Automatic Telephone Manufacturing Co., Ltd., R. Taylor, and C. E. Beale. Telephone Systems. (5/6/28.)
316 733 E. Y. Robinson and Associated Electrical Industries, Ltd. Thermionic cathodes for vacuum electric discharge tube devices. (7/6/28.)
297 028 Standard Telephones and Cables, Ltd. Electron emitters and process of making same. (12/9/27.)
293 031 Siemens-Schuckertwerke Akt.-Ges. Electric control for the steering gear of ships and the like. (30/6/27.)
316 740 C. E. Fry. Switches particularly applicable to prepayment devices for use with electric meters. (29/6/28.)
294 571 Ateliers de Constructions Electriques de Charleroi. Retarded overload relay for electric circuit breakers and the like. (26/7/27.)
316 756 A. F. Bulgin and H. J. B. Chapple. Inductance for use in wireless receivers and like apparatus. (12/7/28.)
316 760 United Electrical Co. (Birmingham), Ltd., F. R. Pendergast, and S. E. Sheerman. Application of fuse units to boards, boxes, and like carriers. (18/7/28.)
295 709 Maschinenfabrik Oerlikon. Limit current electric relays for controlling switching operations. (19/8/27.)
316 763 J. Anderson. Methods of and apparatus for disintegrating obsolete or other unrequired electric cables. (23/7/28.)
299 388 L. Renault. Magnetic sclerometers. (25/10/27.)
316 770 W. H. Scott and H. D. Wheeler. Electromagnetic brakes. (31/7/28.)
316 778 W. J. Charles. Attachment bolt and suspender for suspending bowls, shades, and reflectors used with electric lamps, and for like uses. (10/8/28.)
302 305 Siemens and Halske Akt.-Ges. Tapping device for electrical furnaces. (14/12/27.)
316 784 L. H. Maskell. Phototelegraphy. (16/8/28.)
296 707 Voigt and Haeffner Akt.-Ges. Process for the manufacture of electric heating bodies, in particular heating-plates having heat conductors inside insulating material. (5/9/27.)
316 798 N. Schmitt and O. Schmitt. Electric mine fuse. (5/9/28.)
297 425 Elektrizitats Akt.-Ges. Hydrawerk. Electric condenser. (21/9/27.)
316 805 H. C. Wilson. Two-valve wireless receiving set. (18/9/28.)
297 742 British Thomson-Houston Co., Ltd. Electric steam generators. (26/9/27.)
300 170 Siemens-Schuckertwerke Akt.-Ges. High-tension electric switch gear with arc extinguishing by compressed air. (7/11/27.)
298 906 British Thomson-Houston Co., Ltd. Gaseous glow lamps. (15/10/27.)
300 237 Siemens-Schuckertwerke Akt.-Ges. Double squirrel-cage motors. (9/11/27.)
316 829 J. C. Macfarlane and W. A. Macfarlane. Dynamo electric machines. (27/11/28.)
302 921 K. A. Hawley. Conductor clamps. (23/12/27.)
305 625 Telefunken Ges. fur Drahtlose Telegraphie. Picture and the like telegraph apparatus. (8/2/28.)
317 099 A. M. Taylor. Means for and methods of improving the power-transmitting capacity of super-tension alternating-current systems of electrical power transmission. (4/2/28.)
316 903 Igranic Electric Co., Ltd., J. H. Reyner, and A. H. Curtis. Wiring arrangement for electrical apparatus. (3/4/28.)
316 958 G. R. Lamm. Inductance-coils for ranges of different wavelengths in wireless telegraphy and telephony. (5/4/28.)

Applications for Patents.

July 15th.

21 763 F. A. Andrews. Electric sign letters.
21 721 M. von Ardenne. Wireless receivers. (14/7/28, Germany.)
21 777 Associated Telephone and Telegraph Co. Telephone pay stations. (26/7/28, Belgium.)
21 772 Automatic Telephone Manufacturing Co., Ltd., C. H. Evans and C. Gillings. Telephone systems. (19/4/28.)
21 776 Automatic Telephone Manufacturing Co., Ltd. Supervision of apparatus at a distance.
21 693 F. S. Barton. Wireless systems, etc.
21 765 British Thomson-Houston Co., Ltd., and A. F. Johnston. Indicating instrument readings at a distance.
21 766 British Thomson-Houston Co., Ltd. (General Electric Co. of N.Y.) Rheostats.
21 722 W. H. Bull and J. E. Scheel. Apparatus for electrotherapeutic treatment.
21 774, 21 775 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
21 698 E. Hoogland. Electrically driven machines for cutting out material.
21 767 International General Electric Co., Inc. Means for withdrawing air from condensers. (23/7/28, Germany.)
21 725 Kolster-Brandes, Ltd. (Kolster Radio Corporation). Piezo-electric torsion devices.
21 779 N. Koomans. Secret telegraphy. (14/7/28, Germany.)
21 769 London Electric Wire Co. and Smiths, Ltd., and E. L. Wildy. Wireless receivers.
21 770 London Electric Wire Co. and Smiths, Ltd., and E. L. Wildy. Dual control switches for wireless receivers.
21 773 N. V. Philips' Gloeilampenfabrieken. X-ray tubes. (9/8/28, Holland.)
21 778 N.V. Philips' Gloeilampenfabrieken. Supports for radiological purposes (9/8/28, Holland.)
21 727 W. Pfeiffer and C. Reiss. Electrically heated thermal storage hearths.
21 717 L. Pontecorvo. Overhead suspensions for electric railways, etc. (17/7/28, Spain.)
21 744 Steatit-Magnesia Akt.-Ges. Insulators. (20/9/28, Germany.)
21 763 Strand and Interchangeable Signs, Ltd. Electric sign letters.
21 701 W. S. Wintersgill. Telephone receiver support.

July 16th.

21 856 Associated Telephone and Telegraph Co. Train control systems. (16/7/28, U.S.)
21 843 W. A. Bartlett and Kolster-Brandes, Ltd. Electric switches.
21 793 L. Bell. Frame aerials for wireless receiving apparatus.
21 876 British Thomson-Houston Co., Ltd. Anodes for electric discharge tubes. (16/7/28, U.S.)
21 877 British Thomson-Houston Co., Ltd. Cooling systems for X-ray tubes. (16/7/28, U.S.)
21 854 C. G. Carrothers and R. O. Kapp. Electric protective arrangements. (21/6/28.)
21 855 C. G. Carrothers and R. O. Kapp. Electric protective arrangements. (25/8/28.)
21 829 C. R. Cook. Electric contacts.
21 787 Electric Construction Co., Ltd. Circuit breakers.
21 885 Electrical Research Products, Inc. Signalling cables. (31/7/28, U.S.)
21 837 Electrolux, Ltd. Refrigerator cabinets. (21/7/28, Sweden.)
21 838 Electrolux, Ltd. Refrigerator cabinets. (23/7/28, U.S.)
21 860 Electrolux, Ltd. (Inventia Patenverwertungs Ges.) Vacuum cleaners.
21 824 General Electric Co., Ltd. Loud speakers, etc.
21 900 W. H. F. Griffiths and H. W. Sullivan, Ltd. Electrical bridge systems.
21 830 L. P. Haussauer. Electric water heaters.
21 853 Hermsdorf-Schomburg Isolatoren Ges. High tension condensers. (3/8/28, Germany.)
21 895 Igranic Electric Co., Ltd., and S. R. Wright. Contactor switches.
21 882 International General Electric Co., Inc. Power installations. (16/7/28, Germany.)
21 844 Kolster-Brandes, Ltd. Power transmission systems. (16/7/28, U.S.)
21 914 J. Kral. Automatic electrical cut-out and safety fuse. (21/6/29, Czecho-Slovakia.)
21 795 F. W. Lanchester. Dynamo-electric machines.
21 808 R. Lomax and A. Mugeli. Electric lamp holders.
21 801 C. G. Maisey, A. E. Read, and Walsall Hardware Manufacturing Co., Ltd. Electric junction boxes, etc.
21 787 W. N. Ringrose. Circuit breakers.
21 915 J. K. M. Roberts. Phototelegraphy, radio-kinematography, etc.
21 796 G. F. A. Stone. Electric wall sockets, etc.
21 913 Telefunken Ges fur Drahtlose Telegraphie. Screened grid valves (20/7/28, Germany.)

July 17th.

21 935 H. Ahlbach. Electric lighting system.
22 004 J. L. Baird and Television, Ltd. Synchronising means for television apparatus, etc.
22 005 C. R. Bates. Electric signalling.
21 982 British Thomson-Houston Co., Ltd., and A. J. Johnston. Variable resistances.
21 971 R. J. Wainwright-Brown. Battery eliminators for wireless apparatus.
21 956 Canning and Co., Ltd., and G. A. Pope. Electroplating apparatus.
21 965 A. E. Chapman. Electric discharge vessels and mountings.
21 957 W. H. Egginton and J. Lucas, Ltd. Vehicle electric lamps.
21 969 E. Ellwood. Electric lampholder adaptors.
21 985 H. E. Humphries and Siemens Bros. and Co., Ltd. Electric selectors.
22 017 J. Karpati. Effecting chemical reactions in the presence of materials activated by electrical energy.
22 001 L. Levy. Television and telekinematography. (18/7/28, France.)
21 994 L. Mandelstam and N. Papalexi. Modulation of high frequency currents of thermionic tube generators.
21 954 T. N. Riley and Standard Telephones and Cables, Ltd. Loaded signalling cables.

COMING EVENTS.

Friday, October 18th (to-day).

North-East Coast Institution of Engineers and Shipbuilders.—Bolbec Hall, Newcastle-upon-Tyne. Presidential address by Mr. L. E. Smith.

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. General meeting. Presidential address by Mr. D. Adamson. 6 *p.m.*

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Personal Salesmanship in the Electrical Industry." Speaker, Miss G. Burlton. 7.30 *p.m.*

Saturday, October 19th.

Electrical Power Engineers' Association (Southern Division).—Hotel Cecil, Strand, London. Eleventh Annual Dinner. 5.30 for 6 *p.m.*

Monday, October 21st.

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Inaugural address by the chairman, Mr. B. A. Robinson. 7 *p.m.*

Institution of Electrical Engineers (Mersey and North Wales-Liverpool Centre).—Lecture Theatre of the Laboratories of Applied Electricity, University, Brownlow Street. Chairman's address by Prof. E. W. Marchant on "Science and Electrical Engineering." 7 *p.m.*

E.L.M.A. Lighting Service Bureau.—15, Savoy Street, Strand, London. Twentieth Illumination Design Course. Lecture by Mr. L. E. Buckell on "The Lamp of To-day." 7 *p.m.*

Tuesday, October 22nd

Electrical Power Engineers' Association (London Technical Group).—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Discussion on "Modern Developments in the Electric Lighting of Public Thoroughfares."

Wednesday, October 23rd.

Electrical Association for Women.—46, Kensington Court, London. Social Sub-Committee "At Home." Evening social, with films of electrical interest. 7 *p.m.*

Thursday, October 24th.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Inaugural address by Col. Sir T. F. Purves. 6 *p.m.*

Institution of Electrical Engineers (Western Centre).—South Wales Institute, Cardiff. Reproduction of Col. Sir T. F. Purves' address to the London Centre. 6 *p.m.*

Friday, October 25th.

Institution of Railway Signal Engineers.—Criterion Restaurant, London. Annual dinner.

Birmingham Electric Club.—Grand Hotel, Colmore Row, Birmingham. Lecture by Mr. T. A. Windibank on "Motor Users and the Frequency Change." 7 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W. Paper by Mr. H. Bruff on "Electric Welding as Applied to Bridges and other Structures on the L. and N.E. Railway." 7.30 *p.m.*

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THE ELECTRICIAN

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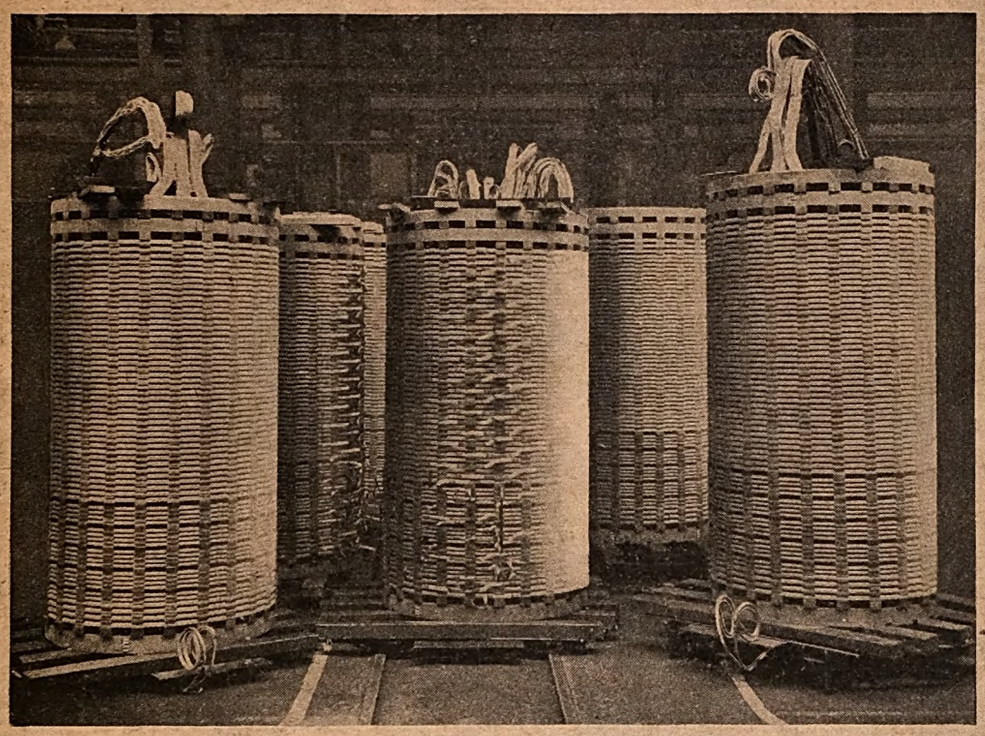

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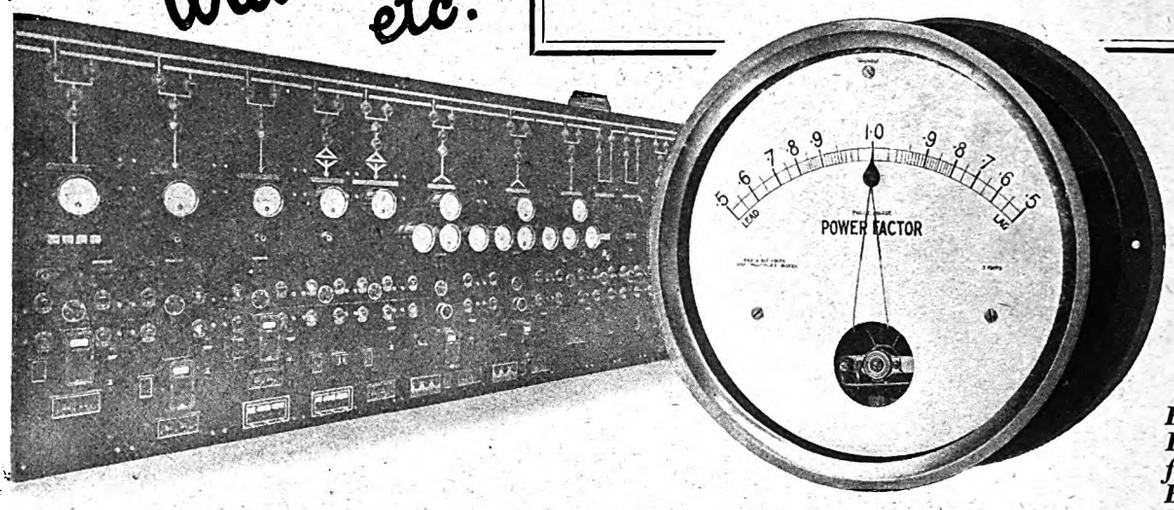

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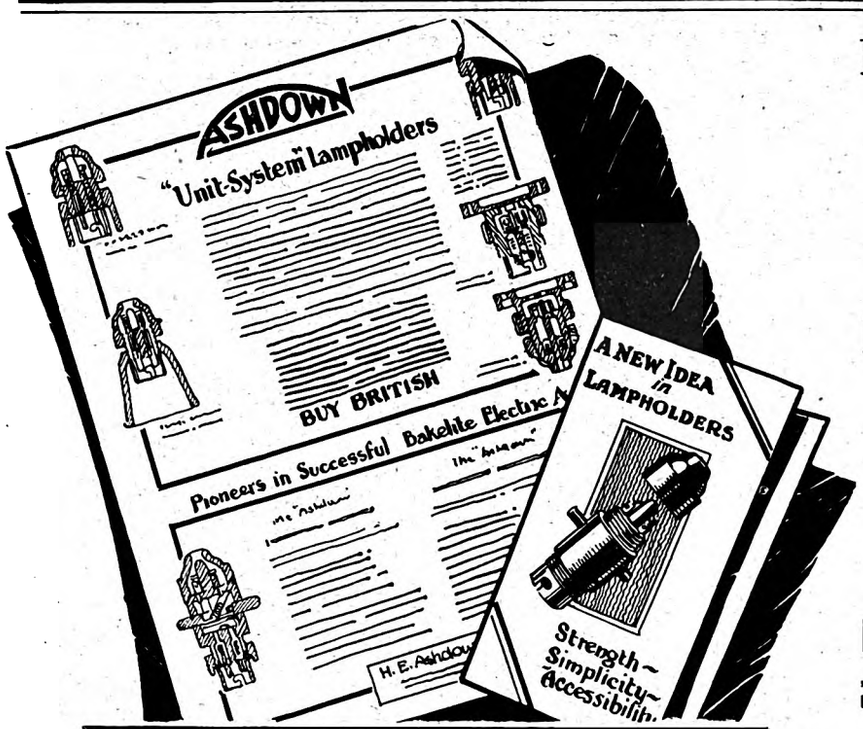

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Current Topics.

Light's Golden Jubilee.

IF most of the world does not now firmly believe that EDISON invented the first practical incandescent electric lamp it is not the fault of those responsible for the organisation of the "Light's Golden Jubilee" celebrations, which culminated on Monday in broadcasts, newspaper articles, and special public illumination in many cities in America and some other countries. It is true that the world's indebtedness to SWAN was duly emphasised by Sir OLIVER LODGE in his talk from 2LO last Friday, but, in view of the ambitious nature of the American propaganda—the scope of which was known over here several months ago—it is disappointing that the British electrical industry failed to mark the occasion in a more spectacular manner. The trouble in cases of this kind seems to be that the electrical industry, though it possesses probably more trade and technical associations and societies than any other, has no body which can act for all in a matter which affects the prestige of the British industry. It would have been easy for such a body to have organised a SWAN celebration to coincide with the Edison festivities on October 21st, and wide newspaper publicity would have been secured. Those who do not understand our undue modesty in matters of publicity may well be pardoned for assuming that the British claim to the invention of the incandescent lamp is without foundation.

A Telephone Surprise.

THE surprise item broadcast from London last Friday immediately after Sir OLIVER LODGE'S talk on "The Beginnings of Electric Lighting," was for the most part excellent. It celebrated the Telephone Jubilee, and took the form of a talk by the Controller of the London Telephone Service, a few words by a London operator, and, finally, of relays from two exchanges. The best part of the transmission was the relay of the London Trunk Exchange. First one heard the operators at the switchboards devoted to incoming British calls. Then the scene was changed to the European section, and there was much conversation in German and other tongues less easy to recognise. But the incoming calls were intelligible—"is that Leeds 44621? Your Milan call."—"Hullo, Madrid wants you," and so on. Lastly, the microphone installed in the American service section was cut in, so that listeners heard not only calls between the United States and England, but understood something also of London's position as master switch in the Europe-America circuit. One heard, "Hullo, New York," and some instructions, followed by "Hullo, Stockholm," and so on. It was a remarkable example of how absorbing an outside relay can often be. There might well be more of such broadcasts, which combine educational value with entertainment to an unusual degree.

Electrical Salesmanship.

THE criticism that the London E.D.A. Salesmanship Conferences do not pay sufficient attention to the selling side did not apply to the first of the 1929 meetings, over which Sir ANDREW DUNCAN presided last Friday. In fact, the trend of Miss BURLTON'S talk was so much in the opposite direction as to draw protests from some of the technically-minded audience. Her description of the dullness and inertia of some of the electrical sales staffs was too near the truth to be very palatable, but the fact remains that electrical showrooms do exist in which the features she noted are readily noticeable, while instances of really adequate treatment by people who are obviously out to help the customer are sufficiently rare to linger long in the memory. Blame for this state of affairs must mainly fall on the chief engineers and managers who still regard selling as something that is undignified and slightly improper,

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and that if it is to be indulged in at all, it can be accomplished by cheap, untrained labour which is too brainless or uninformed to perform a more technical task. As Miss HASLETT very rightly pointed out in the discussion, there is a serious lack in the industry of proper facilities for the training of sales staffs. But it is no use training such people unless provision is also made for employing them at salaries and under conditions that will attract and retain their services and interest.

A Capital Appeal.

WE do not apologise for a further reference to the urgency of the need of the Electrical Trades' Benevolent Institution for the wherewithal to carry on its very necessary work. On the contrary we desire to direct the special attention of all readers to the appeal which Mr. HOWARD MARRYAT makes on a later page of this issue. As this appeal points out, the small annual subscriptions to the fund only just meet the immediate claims for temporary relief. The growing number of cases of permanent disablement for which pensions are required cannot possibly be provided for while the capital fund stands at the pitifully inadequate figure of £37 000. The minimum sum necessary to permit adequate pension provision being made is £50 000. If only ten people will qualify for the vacant vice-presidencies of the Institution, fifty for life governorships, and three hundred for life membership, the necessary capital will be secured. We hope that readers who can afford to contribute under one of these headings will devote the money to this worthy purpose. At the same time, the rank and file should bear in mind that as every little helps, the comparatively unimportant sum representing one year's subscription is far more useful to the E.T.B.I. than regrets that one does not possess the larger capital sums now asked for.

Contractors' Problems.

As this week's correspondence columns show, there is no lack of interest in the major problems with which the electrical installation contractor is faced and which were so effectively set out by Mr. T. C. GILBERT in last week's issue of THE ELECTRICIAN. We have, in fact, received so many letters dealing with the associated questions of registration and wiring rules, that we are only able this week to print a selection. This must not be construed as a sign of intention to discourage full discussion of the matters at issue. On the contrary, so anxious are we to promote a crystallisation of thought on common ground that special arrangements will be made in next week's ELECTRICIAN to accommodate the views of all who have any constructive suggestions to offer. We propose to reserve comment on the letters until a later date, but it may be pointed out that the whole of the letters so far received are from electrical contractors. The views of men in other branches of the industry are particularly desired.

Progress in Illumination.

THE opening meeting of the Illuminating Engineering Society usually affords an opportunity of reviewing progress in the lighting field, and the report presented last Tuesday was exceptionally complete. Apart from the Society's own meetings and discussions there have been other gatherings at which lighting has played an important part—notably the recent annual conference of the Association of Public Lighting Engineers at Bournemouth. Other events have been the International Lighthouse Conference and the informal Aviation Lighting Conference, while at the annual gatherings of the I.M.E.A. and the E.C.A. the opportunity was taken to arrange special demonstrations of floodlighting. Reference is also made to the specifications and reports issued by various committees in which members of the Illuminating Engineering Society take part, such as those connected with the Illumination Research Committee, the National Illumination Committee, and the British Engineering Standards Association. In other countries illuminating engineering seems to be developing rapidly, and the International Illumination Congress to be held in this country in 1931, for which preparations have already been commenced, should be an event of outstanding importance. A continental development of special interest has been the organisation of "festivals of light" in many cities. No doubt before long we shall see something similar initiated in this country.

Radio Price-Cutting.

ALTHOUGH the price-cutting orgy in the radio retailing trade shows some signs of abating, the position to-day is still capable of much improvement. The people who carry on this sorry business are nothing if not bold, and the attention which they draw to their subversive methods may be said to have some value in indicating the source of the trouble. The latest example of price-cutting ingenuity, discovered in a London suburban shop selling electrical and radio appliances by our contemporary, "The Hardware Trade Journal," took the form of a window card bearing the notice that, "Owing to differences with various manufacturers regarding price cutting, we are obliged to leave several articles unpriced. Enquire within for cut prices." For sheer effrontery this example must be hard to beat. There certainly seems to be a *prima facie* case here for investigation by the appropriate trade organisations.

Railway Electrification.

CONSIDERABLE domestic orders for railway electrification work are definitely in prospect, following the welcome decision of the Southern Railway to electrify several additional portions of its system—notably the line from Purley to Brighton—and the proposed extension of the London "Underground" railways north of Finsbury Park. There is a tendency in some quarters to regard the Brighton scheme as a main line electrification, whereas actually the traffic density—almost exclusively passenger—and frequency of the service bring it well within the conditions of suburban transit. Apart from the advantages which this scheme will bring, the Southern Co.'s latest move may spur the other railways to greater interest in electrification possibilities.

A Dinner Need.

Now that the electrical dinner season has again arrived, electrical men and women are preparing, with what fortitude they can assume, to make the best of the business of coping with the fumes which the flashlight photographers produce at the *hors d'œuvre* stage. During sundry fume absorptions we have made diligent inquiries which have disclosed the awful news that one thing that electricity cannot do is to replace the explosive and potentially dangerous flash gun. We could never understand why this fairly simple service could not be performed electrically, and we would suggest that such an invention would bring heartfelt gratitude, if nothing else, to its designer.

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THE OVERHEAD LINES ASSOCIATION.

New President and Officers Elected at Annual Meeting—Mr. Fennell's Review of the Year's Work—Value of a Post Office Concession.

THE annual general meeting of the Overhead Lines Association was held at the Institution of Electrical Engineers, on Wednesday, October 16th.

Notice was given that the Council proposed to revise and simplify the Articles of Association. The work of revision is in the hands of a sub-committee of the Council, and the revised articles will be submitted to members shortly.

The new President for the year 1929–30 is Mr. Theodore Stevens, who has previously served the Association as its honorary secretary. The meeting elected Major Theodore Rich as honorary secretary in his stead.

Members elected to fill vacancies on the Council, due to retirements by rotation, were Mr. R. Borlase Matthews (Past President), Mr. W. P. Gauvain, Mr. A. L. Stanton, Mr. F. Christy, and Mr. C. Wade (associate member). Mr. Swarbrick and Mr. Napier Prentice were elected honorary auditors. It is also the desire to elect vice-presidents. The Articles of Association do not at present provide for this, but Mr. W. C. Bexon and Mr. B. G. Drummond have been appointed, and will be elected as vice-presidents when the revised articles are approved.

The Association's Work.

Mr. W. FENNELL (the retiring President) made a brief statement on the work of the Association during the past year. As to general policy, he said that so far as the President might control the policy of an Association having an active Council, as this Association had, he had tried during this second year of the Association's work to avoid any agitation for relaxation of regulations. The amended E. C. Regulations for Overhead Lines were issued in the Spring of 1928, and it was only fair to work them for at least twelve months before dealing with them. A discussion of the effect of the amended regulations was worthy of an evening to itself.

The Post Office, a few months ago, had given way on the second-comer claim, to which end he had devoted much of his time during the last five years. The potential value of this concession was very great, because a great injustice had been removed, and expense had been obviated. The effect of this upon costs had needed time for demonstration, and he was pleased to say that it had been good.

Stressing the importance of greater freedom for electricity supply engineers in regulations relating to overhead work, he said it had been recognised for many years that the average electricity supply engineer was as expert in underground cable work as the average assistant to the Board of Trade Electrical Inspector, and the Inspectors left it at that and did not multiply detail. They had laid down plain principles many years ago, which were still unaltered and unadorned by complex procedure and unpublished exceptions and additions. Any suggestion to require plans to be furnished, forms to be filled in, and consents to be obtained, was unthinkable.

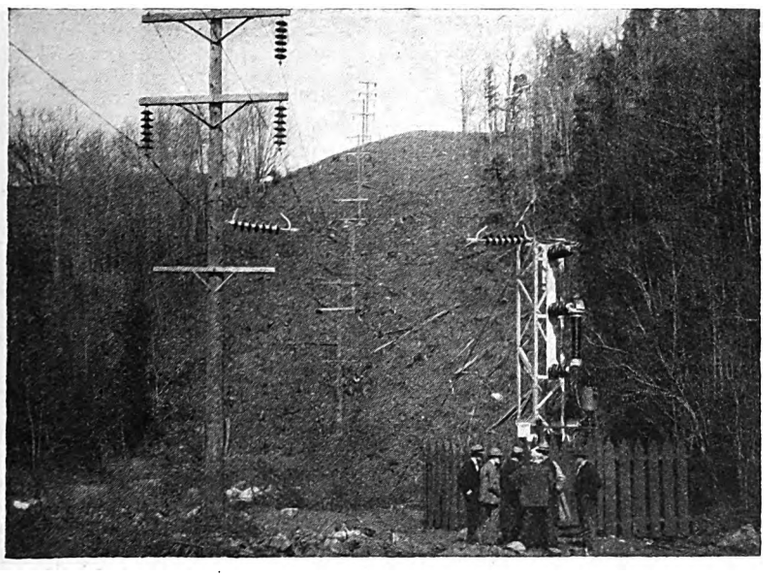
Because engineers felt full responsibility for results, they were careful and thoughtful. As a result, the art of cable, transformer and switchgear manufacture had advanced unhindered, until to-day, without any detailed regulation, they had evolved safe cable and apparatus far in advance of what they would have achieved if the details had been laid down 30 or even 10 years ago by officials, and (as in the case of overhead work) altered painfully and slowly as daring law-breakers had tried new methods and had agitated successfully to have them allowed. His (the President's) aim had been that engineers should achieve that standard of freedom and full responsibility in overhead work which they had always had in underground work; to achieve that they must show that they were as expert in overhead work as in underground work.

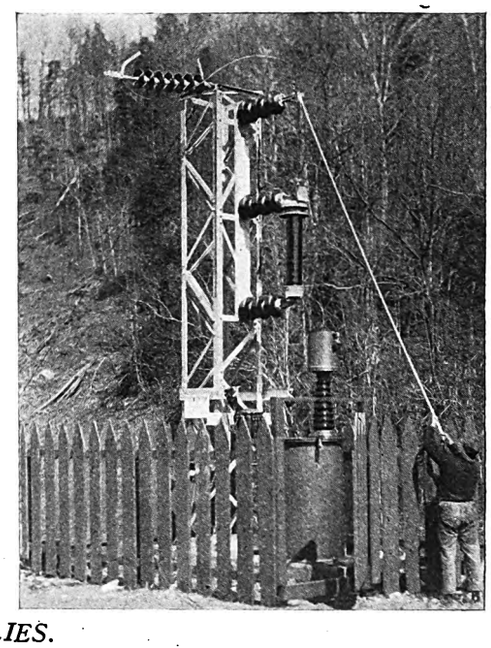
With the same object in view he had endeavoured, in conjunction with the Council, to secure a set of papers which would enable the members of the Association to obtain and to demonstrate their knowledge and caution in overhead construction work. In other words, the session had been a technical and not a political one. The visit to Mid-Cheshire in the summer was designed to exhibit a great variety of construction work.

He had also helped to initiate and to edit a monthly abstract of all papers and proceedings of the Association; this had been appreciated, especially by the more distant members.

The Council had been considering certain questions of standardisation, and last, but not least, the question of wayleaves. The railway crossing difficulty had become acute, and the Association had been in close touch with the railway companies on this matter.

The desirability of incorporating the Association had been considered, but the funds would not allow of both this and the continuation of the monthly abstracts, and the latter had had the preference. The matter would be further considered





TAPPING RURAL SUPPLIES.

IN view of the importance of tapping our main transmission lines for comparatively small rural loads, the above pictures of a new rural area sub-station developed in the U.S.A. are of interest. The picture on the left gives a general view of one of those small-capacity sub-stations tapping a 66 000 V transmission line between the line and earthed neutral to furnish a 50 kVA, 2 300 V single-phase service. The other picture is a close-up view of the same station showing the transformer.

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The membership of the Association had increased considerably during the past year. Indicating the Association's work on bodies with allied interests, he said that it was represented on the Overhead Lines and the Overhead Lines Materials Committees of the B.E.S.A., and on the British Electrical and Allied Industries Research Association Ferro-Concrete Poles Committee.

Wayleave Agreements.

Following the annual general meeting, an ordinary general meeting was held, at which the necessity for a standard wayleave agreement form, and its character, was discussed.

The PRESIDENT (Mr. Stevens) said the Association had published its view in this connection, and had evolved the simplest wayleave form ever produced. Its view was that the ideal form must essentially be standard, simple and short. He emphasised that there should be no blanks to be filled in (except for names and the schedule), and that such a form should render unnecessary the intervention of solicitors.

Mr. R. BORLASE MATTHEWS (Past President) laid stress upon the well-known psychological fact that if people saw an agreement form in print they were prepared to accept the conditions laid down in it as being fair and reasonable, and to sign it. He estimated that between 90 and 95 per cent. of the people asked to sign it would do so. It was also essential to prepare a scale of payments fair to all parties, because the ordinary man did not know what to ask for a wayleave, whereas if he were shown a scale of payments which was recognised throughout the country he would accept it as being fair. No agreement would be acceptable if it were not fair to both sides.. One of the grievances among farmers was that when they were asked to give permission for transmission lines to cross their land, and when they in turn asked for a supply of electricity from those lines, it was sometimes refused, because the lines were high-tension lines. As a result, there was a movement among the farmers' organisations to recommend farmers to say that if the electricity supply undertakings would not give them a supply they would not allow the lines to cross their lands. To the man in the street, of course, there was something in that argument, and Mr. Matthews considered that undertakings whose lines crossed land under those conditions should pay more for their poles than they paid for poles carrying lines which were giving service in the district. He added that the high-tension lines carried far more current than the distribution lines, and, therefore, were able to bear higher charges.

Mr. FENNELL, who emphasised that wayleave agreements should be as short as possible, said he had published a standard wayleave agreement form for his own area, and it had been used with great success. He had found that the printing of such a form, including the printing of the amount to be charged, had enabled him to avoid arguments, and it could almost be said that in 99 cases out of 100 the landowners—for he ignored the tenants, inasmuch as they had not the power to make such an agreement—signed the agreements. He was prepared to send a copy to any who were interested. The form gave three weeks' notice, under the 1919 Electricity Supply Act, that it was proposed to erect a line, and the form was accompanied by a small plan (of which a carbon copy was kept). The fee was one shilling per pole or leg, and it was made clear that the electricity supply company accepted all risks. He had a line covering a distance of five miles on one estate, and the agreement was made on the form mentioned. There had been no squabbles; and the company was careful to pay up. The payment of solicitors' fees was unthinkable, and he had not paid one. One or two landowners had tried to do the business through solicitors, but as soon as they had realised the costs involved they had carried out the business direct.

The adoption of a standard form which was long and involved would render the position worse than it was to-day in the absence of a standard form, because small landowners would not sign it. All that was necessary was to state the names of those between whom the agreement was made, to describe the conditions and the premises, add a small plan, indicate the charges, and state that the electricity authority accepted all risk. As soon as an attempt was made to define the risks, landlords began to conjure up what the risks were, and became frightened. Further, if one had a standard form, and worked carefully, local opinion could be formed against a man who at first refused to sign until he got a higher fee; he realised quickly that it was no use standing out for a fee twice as high as that accepted by his neighbours.

Mr. MATTHEWS (U.S.A.), who was asked for information as to the practice in America, said there was a body of commissioners in practically every State, to whom the property owners or power companies could appeal. Usually, he believed, the power companies gave the commissioners ten days' notice that they wanted to erect a certain line, and at the same time they gave notice to the property owners concerned, and if no objections were raised by the time the notice expired, the power companies carried out the work. If a property owner objected, the difficulties were settled by the commissioners in a short time. If at any time damages were proved, arbitrators were appointed to assess them.

Miss PARTRIDGE (Electrical Association for Women) agreed that a standard form, which was simple and short, was essential, and urged the importance of ensuring that it should have the approval of a body such as the National Farmers' Union or some other such body which would carry weight with the landowners and farmers. It would also be a help if the approval of some law society could also be obtained. She was hoping also that the rural branches of the Electrical Association for Women would be able to help by guiding public opinion with regard to wayleaves for overhead lines, because it was of great advantage to supply authorities to have a favourable public opinion in districts where overhead lines were to be used.

Mr. BARTHOLOMEW (G.P.O.) pointed out that it was much more simple to proceed by notice, stating that, unless objections were raised, it was the intention to erect a line, than to obtain definite consent, because many people would not take the trouble to object when notice of the intention to do the work was given, neither would they take the trouble to give consent where consent was necessary.

Mr. F. CHRISTY supported the suggestion that the Association should get into touch with the National Farmers' Union and the Landowners' Association, because those two bodies were considering very closely the question of wayleave agreements generally. In two cases—one in Devonshire and one in Somerset—overhead lines a good many miles long were to be erected, and wayleaves were being sought; about half the people concerned had signed the agreements, but about 30 per cent. had stated that, although they saw no particular objection to granting the wayleaves, the Farmers' Union was looking into the matter, and they would sign nothing until the Union had made a statement.

Mr. FENNELL also supported the suggestion that the Association should get into touch with the bodies mentioned, and added that the Landowners' Society had produced a form which was shorter than that of the Electricity Commissioners, and more reasonable in respect of most of the details.

The PRESIDENT said there had been correspondence with the Land Agents' Society with regard to attending a meeting of the Association, and a representative of the National Farmers' Union had already attended a meeting of the Association.

Assistance from the E.A.W.

Mr. F. SWARBRICK, emphasising the great desirability of adopting a simple form, said he had followed the example of Mr. Fennell. Also, he had received considerable assistance from the local branches of the Electrical Association for Women, and was quite sure that that Association would be a source of strength in dealing with the problem of wayleaves.

Mr. J. SWAN said that for 25 years he had been erecting lines in Buckinghamshire, and until two years ago had used a very simple form of agreement, by which the persons concerned consented to the erection of the poles, the positions of which were indicated by a sketch; it was also stated that the supply company would make good all damage, and would pay one shilling per annum. That shilling covered any number of poles on one person's ground. More recently, however, high-tension lines were being erected, and it had been found that the very short agreement which had been so suitable hitherto was hardly suitable for the new circumstances. Consequently, a new form of agreement was prepared, but it contained very few clauses; it was an agreement with the landowner in each case that a fee of a shilling per pole and sixpence per stay be paid to the tenants of the lands on which the poles were erected, because it was felt that the tenants were the people who were affected by the erection of the poles. That agreement had been very successful.

Mr. C. F. MOUNSDON, supporting the suggestion that a

(*Continued on page* 488.)

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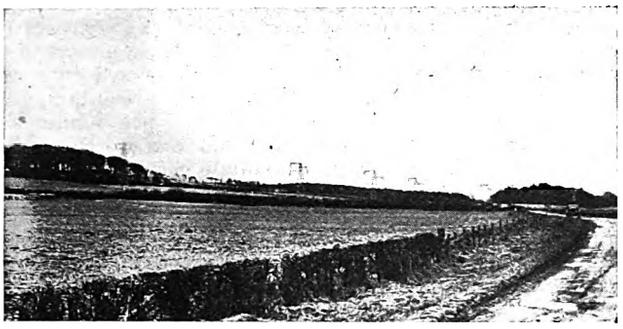

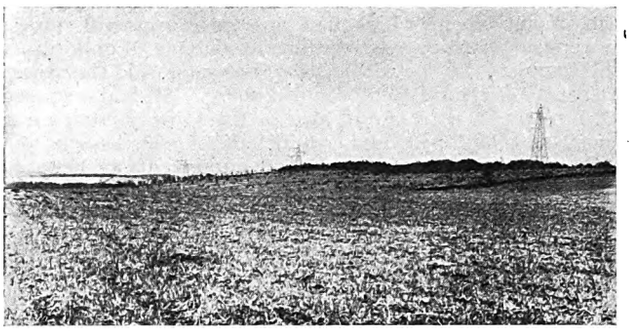

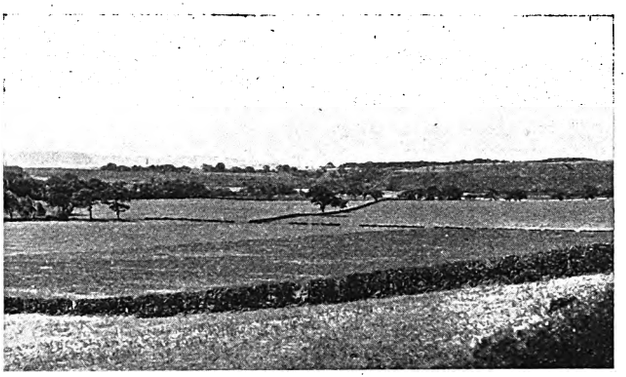

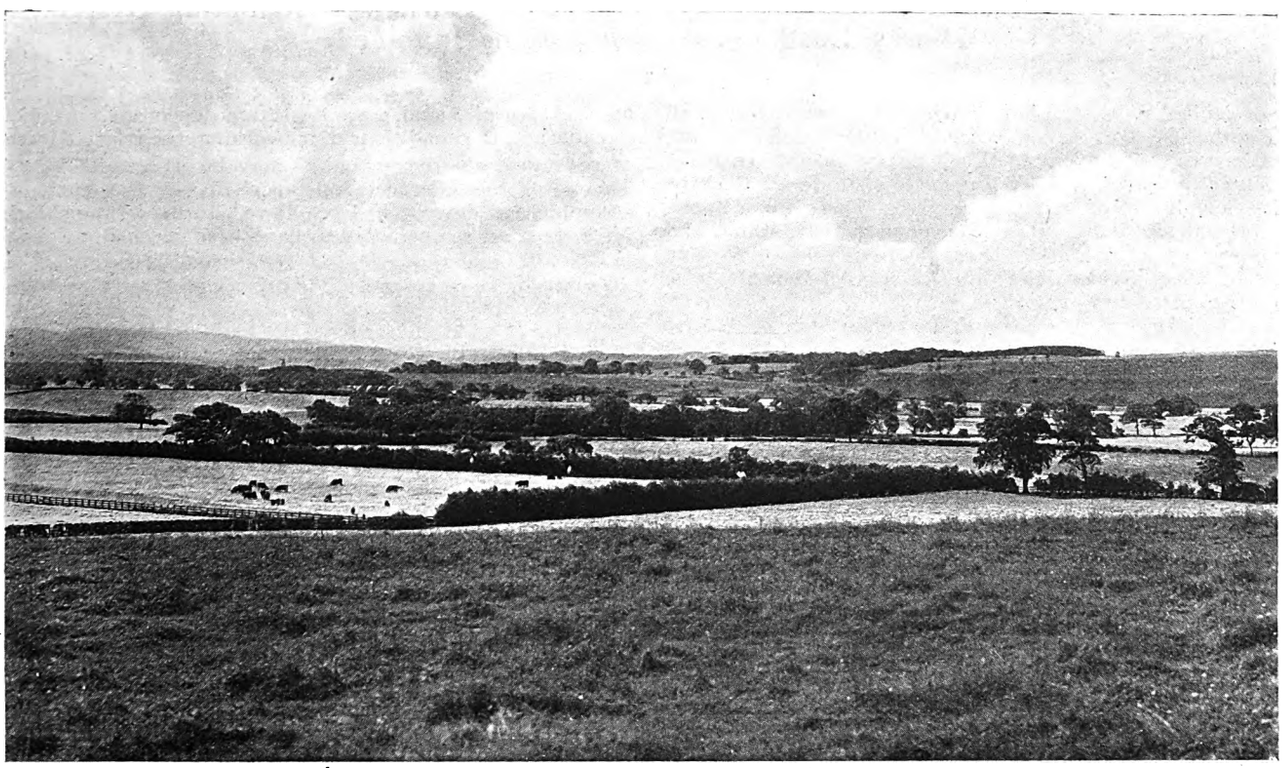

OVERHEAD LINES AND THE "GRID."

IN spite of the Minister of Transport's assent to the construction of the Central Board's overhead lines over the Sussex Downs, further efforts are being made to hinder progress, due to the mistaken idea that such lines will disfigure the countryside. The series of pictures printed above clearly shows that these objections are groundless. The pictures all show a portion of the single circuit, 132 000 V transmission line on the Yoker-Greenock route, and the photographs were taken with the camera at varying distances from the line. Reading from left to right, the two topmost pictures were taken at approximately 200 and 350 yd. distances, the next two at ½ mile and just over 1 mile, while the larger picture was taken at a point 1½ miles from the nearest part of the line. Except in the first two pictures, it is extremely difficult to locate the towers without the assistance of a microscope.

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standard form should be evolved with the help of the Landowners' Association and the National Farmers' Union, expressed the view that it would be futile to attempt to evolve a form of agreement which had not their approval, unless there were sufficient power to enforce it against all opposition.

Mr. FENNELL, dealing with railway crossings, said that these were a source of great difficulty and expense. He had managed to get into touch with one or two of the railway companies, however, and had proposed, on behalf of the Association, that there should be one wayleave agreement as between each railway company and each electricity supply authority. for which agreement a supply authority would not mind paying a fee of, say, two guineas (because it would not be recurring); then the supply authority would pay five or ten shillings for each crossing of that railway company's lines to cover the cost of making the plans, and that a general schedule should be fixed for crossing as was fixed for crossing other people's lands.

Major THEODORE RICH (hon. secretary) said that the cost of crossing roads was often greater than it need be. In his local paper he had noticed reports of violent opposition to overhead lines, and, on the other hand, complaints with regard to the cost of electricity. It would be a great help if the public could be made to realise that increased costs of providing lines resulted in increased costs of electricity, and that they could not have it both ways.

Mr. NAPIER PRENTICE said that he had electrified eight districts in East Anglia, and had not paid for wayleaves. He had a simple wayleave agreement form in which the supply company acknowledged and expressed thanks for the wayleaves, undertook to make good any damage, and to remove the wires if required, on three months' notice. He had never been asked to remove wires except in cases where houses were being built on the routes, or for some other really good reason. There were local advisory committees, consisting of local people who were interested in the development of the districts electrically, and if a landowner objected to a wayleave unreasonably the committee's influence was brought to bear upon him. Why pay even sixpence per annum as a rental? The electrification of the land was worth more to the farmer than was any rental he would get.

The I.M.E.A. Form.

Mr. W. E. GROVES (mains engineer, Birmingham) said that the I.M.E.A. form had been used with a certain amount of success at Birmingham. He suggested, with a view to avoiding delay, that the signing of agreements should be left in the hands of wayleave officers. With regard to the notice to be given for the removal of lines from land which was required for development, he suggested that development should be defined as "building development," in order to provide against the giving of notice for insufficient reasons. The variation of payments from year to year, in accordance with the use which was being made of the ground in which poles were erected, he did not regard as practicable, because it would be a stupendous task to watch the variation of the class of cultivation or the state of the ground each year.

Mr. FENNELL said that one of the grid lines in the north-western area had been erected over a row of houses, and he understood that the rental was similar to that paid elsewhere. Therefore, the erection of a building did not necessarily involve removal of the line.

THE MOST EFFICIENT SIZE OF CABLE CONDUCTOR.

Some Important Considerations in Designing a Low Tension Distributing System for Heavy Loads—The Calculations Involved.

By C. G. WATSON, M.I.E.E.

IN designing a low-tension distributing system for small loads, the size of cable conductor is dictated largely by considerations of voltage drop. When heavy loads have to be distributed, however, it is often possible so to design that the most economic size of conductor is used. Therefore, a knowledge of that size is important to economic distribution, and an attempt is made herein to determine it.

The problem divides itself into three well-defined steps. They are: the determination of

1. The effective resistance of the conductor;
2. The economic current; and
3. The most efficient size.

Having outlined the method in the first three sections, I shall proceed to determine the most efficient size of conductor in four-core armoured cables laid direct in the ground for

4. One feeder cable;
5. Two feeders laid together;
6. One distributor.

Then, in triple concentric armoured cables under the like conditions in sections 7, 8 and 9.

1. *The effective resistance of a cable conductor:*

Let ρ = specific resistance of conductor in ohms at 15°C. in units of one thousand yards and one square inch.

And A = cross-sectional area of conductor in square inches.

Thus, the passive resistance of any conductor in ohms per thousand yards at 15°C.

$$= \rho A^{-1} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad 1$$

Skin Effect.

But, owing to the skin effect, the effective resistance of a large conductor is materially greater than the result of the above calculation would imply. In fact, the relative increase of resistance from this cause may be expressed, within the limits of cable sizes, approximately as sA^2, where s is a constant depending on periodicity and position of conductor. Therefore, the effective resistance at 15°C. per thousand yards of conductor

$$= \rho A^{-1} (1 + sA^2) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad 2$$

Further, let the relative increase of resistance due to rise of temperature = T. Then, and as the constant current necessary to produce that increase may be expressed approximately as δA^{ε}, where δ and ε are constants depending on the class of cable and the conditions of its working, the relative increase of resistance at any current C may be written $TC^2 (\delta A^{\varepsilon})^{-2}$. Therefore, the effective resistance R_c, at the current C, assuming that current to have flowed during a time sufficient for a constant temperature to have been reached,

$$= \rho A^{-1} (1 + sA^2) (1 + TC^2 \delta^{-2} A^{-2\varepsilon}) \quad . \quad . \quad . \quad 3$$

Or, putting $\rho s = k_a$, $\rho T \delta^{-2} = k_b$, and $\rho S T \delta^{-2} = k_c$,

$$R_c = \rho A^{-1} + K_a A + K_b C^2 A^{-(2\varepsilon+1)} + K_c C^2 A^{-(2\varepsilon-1)} \quad 4$$

That result applies to a conductor carrying the current C throughout its length, as a feeder would. But in the case of a conductor in which the current has a value C at one end, and evenly decreases to zero at the other end, the relative increase of resistance due to rise of temperature is one-third of what it is in the first case. Therefore, in a distributor, the effective resistance of a conductor

$$= \rho A^{-1} (1 + sA^2)(1 - 3^{-1} TC^2 \delta^{-2} A^{-2\varepsilon}) \quad . \quad . \quad 5$$

Or, using equation 4, k_b and k_c have one-third of the values they have in the case of a feeder.

2. *The economic current in a cable conductor:*

The total yearly cost of a main, per one thousand yards,

$$= \rho(\alpha + n\beta A) + nC^2 R_c K + G \quad . \quad . \quad . \quad . \quad 6$$

Where p = capital charges per year for interest and depreciation in terms of unity.

α = cost of excavation and reinstatement of trench plus constant part of cable and laying cost in pounds per thousand yards.

β = a cost constant depending on class of cable in pounds per thousand yards.

n = effective number of conductors in cable.

K = cost of one watt of loss per working year in pounds $= fm\ c_m\ 8760 \times 10^{-3}$, fm being the mains loss factor, and c_m the cost per unit of loss.

And G = value of losses in sheath, armour, and dielectric, all hereinafter assumed to be so slight as to be negligible.

It is to be noted that I make no allowance for the variation of conductor resistance throughout the year. I do so because further factors would only complicate without adding greatly to accuracy.

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Substituting in formula 6 the value of R_c from 4, the yearly cost per thousand yards of main becomes

$$p\alpha+np\beta A+nKC^2\{(\rho A^{-1}+K_a A+K_b C^2 A^{-(2\varepsilon+1)}+ K_c C^2 A^{-(2\varepsilon-1)})\}$$

And, differentiating with respect to A and equating to zero, least cost is when

$$np\beta-nKC^2\rho A^{-2}+nKK_aC^2-(2\varepsilon+1)\,nKK_bC^4A^{-(2\varepsilon+2)} -(2\varepsilon-1)nKK_cC^4A^{-2\varepsilon}=0$$

whence

$$C^4[(2\varepsilon+1)K_bA^{-(2\varepsilon+2)}+(2\varepsilon-1)K_cA^{-2\varepsilon}]+C^2(\rho A^{-2}-K_a)=\rho\beta K^{-1}$$

Put $K_b(2\varepsilon+1)=X$, $K_c(2\varepsilon-1)=\psi$, and $\rho BK^{-1}=V$.

Then, $C^4(xA^{-(2\varepsilon+2)}+\psi A^{-2\varepsilon})+C^2(\rho A^{-2}-K_a)=V$.

Or, putting $XA^{-(2\varepsilon+2)}+\psi A^{-2\varepsilon}=j$,

and $\rho A^{-2}-K_a=l$,

$jC^4+lC^2=V$.

Whence $$C_e=\sqrt{\sqrt{Vj^{-1}+\cdot25l^2j^{-2}}-\cdot5lj^{-1}} \quad . \quad . \quad 7$$

C_e being the economic current at peak load

The immediately preceding result applies to a feeder. For a distributor, the case is somewhat different.

Assuming that the current decreases evenly along the length of the cable, the C^2R loss in a distributor is one-third of what it would be in a feeder with the same current entering. Therefore, the formula for the total yearly cost of a distributor is

$$p(\alpha+n\beta A)+nC^2R_cK3^{-1} \quad . \quad . \quad . \quad . \quad 8$$

R_c in this case being the effective resistance of a distributor.

Whence $$C_e=\sqrt{\sqrt{3vj^{-1}+\cdot25l^2j^{-2}}-\cdot5lj^{-1}} \quad . \quad . \quad 9$$

3. *The most efficient size of cable conductor :*

Again, the total yearly cost per thousand yards of main, omitting G,

$$=p\alpha+np\beta A+nC^2R_cK \quad . \quad . \quad . \quad . \quad 10$$

Therefore, the total yearly cost per ampere at the economic current

$$=(p\alpha+np\beta A+nC_e^2R_cK)C_e^{-1} \quad . \quad . \quad . \quad 11$$

By substituting in 11 the value of R_c from 4, and by substituting in the result the value of C_e from 7, a formula is obtained involving A as the only unknown. By differentiating and resolving, the value of A to give least total cost per ampere may be derived. That is to say, the most efficient size of conductor is obtained.

But the resulting equations are so cumbersome and the work involved in proceeding thus is so laborious, that I leave the solution by this method to one more skilled than I in such matters, and proceed to get the result aimed at in another way. I do this all the more readily because figures will be obtained which will be useful for other purposes. What I do, therefore, is to give practical values to the various constants and work out the cost for each size of conductor. Then least cost is found by inspection.

4. *The most efficient size of conductor in low-tension four-core armoured cables laid singly direct in the ground and used as feeder :*

The values I assume for the constants are :

ρ $=0\cdot024$.
s $=0\cdot36$. (at 50 ~)
T $=0\cdot2$.
δ $=770$. } —These two values follow from the
ε $=0\cdot564$. } figures given in Melsom and Booth's paper in Vol. 61 of "Journal of I.E.E."
p $=0\cdot08$.
n $=3$.
β $=1\,500$.
K $=0\cdot00714$. (This is on the assumption that yearly load factor is ·3, that the cost per kilowatt of maximum demand is £5 a year, and that the cost per unit of energy is ·3d.)

Then, the secondary constants have these values :

K_a $=0\cdot00864$,
K_b $=0\cdot81\times10^{-8}$,
K_c $=0\cdot292\times10^{-8}$,
x $=1\cdot72\times10^{-8}$,
ψ $=0\cdot0373\times10^{-8}$,
V $=16\,800$,

and, as a step towards our aim, the values of C_e, R_c, $C_e^2R_c$, $C_e^2R_cKn$, and $n\rho\beta A$ are given in Table I.

I must here remark that the results of the calculations are given to three significant figures, not because the results of actual practice are expected to conform to the figures to that extent, but in order to show the relative order.

TABLE I.

A	C_e	R_c	$C_e^2R_c$	$C_e^2R_cKn$	$np\beta A$
0·06	49·2	0·408	988	21·2	21·6
0·1	81·2	0·248	1 640	35·1	36·0
0·15	121	0·168	2 450	52·4	54·0
0·2	160	0·128	3 270	70·1	72·0
0·25	198	0·104	4 110	87·9	90·0
0·3	240	0·0887	5 100	109	108
0·4	313	0·0694	6 810	146	144
0·5	389	0·0582	8 800	188	180
0·6	468	0·0511	11 200	239	216
0·8	628	0·0432	17 000	364	288
1·0	797	0·0396	25 200	539	360

Now, giving values to α of 1 000, 500, and 250, and using formulas 10 and 11, we get the results given in Table 2.

TABLE 2.

	α=1 000		α=500		α=250	
A	Total Yearly Cost of Main. £	Cost per ampere per 3 conductors per year per 1 000 yds. £	Total Yearly Cost.	Cost per amp.	Total Yearly Cost.	Cost per amp.
0·06	123	2·50	82·8	1·68	62·8	1·28
0·01	151	1·86	111	1·36	91·1	1·12
0·15	186	1·55	146	1·21	126	1·05
0·2	222	1·39	182	1·14	162	1·02
0·25	258	1·30	218	1·10	198	1·00
0·3	297	1·24	257	1·07	237	**0·989**
0·4	370	1·18	330	**1·05**	310	**0·989**
0·5	448	1·15	408	**1·05**	388	0·998
0·6	535	**1·14**	495	1·06	475	1·02
0·8	732	1·17	692	1·10	672	1·07
1·0	979	1·23	939	1·18	919	1·15

The figures show—what, indeed, an inspection of formula 11 would show—that the cost per ampere (and so the cost per unit sold) depends appreciably on α; and that the most efficient sizes of four-core armoured cable are 0·6, when $\alpha=1\,000$; 0·45, when $\alpha=500$, and 0·35, when $\alpha=250$. It were well, therefore, to split that constant into its components in order to see what other light can be let in; call α_1 the cost of excavation and reinstatement, and α_2 the cost of cable and laying irrespective of conductor size. Now, for the cables in question, α_2 approximates to £250 per thousand yards, and so the figures appearing in the last two columns of Table 2 apply to the case of a cable and its laying when the excavation costs are omitted.

An Interesting Conclusion.

And so we reach the interesting conclusion that, under certain conditions, it may be economical, apart altogether from mechanical considerations which have no place herein, to lay two, or more, cables to work in parallel in one trench (seeing that excavation cost is no greater for two than for one cable). That is to say: when the total current to be carried exceeds a certain amount, two or more cables of the same size, each carrying its proper proportion of the load, should be laid together.

5. *The most efficient size of conductor in four-core armoured cables laid two in one trench and used as feeder.*

There is this point to be remembered: when two or more cables, each of same size, are laid close together, the heating effect is greater than when one cable of similar size is laid alone, current density, of course, being the same in each case. The effect of laying two cables of one size in the one trench and centres 6 in. apart is shown in Table 3. The constants in this case, where they differ from the preceding, are :—

δ $=616$
K_b $=1\cdot26\times10^{-8}$
K_c $=0\cdot455\times10^{-8}$
x $=2\cdot69\times10^{-8}$
ψ $=0\cdot0583\times10^{-8}$

TABLE 3.

A	C_e	R_c	$C_e^2R_c$	$C_e^2R_cKn$	$np\beta A$	Total cost α=250	Cost per amp α=250
0·06	48·7	0·413	978	21·0	21·6	62·6	1·29
0·1	80·0	0·252	1 410	34·5	36·0	90·5	1·13
0·15	118	0·171	2 400	51·4	54·0	125	1·06
0·2	156	0·131	3 190	68·3	72·0	160	1·03
0·25	193	0·107	3 990	85·4	90·0	195	1·01
0·3	232	0·0917	4 930	106	108	234	**1·01**
0·4	302	0·0720	6 560	141	144	305	1·01
0·5	374	0·0607	8 480	182	180	382	1·02
0·6	444	0·0535	10 600	227	216	463	1·04
0·8	591	0·0456	16 000	342	288	650	1·10
1·0	743	0·0421	23 200	497	360	877	1·18

From which it appears that 0·3 is the most efficient conductor

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in this case, although the cost per ampere is higher than in the case of a single cable.

6. *The most efficient size of four-core armoured cable used as distributor :—*

Adopting the value of the primary constants given for a single feeder and allowing for the variation of conductor resistance throughout its length, figures for different sizes of conductors appear in Table 4.

TABLE 4.

A	C_e	R_c	$C_e^2R_c$	$C_e^2R_cKn$	$np\beta A$	Total Cost $\alpha=250$	Cost per amp. $\alpha=250$
0·06	82·2	0·412	2 780	19·9	21·6	61·4	0·747
0·1	134	0·247	4 450	31·8	36·0	89·8	0·655
0·15	196	0·167	6 430	45·9	54·0	120	0·612
0·2	257	0·127	8 370	59·8	72·0	152	0·592
0·25	315	0·103	10 300	73·4	90·0	183	0·582
0·3	377	0·0877	12 400	88·8	108	217	0·576
0·4	486	0·0682	16 100	115	144	279	**0·574**
0·5	595	0·0568	20 100	143	180	343	0·577
0·6	707	0·0502	25 100	179	216	415	0·587
0·8	926	0·0414	35 500	254	288	562	0·607
1·0	1 150	0·0347	45 700	326	360	706	0·616

A 0·4 conductor being the most efficient size of distributor cable, but it is to be noted that the economic current is higher than the safe current.

7. *The most efficient size of Triple Concentric Armoured Cable used as feeder and laid singly direct in ground :—*

The constants, where they differ from those for a 4-core cable, are :—

$s=0·07$ (The mean of the inner and outer conductor values in a concentric cable at 50~. It is based on the assumption that the skin effect in a stranded conductor is equal to that in a solid conductor of equal resistance per unit length ; but it is much to be desired there were experimental confirmation of this.)

$\delta=870$

$\varepsilon=0·590$ and $n=2$

The results appear in Table 5.

TABLE 5.

A	C_e	R_c	$C_e^2R_c$	$C_e^2R_cKn$	$np\beta A$	Total Cost $\alpha=250$	Cost per amp. $\alpha=250$
0·06	49·3	0·407	989	14·1	14·4	48·5	0·984
0·1	81·3	0·247	1 630	23·3	24·0	67·3	0·827
0·15	121	0·166	2 410	34·4	36·0	90·4	0·751
0·2	160	0·126	3 220	46·0	48·0	114	0·713
0·25	198	0·102	3 990	57·0	60·0	137	0·692
0·3	236	0·0854	4 770	68·0	72·0	160	0·678
0·4	311	0·0652	6 310	90·1	96·0	206	0·663
0·5	386	0·0532	7 920	113	120	253	0·656
0·6	458	0·0452	9 450	135	144	299	**0·653**
0·8	604	0·0353	12 900	184	192	396	0·655
1·0	747	0·0295	16 500	235	240	495	0·663
1·25	927	0·0250	21 500	307	300	627	0·677
1·5	1 110	0·0222	27 200	389	360	766	0·695
2·0	1 460	0·0192	40 600	579	480	1 080	0·742

8. *The most efficient size of Triple Concentric Armoured Cable laid two in one trench and used as feeders :—*

In this case, $\delta=696$.

Other constants as in preceding case.

Results in Table 6.

TABLE 6.

A	C_e	R_c	$C_e^2R_c$	$C_e^2R_cKm$	$np\beta$ 1	Total Cost $\alpha=250$	Cost per amp. $\alpha=250$
0·06	48·8	0·411	977	14·0	14·4	48·4	0·991
0·1	80·2	0·250	1 610	23·0	24·0	67·0	0·835
0·15	119	0·169	2 380	33·9	36·0	89·9	0·758
0·2	157	0·129	3 150	44·9	48·0	113	0·722
0·25	194	0·104	3 910	55·9	60·0	136	0·701
0·3	230	0·0878	4 640	66·3	72·0	158	0·688
0·4	304	0·0675	6 210	88·7	96·0	205	0·675
0·5	372	0·0552	7 620	109	120	249	0·671
0·6	441	0·0470	9 150	131	144	295	**0·668**
0·8	577	0·0369	12 300	176	192	388	0·672
1·0	711	0·0310	15 700	224	240	484	0·681
1·25	876	0·0265	20 400	291	300	611	0·697
1·5	1 040	0·0237	25 600	365	360	745	0·717
2·0	1 360	0·0205	37 800	540	480	1 040	0·766

9. *The most efficient size of Triple Concentric Armoured Cable used as Distributor :—*

TABLE 7.

A	C_e	R_c	$C_e^2R_c$	$C_e^2R_cKu$	$np\beta A$	Total Cost $\alpha=250$	Cost per amp. $\alpha=250$
0·06	82·6	0·407	923	13·0	14·4	47·4	0·574
0·1	135	0·246	1 490	20·9	24·0	64·9	0·483
0·15	198	0·165	2 150	30·3	36·0	86·3	0·437
0·2	259	0·125	2 790	39·3	48·0	107	0·415
0·25	318	0·101	3 400	48·0	60·0	128	0·402
0·3	377	0·0847	4 000	56·4	72·0	148	0·394
0·4	489	0·0644	5 130	72·4	96·0	188	0·385
0·5	602	0·0524	6 330	89·4	120	229	0·381
0·6	709	0·0443	7 430	105	144	268	**0·379**
0·8	919	0·0344	9 700	137	192	349	**0·379**
1·0	1 120	0·0285	12 000	170	240	430	0·382
1·25	1 380	0·0240	15 200	214	300	534	0·388
1·5	1 620	0·0212	18 600	262	360	642	0·396
2·0	2 100	0·0180	26 400	373	480	873	0·416

Here, again, the economic current in the most efficient size is higher than the safe current.

Before I end, I have a debt to pay. The calculations, the results of which appear herein, have all been made by my brother, H. F. Watson. That he has had no light task, only those having experience of such calculations will fully appreciate ; why, the calculations leading to the approximation for the skin effect were, at any rate to myself, appalling. Therefore, to my brother, all those who have been interested by this article, owe thanks.

BOOK REVIEW.

Relais und Schutzschaltungen in elektrischen Kraftwerken. By REINHOLD RUDENBERG. Pp. 280. 25.50 Marks. (Berlin : Julius Springer.)

The work under review is one of the most extensive in its scope that the reviewer has seen ; it deals with the design, construction and operation of relays of all kinds and for all purposes. The work is divided into seven chapters, each of which is written, under the editorship of Dr. Rudenburgh, by a well-known engineer ; each approaches the subject of relay operation from a different viewpoint. The first chapter shows various systems of networks in Germany with central stations, sub-stations and the run of e.h.t. transmission lines ; the necessity for adequate protection is emphasised. The second chapter deals with principles of protection (several circuit diagrams are given) and the effects of improper or inefficient protection are illustrated. Insulators and line masts are shown in illustrations destroyed through the effects of extensive corona. Figs. 14, 15 and 16, with the text relating to them, are interesting from the fact that a comprehensive idea of corona, and its effect, from e.h.t. lines is given ; the calculations are valuable. This chapter also includes illustrations of breakdowns (due to surges) of coils, oil switches, stator windings and transformer coils. This chapter is an excellent introduction to the remainder which deal with the design, construction and operation of relays proper. The third chapter may be said to be a description of experiments carried out on relays of simple and more intricate design. Pieces of wire and slotted drums are illustrated operating in magnetic fields of various types and the results are shown in graph form. Several dozens of experiments are described and illustrated ; they are food for thought for the designer who may be hesitating over a particular line of proceedure in a design. The next chapter is devoted to the application of relays proper to various systems of distribution. Many types of relay are illustrated, both with their schematic diagrams of connections to the apparatus they are intended to protect, and as they appear with their covers on and off. The remaining chapters are written on the same lines dealing with more or less intricate systems of protection. To those interested in the subject, the work is to be commended ; this merely from an instructional point of view since some of the applications suggested are not possible at the moment in this country.

CYRIL SYLVESTER.

BOOKS RECEIVED.

"Molecular Magnetism." By W. Peddie. (London : Edward Arnold and Co.) Pp. viii+140. 10s. net.

"The Book of Electrical Wonders." By Ellison Hawks. (London : George G. Harrap and Co.) Pp. 316. 7s. 6d. net.

"Overhead Power Lines.' 'By W. Morecombe. (London : Chapman and Hall.) Pp. xi+236. 15s. net.

"Posters and Publicity, 1929." Edited by F. A. Mercer and W. Gaunt. (London : The Studio, Ltd.) Pp. 164. 7s. 6d. net, in wrapper ; 10s. 6d., net, in cloth.

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SCIENCE AND ELECTRICAL ENGINEERING.*

Why Scientific Work of a Fundamental Nature should be Encouraged—Industry's Indebtedness to the Scientist—The Discoveries of To-morrow.

By Prof. E. W. MARCHANT, D.Sc., M.I.E.E.

THERE is, of course, a very big step between Faraday's experiment and the 160 000 kW alternators that are being built to-day. There are many men such as Gramme, Pacinoti, Siemens, Wilde, John Hopkinson and Parsons whose work as engineers has brought the generator of electrical energy to its present efficiency and size. Although I do not wish to minimise the services of these and many other eminent engineers, it is well to remember that the whole technique of the production of electrical energy could be altered, if some other method than the steam boiler turbine and alternator were discovered which would enable a larger fraction of the energy in coal to be transformed directly to electrical energy. All scientific work, therefore, of a fundamental nature should receive encouragement, for it is possible that entirely new methods of controlling the electrons which we now know constitute an electric current may be discovered. Our knowledge of the fundamental nature of matter has undergone a profound change since Faraday made his great experiment, and it does not seem beyond the realm of scientific possibility that some methods may be devised of setting electrons in motion by other methods than those with which we are familiar.

Another branch of electrical engineering which had its beginning in more or less academic scientific discussion was cable telegraphy. The idea of telegraphing across the Atlantic was one which had appealed to many electrical engineers, and it was in 1856 that the money was raised which enabled the first cable to be laid, but the theory of cable transmission was not clearly understood. After Kelvin's delicate syphon recorder had been constructed, cable telegraphy became a practical thing, and a great step had been made in practical electrical engineering.

We have celebrated recently the work of Alexander Graham Bell. His serious study of electricity was undertaken with a view to understanding and repeating Helmholtz's experiments in the artificial production of vowel tones.

Nowadays we are so familiar with telephony that we perhaps fail to realise what a change it has made in our lives. One man can now do a volume of administrative work which would have been impossible without it, and the saving of time and trouble to the ordinary man is incalculable.

High Frequency Currents and Wireless Telegraphy.

I have referred quite recently to the developments that arose from Lord Kelvin's paper on "The production of high frequency currents by the discharge of a condenser through an inductive coil." That paper was really the starting point of wireless telegraphy. I remember, too, a paper by the late Mr. Duddell on the direct current arc, which was read before this Institution, in which he showed how it was possible to produce electrical oscillations in an ordinary carbon arc by shunting it with a condenser and a coil. At the time it seemed a very interesting experiment with very little practical application, but it was found by Poulsen that if the arc burnt in an atmosphere of hydrogen and in a strong magnetic field the frequency of the oscillations which it produced could be raised to values which might be applied in wireless telegraphy, and its utility became apparent. At the time of the war the Poulsen arc, as it is now generally called, became the best known means of producing continuous high frequency oscillations. Nowadays it has, of course, been replaced by the valve.

There is a good deal to be said for what Lord Rayleigh called "wild catting" in experimental research. The introduction of the third electrode by Lee de Forest was made in this way. It is evident that he had very little understanding of the action of the three-electrode valve when he first made one. The use of the third electrode was one of the greatest steps in the development of the technique of the thermionic valve, since it was after the insertion of this electrode that it became possible to use the valve as an amplifier and generator of electric waves.

The discovery of the fact that the resistance of selenium is reduced when exposed to light was first applied by Shelford Bidwell in an attempt to transmit pictures, and the photo-electric properties of potassium and potassium-sodium alloys were studied by Elster and Geitel. At a soirée of the Royal Society over 20 years ago there was a demonstration given by Prof. Fleming of a sodium-potassium photo-electric cell which gave an e.m.f. of nearly 0·5 V and a current of 5 mA. The advantage of the cell, as compared with selenium, is that it is very nearly instantaneous in its action and gives its current almost immediately after a beam of light falls on it. The practical possibilities of these results were obvious, but it has taken nearly 20 years for the "talkie" to emerge, for it was only after the methods of amplification that have been made possible by the valve had been perfected that the production of the currents from these cells became useful in practice.

Television also may become practicable in course of time. That is another application of the same experiment.

Wireless Echoes.

Perhaps the most interesting observations that have been made within recent months in wireless telegraphy have been those by Stormer and Hals on wireless echoes of long delay. Stormer has noticed that in some cases an echo of a short wave (with a wave length of about 30 metres) signal appeared to return to the sending station as long as three minutes after it had been sent out. Many observations of this kind have been made, the time interval ranging from several seconds up to over four minutes.

A very interesting paper by Pedersen has recently been published in which he has discussed the possible explanations of this result. He has shown that it cannot be explained by a signal, which goes round and round the earth continuously, for the attenuation of the wave would be too great, neither can it be explained by a lowered group velocity in the space above the Heaviside layer. The theory which meets the facts most successfully is that the wave penetrates the Heaviside layer, impinges on an electrical stream of charged particles emitted by the sun and, in some way, is reflected back again to the earth. It is estimated that the length of path necessary to account for the delay in the echoes must be over 75 million kilometres, so that the signal must have traversed nearly a quarter of the distance to the sun before returning once more. The theory is borne out by the fact that these echoes are only heard at times of magnetic storms, when it is known that sun spots are actively sending out streams of charged electrons. The results are of considerable interest scientifically. If confirmed, they would appear to be the first records of signals sent out from the earth which have penetrated the upper regions of the atmosphere and returned again.

Such are some of the fundamental scientific discoveries which have proved of importance to the electrical engineering industry. But there are many other sciences which have been of great value to electrical engineers.

Some of the most valuable scientific work that has been done within recent years is that on engineering materials. It is, of course, many years since Barrett, Brown and Hadfield first published their researches on silicon iron and showed how much smaller were the losses in this material when subjected to alternating magnetisation than with ordinary iron. It is not too much to say that the discovery of silicon iron enables as great an advance to be made in the design and construction of transformers as any other single experimental fact. It enabled the designer to reduce the weight of the iron cores of transformers to nearly half the value that would have been needed without it, and simplified the problem of cooling the transformer.

More recently the discovery of cobalt steel has led to almost as big a revolution in the design of permanent magnets. Before its discovery a coercive force of 60 or 70 with tungsten steel was the greatest that had been possible (and this was a great advance on the figures with iron containing no tungsten), but a coercive force of nearly 250, such as is now possible with a steel containing 20% or 30% of cobalt has enabled permanent magnets to be made of less than one-third the weight previously required. Instead of the heavy horse-shoe magnets previously

* Extracts from the chairman's address to the Mersey and North Wales (Liverpool) Centre of the I.E.E., at Liverpool, on October 21st.

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needed in magnetos, it is now possible to use short straight bars 3 in. long and 1½ in. wide, bars such as no maker of permanent magnets would have attempted to use with materials of lower coercive forces.

Another alloy which has enabled great developments to be made is the nichrome wire now used so universally in radiators and heaters of all descriptions. In this connection I should like to refer to a series of experiments that has been made recently in this laboratory by Mr. E. C. Walton, on the causes of failure of such substances when used in cookers and boiling plates. The chief cause of failure is the presence of salt in any solution that may fall on the heated spiral. If such a spiral is immersed in water and heated, it will last well, but as soon as salt is present, electrolysis occurs, and the metal corrodes rapidly. Milk also causes the spiral to become heavily coated with a thick hard mass which prevents the radiation of heat and finally causes the failure of the element. Fatty substances which do not contain salt have very little effect on the heated spirals.

The effect of electrolytic corrosion with a.c. is very much less than with d.c. With one such wire electrolysis led to its breaking after only 20 minutes immersion in a 1% salt solution when direct current was passed through it, whereas the same wire lasted nearly 3 hours when alternating current, having the same R.M.S. value, was used to heat it.

In milk the same wire lasted 1 hour 55 minutes when direct current was passed through it, while with alternating current of the same R.M.S. value the wire showed comparatively little deterioration after 10 hours immersion. This fact is of interest to central station engineers who are now changing over their systems from d.c. to a.c.

Distribution Problems.

One of the most important problems before the supply engineer to-day is the economical design of the transmission network. In some cases the cost of the distributing network is four times as much as the cost of the generating plant. The problem is one which requires intensive study, since the cheapening of the cost of electricity depends as much on a reduction in the cost of the distributing network as on any other factor. Here again, science and scientific method has been able to render notable service. A most valuable series of researches was undertaken by the Electrical Research Association, the results of which have been published in the "Journal of the Institution of Electrical Engineers," with a view to determining the maximum current that can be sent through buried cables without danger to the insulation. This information is now available to the supply industry, and will save it many hundreds of thousands of pounds.

It is almost universal in South Africa for the supply systems to remote districts to consist of overhead lines. The distributing network is carried by overhead wires supported on steel or ferro-concrete poles. Provided care is taken in the placing of these poles their presence is almost unnoticed and the saving in cost as compared with underground cables is very considerable. The problem of supplying electrical energy to the suburbs of towns like Johannesburg or Cape Town is more difficult than it is to the more concentrated towns in England, but with the development of the suburban area, with 8 houses to the acre, which now surround all our big towns, it would seem to be inevitable that the distributing network must be carried overhead unless the cost of electricity is to become prohibitive.

It is possible also that for remote districts with a very bad load factor, it may be possible to use iron wires instead of copper and aluminium. If this is done it is important to have an exact knowledge of the behaviour of the metals which may be used as substitutes. Some figures giving the magnetic and electrical characteristics of such wires, and the chemical composition and treatment that results in the best quality, have recently been published by Mr. Walton, and it is to be hoped that similar results will be available for the other cheap materials, giving the same detailed particulars of the mechanical and chemical properties of the substances to which they relate.

I was interested to find on a visit that I made this summer to South Africa, that the study of lightning and the nature of lightning discharges had been of no small service to the engineers in charge of the recently electrified Natal main line. During the summer the lightning storms in this district are very severe, and when electric traction was first installed, the interference with the working by the almost continuous lightning storms threatened to jeopardise the success of the undertaking. The research engineers of the railway, however, made a complete study of the nature of the breakdowns, and have been able to prevent undue interference, and have thus saved the electrified scheme from failure.

Measuring and Recording Apparatus.

Electrical engineering is concerned primarily with the construction of apparatus for the generation and distribution of electrical energy, or as a means of communication, but like other applications of physical science, it owes much of its progress to accurate measurement and observation. The devising of instruments and apparatus for observing and recording, has proved of incalculable value to the electrical industry. It was my good fortune to be associated for many years with the late Mr. Duddell, and I venture to think that the practical progress he made with the oscillograph and the power it gave of observing quantities that were varying very rapidly, has helped the operator and the designer of electrical machinery and apparatus to a very marked degree. It was only after the oscillograph was available that some of the hitherto obscure phenomena in electrical machinery and apparatus were explained. The oscillograph did for electrical machinery very much what the indicator did for the steam engine. More recently the cathode ray oscillograph has enabled the properties of materials to be investigated at wireless frequencies, and the "Klydonograph," when calibrated with a Dufour cathode ray oscillograph, has given much useful information on the nature and intensity of lightning storms.

The oscillograph also enabled detailed investigations to be made on Graham Bell's problem, the analysis of vowel sounds, and with the development of broadcasting and the necessity for an exact reproduction of music and the spoken word, the study of what has been called the new acoustics has again become important.

It is impossible to lay too much stress on the necessity for accurate observation of electrical quantities. It was accurate measurement by the late Lord Rayleigh and Sir William Ramsay that led to the discovery of argon and other new gases that are now being used in the construcition of gas-filled lamps. The utmost care should be taken to secure accurate results in all observations; it is notable that nearly all great discoveries have been based on effects which are relatively small. Oersted, Faraday and Thomson to whom references have already been made, would never have observed the phenomena for which they obtained world-wide fame, unless they had noticed small and insignificent effects.

It is significant that big manufacturing undertakings all over the world have now established research laboratories on a very extended scale, and that they do not confine their activities to the testing of apparatus and materials used in the factories, but employ many people who are engaged in the study of pure science. H. D. Arnold, of the Bell Laboratories, may be quoted :—"Our research problems are scattered along the whole frontier of the sciences which contribute to our interests, and extend through the fields of physical and organic chemistry, of metallurgy, of magnetism, of electrical conduction, of radiation, of electromics, of acoustics, of phonetics, of optics, of mathematics, of mechanics, and even of physiology, of pyschology and of meteorology." Manufacturers are not necessarily philanthropists. They realise that such study pays.

Training of Students.

The universities have done a great deal in the training of men who can staff such laboratories (that is one of their primary functions), and they can best do this part of their work by encouraging their students to carry on "investigations" themselves. Although a great many of the discoveries that have proved of such importance have been made in university laboratories, many of those that have been described, have been made by private investigators. It is of the utmost importance that such studies should be encouraged, and that investigation and discovery should not be hampered by lack of means.

Faraday carried out his work for the love of knowledge, and I am sure there are many research workers to-day whose chief concern is the pursuit of knowledge for its own sake; but that is no reason why they should not receive adequate material recognition.

Scientific discovery is the basis of all electrical engineering. Without it, the electrical industry would not exist. It is as necessary that it should be encouraged to-day as ever it was, for the discoveries of to-morrow may lead to as great a material revolution as did those of Faraday.

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RATIONALISATION OF INDUSTRY.*

A Stage in the Evolutionary Process—Industrial Electricity as a Factor—The World's Electrical Industry Envisaged as a Single Unit.

By A. P. YOUNG, O.B.E., M.I.E.E., M.I.A.E.

IT must be realised that the rationalisation of industry now being experienced is but a stage in the continual process of industrial evolution.

The invention of the steam engine and other associated inventions relating to textile machinery gave a great impetus to the growth of factories towards the end of the eighteenth century. The evolution of industry in this country during the nineteenth century is a story in itself, and cannot be completely dissociated from political developments. At the beginning of the century this little island had a population of just over ten million, with a total of nearly 1¾ million homes. At the end of the century the population had increased to 37 000 000, and the number of homes to 7 000 000—an increase of almost exactly four times in each case.

By the end of the century it is true to say that Great Britain had become the workshop of the world, and more important still, in thus working out her industrial salvation, she had blazed the trail by the initiative skill, ability, honesty of purpose, and financial genius of her people, for the industrial developments which have, during the last few decades, permeated all other countries and made these countries her active competitors in the markets of the world.

Although little more than one quarter of the twentieth century has been travelled, it is true to say that the industrial progression achieved in this relatively short span of time is far greater—when measured by economic and human standards—than the sum total of progress made previously and since the inception of the industrial era. Four factors have contributed to this result:—

(*a*) The rapid application of the use of electrical energy for industrial purposes, which has enabled the individual worker to control more power and thus increase his productivity.

(*b*) The general speeding-up of the rate at which we have increased our knowledge of Nature's laws and materials.

(*c*) The reactionary effect of the great war.

(*d*) The growing appreciation of the supreme importance of the human factor in all industrial undertakings.

The combined effect of these four evolutionary forces has been in the direction of applying an ever-increasing concentration on the development and improvement of the power driven machine. Examples of such application are to be seen in the universal use of the motor car; the great advances made in the last decade in the design and construction of machine tools; the rapid developments in the use of machines operated by electrical energy for meeting industrial and domestic needs; the extraordinary growth of the use of machines in connection with the radio art; the evolution of the aeroplane which enables man to transport himself at a speed a little less than half the speed of sound—just to cite a few striking illustrations.

Mass Production.

As a corollary of this trend of development, it has been possible to concentrate huge industrial organisations on the manufacture of one article, segregating the manufacturing operations to such a degree that each becomes basically simple and within the capacity of the unskilled to perform successfully. By such means so-called mass production has been successfully realised, the condition of success being steady and continuous flow from mother earth to consumer, through the manufacturing machine, this in turn involving mass consumption which is brought about by ever widening the market through reduced costs, lower selling prices, and the maintenance of a high wage level.

It seems inevitable that, ultimately, the industries of the world will become internationalised. Even at the present time, industrial activity knows no boundaries; worships no particular nationality; and is all embracing in its sweep, being impelled by the basic idea of service to its customers. True, artificial barriers are erected which tend to impede the onward and all-pervading rush of industrial activity, but when studied in its broader aspect from the angle of world progress, all such artificial barriers are found to retard the rate of industrial progression, and ultimately they will, in my judgment, be swept away.

Just consider for a moment the electrical industry, and let us concentrate our attention for a moment on a large rotary converter. An analysis of this design of 1 000 kW capacity revealed that no fewer than 12 528 separate pieces were used in its construction, involving the handling of some 39 different materials. These materials have come from all over the world, and it is perfectly true to say that the effort which we are able to make in the B.T.H. Works at Rugby in manufacturing one of these machines is the terminal point, so to speak, of innumerable lines of communication which spread out all over the world, being anchored to some form of human activity at these distant points upon the efficiency of which our effort in Rugby is greatly dependent.

International Character of Industry

The international character of the industrial activity surrounding the ultimate manufacture of the converter cited as an illustration of my theme is true, in greater or lesser degree, of all forms of industrial activity, and serves to show that industrial activity and efficiency in any particular factory, town, state, or country, cannot be completely divorced and dissociated from similar activity elsewhere, but on the contrary, all these separate and distinct industrial operations are closely interconnected and dependent one on the other. Industry, therefore, knows no boundaries of country, race, or creed, but is ever flowing and all embracing, so that its onward march must tend to bind the countries and peoples of the world closer and closer together until they become a united family.

It is not difficult to conceive a state of affairs when the whole electrical industry, the world over, is interconnected and so allied so that it has become virtually a single operating industrial unit, inspired by the nobleness of the task of developing the power of usefulness of this wonderful agency, and dedicated to the proposition of utilising every means in its power to serve humanity by urging it along the path of electrical progression. The same line of evolution is possible with each of the other basic industries, so that by such means there would ultimately be established an international industrial world state, in which all those concerned with the rendering of a particular service—whether this take the form of food, electricity, clothing or transportation—are banded together as a united human team, marching forward along the path of human progress, and united in their supreme allegiance to the ideal of making this service better and better.

This conception of a future state of industry which it may take many centuries to realise, does not involve the destruction of the individual initiative of any members of the team, nor does it mean that the individuality of any particular organisation will be crushed by such a huge merging of world interests. On the contrary, anything which operates in this direction of preventing the human unit from giving free expression to its individuality and initiative, is harmful to progress, because the human factor must ever remain of supreme importance in industry. It all depends on the way in which the team spirit is made to permeate the whole human organism, and the degree to which this spirit is directed towards improving the service to which the whole human team is dedicated.

The term rationalisation is now being applied to any process of merging industries in a "horizontal direction" as distinct from a trust or combine in which the merging is "vertical," to permit the activities of the group to embrace and control the flow of materials in the industrial circuit at all stages from mother earth to consumer. Classical examples of the latter type of combination, as distinct from a rationalised industry, are the huge business conducted by Lever Brothers in this country and the wonderful organisation of Henry Ford in the United States of America.

Rationalisation is, therefore, a process of merging in which industries giving the same class of service are brought into very close and intimate association, objective to improving the efficiency of that service by the elimination of waste at all stages of the industrial processes.

(To be concluded.)

* Extracts from a paper read at the October meeting of the Rugby Engineering Society.

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"LIGHT'S GOLDEN JUBILEE."

Sir Joseph Swan the True Inventor of the Incandescent Lamp—Some Inconsistencies in the American Claims on behalf of Edison.

By KENNETH R. SWAN.

IN view of the statements, emanating from America, giving the credit for the invention of the incandescent electric lamp to Mr. Edison, readers of THE ELECTRICIAN may like to have a brief statement of the true facts of the matter.

No doubt the world acclaims Edison as a great inventor, but it is incorrect to say that it recognises him as the founder of the electric lighting industry. Take England, for example. Does England acclaim Edison as the founder of the electric lighting industry? Clearly not, seeing that the foremost

The late Sir Joseph Swan, inventor of the incandescent electric lamp.

representative body of electricians in this country, the Institution of Electrical Engineers, on December 20th last year commemorated with fitting ceremony the invention of the incandescent electric lamp by Sir Joseph Swan, and recorded the fact that the electric lighting industry in this country, and indeed in other countries, largely owed its development to his invention. There may be other countries besides the United States which designate Edison as the founder of the electric lighting industry, but if there are, it is certainly not to be assumed that they do so rightly.

Now I think it is perfectly true that Edison is entitled to rank amongst the first and foremost who correctly formulated the conditions necessary for realising what was in those days called the "subdivision of the electric light"—namely, high resistance lamps run in parallel. I believe that in this country Lane Fox was amongst the earliest advocates of this principle.

Swan was not so much concerned with the principles of electric distribution as in devising a practical form of lamp to give a small unit of light. He was quite alive to the importance of making a lamp with a high resistance, though he did not, in the very early days of his lamp making, see the way to make a practical lamp with a resistance as high as was necessary for parallel work, as first clearly set forth by Lane Fox and then by Edison. But, as he gradually perfected his method of making filaments, he found himself able to make lamps which ran satisfactorily on a 100 V circuit suitable for wiring in parallel, and later on circuits of 200 V and higher voltages.

But the real problem which Swan set himself to solve in 1877 (resuming his earlier abortive experiments of 1860) was to devise a practical form of lamp having a durable carbon conductor as thin as possible mounted in an evacuated glass bulb. This problem Edison also set himself to solve. The system of distribution was a problem which could be solved on paper, given a suitable lamp, but the discovery of a suitable lamp to fulfil the specified conditions could only be solved by experimentation. There were at least three serious difficulties to be surmounted before a successful lamp could be made:—

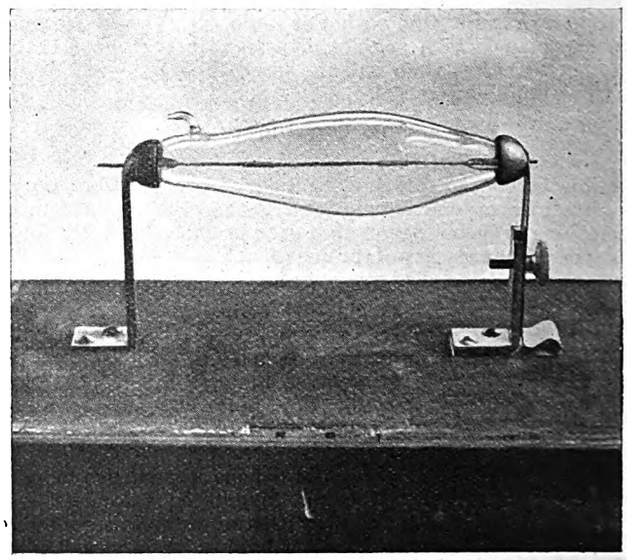
The first was to obtain and maintain a high degree of vacuum in the glass container. Swan and Stearn, during their joint experiments in 1877 and 1878, discovered that this difficulty could be surmounted by continuing to run the lamps on the pump after the filament had begun to incandesce. Edison, I believe, also discovered this means of getting rid of occluded gases when working with platinum filaments. Swan was working with carbon throughout, and his discovery of this means of improving the vacuum was, I believe, prior to Edison's similar discovery, and wholly independent of anything done by Edison.

A Formidable Difficulty.

The second difficulty, which was perhaps the fundamental crux, was the discovery of a suitable material for the filament.

The third problem was to devise means of mounting the filament so that it did not break, and of leading in the wires through the glass envelope so that the vacuum was not impaired. This difficulty, which was no inconsiderable one, was surmounted by Swan and Edison in various ways, again working on independent lines. But it was the second difficulty, the discovery of the substance from which a satisfactory filament could be constructed, which proved the most formidable; so formidable did it prove in Edison's estimation that he gave up carbon in 1878 as hopeless, and turned his attention to iridium and various alloys of iridium.

Swan was satisfied that carbon was the right material, for his early experiments in 1860 had convinced him that he was able to produce, by his special process, carbon in such a dense and elastic form as to make it eminently suitable for his purpose. In December, 1878, Swan produced a lamp which satisfied him that the problem was solved. It is true that the carbon conductor was not as thin as he could have desired, but that was a matter which he felt sure he could improve upon. Several lamps of this type were made and exhibited to large numbers of people in the following months, January and February, 1879. Whether it was because the news of this



One of Swan's original lamps which were publicly shown in 1878.

achievement reached the ears of Edison or not, I do not know, but for some reason not explained, Edison, shortly after Swan's achievement, returned to carbon as the material for

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making the filament for his lamp, and, as is recorded, he succeeded in getting a lamp with carbonised cotton to glow satisfactorily for some 40 hours on October 21st, 1879.

But this lamp of Edison's was not a practical lamp; and had the matter gone no further than this the problem would have remained unsolved. Edison thereupon sought about for an alternative form of carbon conductor, and started to make filaments of carbonised paper and cardboard, just as Swan had already done in 1860. Ultimately, after a world-wide search for suitable material and the expenditure of a vast sum of money, the best material which Edison could discover for his filament was a certain species of bamboo, and the lamps exhibited at the Paris Exhibition, 1881, and the Crystal Palace Exhibition, 1882, were made with bamboo filaments. But bamboo filaments, though more satisfactory than paper, were not the solution of the problem; and the bamboo filament was soon discarded in favour of the filament which Swan had devised.

The Squirted Filament.

The difficulty in making a small surface carbon of high resistance was that if the carbon is of a strong material it has a low specific resistance, and has therefore to be made very long and thin. If a porous carbon is used, such as that from paper, bamboo, wood, etc., the specific resistance is high and the carbon is therefore reasonably short and thick, but this advantage is outbalanced by the weakness of such carbon. Edison's commercial bamboo lamps were very weak, and had to be run very dull to get any life duration, and were merely a variant of the paper which Swan had discarded for his homogeneous amyloid, which became universal.

Early in 1880, Swan, having worked continuously on the problem of obtaining a thinner and more satisfactory conductor than those used in his earliest lamps, had hit upon the idea of parchmentising a certain quality of cotton thread and carbonising it according to his particular method. In this way he formed a filament which had the desired qualities, and with this filament the earliest commercial lamps were made in England. In France and elsewhere on the Continent Swan's parchmentised cotton filament was either initially or ultimately adopted in preference to the bamboo, and I believe I am right in saying that the American manufacturers before long also adopted the parchmentised cotton filament in place of Edison's bamboo filament.

This type of filament, the parchmentised cotton filament, held the field for some nine or ten years, until it was superseded by the squirted filament, made by squirting cellulose through a fine orifice. This process was invented by Swan in 1883; and it was this process which so materially facilitated and improved the making of lamps of higher voltage and efficiency as to give an enormous stimulus to the more general use of incandescent electric lighting. Edison did not in any way contribute to these vital improvements in the carbon filament, though I observe that in the "Life of Edison," written by G. S. Bryan, Edison is credited with the invention of the squirted filament (see pages 137–138), where it is stated:

"In the meantime, however, Edison had been developing an artificial filament—a 'squirted' filament, as it was termed. A soluble cellulose was prepared and then forced through a die, the result being a long thread that when hardened looked somewhat like catgut. The thread was cut into lengths and these could be formed into desired shapes. After this material was carbonised at a high temperature (the higher the better) the carbon residue was found to be both extremely dense and highly elastic. Gradually the new process was adopted for the commercial production of lamps."

This is only one of the many instances in which the history of the incandescent lamp has been garbled by false attribution.

In the above summary I think I have correctly set forth the respective contributions of Sir Joseph Swan and Thomas Edison to the solution of the problem of making a practical incandescent lamp. But it is also important to observe this fact, that the practical manufacture of the incandescent carbon filament lamp in this country does not owe one iota to the work of Edison. It was initiated and developed entirely without assistance from Edison's experiments, so that, quite apart from the question of priority of date in the invention of the incandescent carbon filament lamp (as to which I think Swan clearly has the stronger claim), the initiation and establishment of the manufacture of the incandescent electric lamp in this country was based not on Edison's work but on Swan's.

How then, can it be truly said that "the world rightly designates Thomas Alva Edison as the founder of the electric lighting industry"?

THE EVOLUTION OF A PERFECT TOTALISATOR.

A Triumph for British Electrical Manufacturing Enterprise.

By a SPECIAL CORRESPONDENT.

BEHIND the recent letter to the Jockey Club from Sir Clement Hindley, chairman of the Racecourse Betting Control Board, there is a story of which the British electrical industry has much cause to be proud. It bears out once again the old story that when it comes to doing what seems to be impossible, the British manufacturer just gets down to the job and does it.

Before it is possible to appreciate the exact nature of the problem which the Racecourse Betting Control Board set before the electrical industry, it is necessary to understand the problems which confronted Sir Clement Hindley and his colleagues on the Board in this task of installing totalisators on English and Scottish racecourses.

In every country where the totalisator—either in its fully mechanised form or in its partially mechanised form where hand selling and an indicator work together—has been in operation, there is some form of centralised racing. That is to say, there are a number of racecourses, located conveniently near big centres, where on 30, 40 or 50 days in each year racing takes place either on the flat or "over the sticks." At such meetings it is possible to instal a permanent form of totalisator—a sort of factory, as it were, in which all the machinery is immobile, and the working parts, once fixed into their proper positions, remain there year in, year out.

Vigorous efforts to persuade the Racecourse Betting Control Board to adopt this type of installation on the majority of the larger flat racecourses here were doomed to failure from the outset, because the cost of such immobile installations was prohibitive in view of the fact that much costly machinery would be lying idle from 355 to 360 days a year on the majority of our racecourses. There are only six or seven racing days a year on the majority of the courses, and only two or three days on which really large attendances can be expected.

Thus, the problem laid before the British electrical industry was the evolution of an efficient totalisator, the integral working parts of which would be portable. Portability means that the working parts can be dismantled conveniently at the end of a given race meeting, transported to the next fixture and re-erected there in a short space of time. It must allow this procedure to be continued indefinitely so that the same equipment may cover a series of important meetings, year after year, and thus become a comparatively light charge on the totalisator fund.

The fully mechanised tote is a ticket selling machine which records automatically on the electrical indicator each unit (2s. is the agreed unit) as it is sold. There may be two indicators in different rings, and the sales all over the course must be shown simultaneously on each. There are two "pools"—one for win and one for place—on each race, and the tote must show the position of each pool up to the moment the starter releases the gate and the horses are off.

The perfect synchronisation of the indicators has been one of the toughest nuts to crack, and it is very gratifying to find that this point has been dealt with, in common with the other details required by the specification.

In the course of his letter, Sir Clement Hindley wrote:—

"The type of indicator adopted, while there are differences of detail in the articles designed by the three contractors, is generally similar to that already seen in use at many of the courses where totalisators of the simple form have been operated, namely, at Carlisle, Catterick, Folkestone, Gatwick, Lanark, Ayr, Hamilton Park, Chepstow, Thirsk and Haydock Park. It shows the figures by means of electric lights, and the Board considers it a distinct advance on any system of indication previously adopted, by reason of its great range of visibility, and its portability. The figures can be read up to a distance of over 500 ft. in bright sunlight; and, as an instance of portability, I may mention that recently one set of equipment of this type did duty at Ayr on September 18th, 19th, and 20th; at Hamilton Park on September 30th, and

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October 1st, and at Haydock Park on October 11th and 12th. The adding machinery which has been evolved in a portable shape consists of different adaptions of apparatus in common use in automatic telephony, which has proved its reliability in many countries. The different firms of contractors have used different methods, but in each case are working to the Board's requirements, the Graham Amplion Co. working with the General Electric Co., the British Automatic Totalisator Co. working with Messrs. Ericssons, and the British Thomson-Houston Co. working with the Automatic Telephone Manufacturing Co., are now putting the final touches to the evolution of apparatus suitable to our requirements, in close consultation with our experts. And, in addition, we are taking the advice of one of the most eminent firms of consulting electrical engineers in the country."

It is hoped that a working demonstration of the new apparatus will be available on a racecourse in London before the end of the year, and there is no doubt that keen public interest will be raised in the efforts put forward by so many important undertakings associated with the electrical industry.

E.P.E.A. DINNER.

Mr. Frank Hodges on the Overhead Line Opposition.

THE annual dinner of the Southern Section of the Electrical Power Engineers' Association, held at the Hotel Cecil, London, on October 19th, attracted some 500 members and guests, including Sir T. F. Purves, who made his first appearance as President of the Institution of Electrical Engineers. Mr. E. Rendell Ingram was in the chair.

Mr. FRANK HODGES, in proposing the toast of "The Association," remarked that most of the chief engineers in the country had graduated through the E.P.E.A., and he was proud to be associated with an industry in which grit and perseverance were suitably rewarded.

Referring to the agitation against the erection of the Central Board's overhead lines on the Sussex Downs and elsewhere, Mr. Hodges said that while there were, undoubtedly, a number of people and organisations who were deeply concerned to protect as far as possible in our industrial island the beauties and amenities of our countryside, there were others who were making a brazen effort to preserve their own selfish interests at the expense of the improvement in the standard of life of the industrial and rural population.

Not only were such people selfish to a degree, but they endeavoured to set up a code of conduct for themselves which they would publicly declare as reprehensible in the working classes if the latter adopted it.

They were trying to get behind the findings of the Minister of Transport, who had arrived at a decision with respect to the establishment of the high tension transmission lines along the downs, after setting in motion all the judicial procedure for hearing all evidence, for and against, at a public court, in accordance with an Act of Parliament agreed to by all parties.

If the working classes had endeavoured to break the law, or contravened an agreement, their conduct would have been described as dastardly and unpatriotic, and we should have heard much piteous wailing about the inability of the workers to accept the findings of a Court of Arbitration.

The industrial community would certainly resist the efforts of the rich, who had made their money out of the industrial community, and who had the good fortune to live sometimes in our beautiful and sequestered countryside, to prevent the rural population surrounding them from having the full advantages of modern electricity development.

Working Classes and Cost.

The working classes, he said, would never agree to the additional, almost fabulous, cost that the Board would be put to if the schemes of these protestors were adopted in the countryside, for every pound needlessly expended in putting cable underground to preserve rural amenities meant that the industrial worker, who rarely ever had the opportunity of visiting these beauties, had to pay dearer for his electricity, and was deprived of the opportunity of having even those smaller amenities in his industrial life which were absolutely essential to his physical existence.

With regard to the outcry against the erection of the Battersea power station, the question might be asked, "Do we want sheep grazing on the Embankment, or do we want livelihood and health-giving industries along the river banks?"

The industrialist, both employer and workman, had not yet raised his voice against being taxed for the benefit of a rural brother, in the effort to provide him with his electrical amenities. But he was gradually being provoked into definite hostility by the action of those who, for utterly selfish ends, not only imposed a burden upon the town dweller and industrial worker, but whose efforts condemned the agricultural population to continuous drudgery and to a state of backwardness as compared with the agricultural population in other countries in the world. At present the Sussex Downs were meaningless to millions of our population because under existing conditions they could never go there.

Employment Problems.

Mr. T. D. MARTIN, the president of the Association, referred to the low efficiency of present methods of generating electricity and wondered whether, in spite of the developments that had been made, we had progressed very far since a Chinese burned his house to make roast pork. Referring to the Whitley scheme, Mr. Martin was convinced of its great success in the electrical industry, and as evidence of this it might be mentioned that it had only once been necessary to take a case to arbitration. To the E.P.E.A. the coming of the Central Board meant fewer generating stations. On the other hand, more staffs would be required on the distribution side. During the transitional stage employment difficulties would arise, but this aspect was being dealt with by a displacement committee.

The toast of "Our Guests" was proposed by Mr. E. Rendell Ingram and replied to by Mr. F. W. Purse, chief engineer to the London and Home Counties Joint Electricity Authority.

Some of the members of the Electrical Power Engineers' Association and their guests at the E.P.E.A. Southern Division dinner at the Hotel Cecil, London, last Saturday. The speeches, reported above, included a striking criticism by Mr. Frank Hodges of the critics of the Central Board's overhead line projects.

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PERSONAL SALESMANSHIP.

Its Application to the Electrical Industry—Dullness and Showroom Service—The Art of Reception.

"PERSONAL Salesmanship in the Electrical Industry" was the title of the lecture given by Miss Gladys Burlton at the first E.D.A. Salesmanship Conference, at the Royal Society of Arts, on October 18th. Sir Andrew Duncan (chairman of the Central Electricity Board) presided.

Miss Burlton said that if she were asked what was the chief fault in the service of the electrical showrooms she had visited, she would say dullness. The people were extraordinarily dull. She was never once thrilled or excited in any of the showrooms; she was depressed when she went in and was more depressed when she came out.

The essential fundamental in successful salesmanship was to be able to like the customers, to make each and every customer feel that they were the very person the salesman had been waiting for for years and that here at long last that customer had arrived. Nothing like that, however, seemed to happen in the electrical showrooms she had visited. The people there seemed to bear her entry with fortitude. They did not seem to be in the least moved, and in most cases her presence was not even acknowledged from beginning to end. The reason why there was so much unsuccessful selling in what might be termed a technical industry was that technical experts generally hated people. Scientists generally disliked their fellow-beings, and that made them bad salesmen. Therefore, unless a person was able to like people—the nasty people as well as the nice people—he or she should keep away from the selling business.

Therefore, the first thing for the industry to cultivate was the art of receiving people. She had been received in a showroom on the previous day by a commissionaire, and when she asked to see some fires, he said, "Oh," and went away. She had, she continued, come across several cases in which there had been no very intelligent method of making contact with the prospective customer. The juniors were not trained; they did not know what to say and were nervous. They were told by the customer what was wanted, and then fetched somebody else to whom the story had to be told all over again.

Personality.

She felt it necessary to emphasise the point that if a salesman liked a customer it was as well to show it. One salesman she came across seemed so miserable that she suggested to the manager that he looked as if he contemplated suicide. The manager, however, said he was the best salesman he had, and was very nice underneath. She found out that that was so, and felt tempted to place a placard on him, "I am very nice underneath." How could anybody know you are nice, asked Miss Burlton, if you did not show it?

After discussing the "art" of keeping people waiting, and the annoyance to a customer when the salesman is called away to the telephone, Miss Burlton spoke of the importance of knowledge on the part of the salesman of the article he is selling, and mentioned that one or two assistants in electrical showrooms she had visited were extraordinarily vague, and only too thankful to hand her over to somebody of more experience. She had been wondering what methods were adopted of training the junior staffs, and had a sort of feeling that there was no method at all, or that there was something wrong with the method. It seemed to her that no trouble was at present taken to teach the juniors much about the apparatus in the showrooms. At the same time, the less technical the salesman could be the better.

Detailing the general essentials of selling, Miss Burlton placed first the ability to like people; secondly, a knowledge of the goods being dealt in; and thirdly, skill in talking and demonstrating.

The CHAIRMAN, in asking for discussion, said he felt very disposed to ask Miss Burlton to go down to the South Downs and try and sell wayleaves, and if she were successful he would ask her to go to the Lake District.

Councillor WATT pointed out that electric cooking, for instance, was an entirely new method of cooking, and it must be explained more or less scientifically. Only in that way could the consumer be educated.

Mr. ROBINS said he could understand an assistant in a showroom not knowing the voltage in any particular case, because in his district there were four voltages.

Mr. CONEY agreed with Miss Burlton that there are a very large majority of customers who know nothing of electricity, and are not in a position to understand technical descriptions by the salesmen.

Mr. HOWELL commented on the high qualifications laid down by the lecturer for a salesman in an electricity supply showroom, and yet, he said, most undertakings expected to get people with those attainments for about the same salary as that paid to the municipal dustman.

Mr. JACKSON suggested that some supply authorities do not encourage salesmanship. Some even said they did not want the cooking load, and the sales staff did not get the encouragement they should have. He knew of one very enthusiastic salesman who was having the heart knocked out of him by the attitude of the management.

Electrical Showroom Atmosphere.

Miss C. HASLETT remarked that the electrical showroom had a totally different atmosphere from that of the ordinary commercial shops. Women were brought up with some knowledge of hats and clothes and furniture and fabrics, and they knew something about them when they went into a shop. That was not the case, however, with electricity and electrical apparatus, in connection with which they suffered from an inferiority complex. Therefore the problem of serving a customer in an electrical showroom was a very peculiar one and did not bear any resemblance to ordinary kinds of salesmanship. She would very much like Miss Burlton to spend a considerable time in an electrical showroom and then come and give her experience. In her view, continued Miss Haslett, the electrical industry was not taking sufficiently seriously the problem of training juniors. The Electrical Association for Women was constantly being asked for women demonstrators, but the available supplies of trained people had been exhausted. Therefore it was essential to take in hand very seriously the training of juniors to fill positions as saleswomen and demonstrators, otherwise the industry would be up against a very serious problem.

Mr. HAYES also complained of the lack of training facilities and opportunities for juniors. The general policy, he said, was to keep the staff down to such a minimum that there was little margin for illness and even holidays. On the question of salaries, he claimed that, for the technical qualifications now demanded of sales people, higher salaries should be paid, and urged those engaged in this work to hold the big idea and demand higher salaries.

Mr. MORRIS, speaking as a contractor, said it was very difficult for the average contractor to have a large number of assistants, although he agreed that the assistants that were employed should be well paid.

A Suggestion.

At the conclusion of the discussion, the CHAIRMAN, proposing a vote of thanks to Miss Burlton, said that he had visited a good many showrooms in this country, and some of the more recently erected ones were very expensive and admirable buildings. He always asked the question, when he went into a new showroom, where the complaints room was. He usually got the answer, "We do not have complaints," and in such cases he knew precisely what to think. In another country, recently, he saw a most interesting illustration of how he thought a sales department should be run. The best room on the ground floor was set aside for receiving inquiries or complaints, and these people were attended to by the best salesman on the staff. On an upper floor there was a large room in which there were, according to conditions, from 24 to 48 telephonists receiving telephone calls from consumers. That was what he called sales organisation. That particular undertaking, of course, was a very large one, and there was room for such a sales organisation. He would not suggest that a similar organisation was possible with smaller undertakings, but it occurred to him that the E.D.A. might spend a profitable evening in having a general discussion on the organisation of sales departments.

Miss BURLTON, replying to the discussion, said she was perfectly well aware, as Miss Haslett had said, that she would have been more useful had she known more about the electrical industry. Undoubtedly the proper staffing of a showroom was an important matter, and she hoped the representatives of managements who were present would take notice of what had been said.

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GERMANY AND FOREIGN CAPITAL.

Herr C. F. von Siemens Criticises Foreign Control Policy.

THE following extracts from a translation of an article in the "Berliner Tageblatt" of October 13th indicate the development of a controversy which recently aroused considerable attention in electrical and public circles in this country:—

"The transaction reported in yesterday's morning papers by which the controlling majority of the Mix and Genest Co. and of the South German Telephone, Cable and Wire Co., with the F. Schuchardt Co., all belonging directly or indirectly to the A.E.G. concern, should be combined in a holding company under the control of the American International Telephone and Telegraph Co., has provoked the Siemens Co. to a quite unusual attack on German companies, as they evidently feel this combination to be directed against their interests.

"Dr. C. F. von Siemens, the chairman of the Siemens and Halske Co. took the occasion of an internal celebration of the Siemens groups of the 82nd anniversary of their foundation, to make a speech which was openly directed against the capital policy of the A.E.G., the largest German competitor of the Siemens group. After referring to the development of the German pre-war electrical industry, and particularly the leading part the Siemens Co. took in this development, Herr von Siemens said:—

"'It seems to me that many leaders of the once so proud electrical industry have too soon relinquished the wheel and called the foreign pilot, because they did not think it possible to master the tempest by themselves. They fell under the spell of the fatalism so frequent in the present day. They did not make the work easier for those who hoped with their own strength and with their own crew to recover the proper course, and to keep a German ship in the leading line in competition with foreign nations.

"'The foreign pilot, even if he is only standing next to the German helmsman in a consulting capacity, will not and cannot give his advice with the strong feeling of common interest between leaders and crew. How much less so if the pilot is not only pilot, but is, in addition, navigating ships of his own under the flag of his own country in competition with German enterprise. He will use his German captains as assistants for the will of foreign countries. What he considers undesirable or what is opposed to his orders or interferes with his plans will be kept down with German support.

"'As the economic conditions in Germany have been developing, we are unfortunately no longer in a position to obtain the necessary means for the development of a growing industry from our own German sources. We must get the assistance of foreign gold created by German labour. We all know that this foreign gold waits for the moment when it can get the supreme control of large enterprises which hitherto have given us orders.'

Foreign Influence.

"These sentences follow logically a short but very dramatic scene created by Dr. Sempell, a member of the board of the United Steel Works, and as such also a member of the Siemens board, at the meeting of the Association of German Industry. He pointed out, without mentioning the names of the A.E.G. and Osram that he considered a preponderating foreign influence damaging German industry to be already existing if only a large minority of shares was placed in foreign hands and if the representation on the boards in such cases was not sufficiently balanced in favour of German capitalists.

"Nobody knows what the arrangements will be for the new holding company, particularly the American International Telephone and Telegraph Co., who control the majority of that holding company, and what technical compensations they will offer to the new enterprise in addition to the assistance with capital.

"We cannot imagine that only fear of competition intensified by technical and capital assistance has caused the unusual procedure of the Siemens Works. Some national idealism may also be involved, perhaps also the disappointment that it has not been found possible to unite the two large German electrical concerns in some way and strengthen their position in foreign countries.

"There were times when certain attempts were made to bring about such an arrangement. Was the A.E.G. to blame at the time that such an arrangement failed, or is the Siemens concern responsible for the failure of an arrangement which was many times expected and predicted by the Stock Exchange? The development has gone other ways, and the two electrical groups face each other in a fighting attitude such as has never been expressed previously in such a clear way.

"This position is not altered by the fact that in some enterprises both companies are co-operating, such as, for instance, in the Osram Co., in which apparently the Siemens Group as a large shareholder has not objected to a participation of the American General Electric, if only to the extent of 15%.

"It will be interesting to see how the fight will continue, and what its effect will be both in the electrical industry and in the economic field generally."

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Sound Recording."

[To the Editor.]

SIR,—Is not the so-called Blattner system of electro-magnetic recording and reproduction really originally due to Poulsen?

In Copenhagen, many years ago, I was shown by the latter an apparatus exactly similar to that described. It worked exceedingly well, being extraordinarily clear, if not very loud; but obviously the loudness could easily be increased by amplification.—I am, etc.,

A. A. Campbell Swinton.

London, S.W.1.
October 16th.

"Control of Ships' Auxiliaries."

[To the Editor.]

SIR,—A portion of the correspondence in your issue of October 11th, entitled "Control of Ships' Auxiliaries," has been brought to my notice, and I regret having delayed my reply owing to my absence on the Continent.

There seems to have been a little confusion in the minds of the Brookhirst Switchgear Co., which is partly my fault. The point that I was trying to stress in the particular portion of my article which caught their attention, was the advantage of controlling auxiliary motors actually on the motors themselves, with a push button; I was, of course, aware that controls for motors had been fitted for some time in convenient parts of the engine room near the motors.

I am entirely in agreement with your correspondents that the general practice is still to control each auxiliary motor by means of a separate hand operated starting panel, but I have been trying in several of my articles recently, to stress the advantage of actually being able to control each motor on the motor itself; and that is why the "Uni-Start" system of your clients has appealed so strongly to me.

The particular ships which I had in mind at the time I wrote my article were the new motorships of the Netherland S/S Co., in which, partly no doubt owing to the co-operation of your correspondents, the electrical technique struck me as being of a particularly high order.

Control of individual motors at the motor itself is still a comparative rarity, though it should be remembered that it was first tried out on Henry Ford's motorship "East Indian," and that a great deal of all that is most advanced in marine electrical technique still comes from the other side of the Atlantic.

One of the most up-to-date and practical switchboards that I have seen on a modern motorship was on the Dutch motorliner "Christaan Huygens." This, incidentally, was a switchboard which incorporated starting panels made by your correspondents.—I am, etc.,

A. C. Hardy.

London, E.C.
October 21st.

"Our House in Order."

[To the Editor].

SIR,—I have read the earnest and interesting article by Mr. T. C. Gilbert, and its seeking-for-a-way spirit and its leaning to what "this one says" and "that one says" somehow set me thinking of the tinker of Bedford. (The reference, of course, is not to any of the local contractors.)

Mr. Gilbert pictures the installation industry as still at the "What shall I do? What shall I do?" stage. Now, we have been nigh 50 years on our pilgrimage, and got on a bit further surely than that.

Our band of contractor pilgrims is a bit of a rabble perhaps. We have our Mr. Pliable, our Mr. Obstinate, and our Mr. Ignorance, with their sons and nephews in the ranks still, but also we have our Greathearts and Hopefuls. The ladies are now joining our band and The Electrician is helping us on.

We, who have travelled so far, have still some of the despondency and mire of our struggles on us, and know well that there is a difficult and dangerous road ahead. But, thank goodness, there is still a road, and the lions which we see in front have, we shall find when we get up to them, their own hidden chains, At least that has been our former experience.

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Does Mr. Gilbert picture the Contractors' Paradise as the time when we, the self-elected monopolists of installation knowledge, shall flourish like a solitary licensed victualler in a busy seaport? No rules, no inspectors, nothing but orders, commissions and cheques?

We might possibly attain to this ideal, even out of present conditions, if we had that contractor Mussolini, gave him a starting refresher of £10 000 a year, and control of the castor oil bottle. But after all, it is probably better fun being one of many harassed contractors than one of the few who would reach such a temporary and uninspiring paradise, and lots of us would fall by the kerbstones.

Part of the charm of our work, and indeed our strength as contractors, is its—and our—infinite variety. We are well in among the people. Our workmanship is established in the mansions of the rich and our tough rubber is buried in the plaster of the cottage. We know where the fuseboards are and the lurking places of the battery boxes. Let us hang on to our knowledge, add to it, lengthen it, broaden it, deepen it. Let us be real craftsmen with pride in our up-to-date work, and as individuals, give individual consideration to our clients' property.

Mr. Gilbert correctly emphasises the vital importance of workmanship. Our apprenticeship system, if the ideals of our particular shop are right, can do more to foster good craftsmanship than can any atmosphere of municipal jobbery.

I can sympathise with the mood in which Mr. Gilbert has his good grouse at the conditions of our industry. Nearly every week I do it myself. At the same time I more and more realise that my business and our business are pretty much what we have made them. It is laziness and inertia that is keeping us back. If we perish it is our own fault.

As an industry we have tremendous power if we would only use it. We have great weapons in the National Register and the Electrical Contractors' Association. A few contractors give much time to these agencies for improvement, but their efforts are greatly discounted by the criminal apathy of the majority.

Mr. Gilbert asserts that contractors would respond with alacrity to any clear-cut policy definitely formulated. Well, I would answer that the clear-cut policy is "work for the industry" and its definite form must be adapted to the conditions of the moment. Now then for the alacrity!

The N.R.E.I.C. and the E.C.A. should reflect all our difficulties and aspirations. If three quarters of the total membership took active part in the work of these bodies nothing could stop our progress.

It is not enough to send along an annual pittance and expect miraculous affluence to come out of a group of initials. As engineers we might know that we are likely to get less out of anything than we put in. But if, instead of leaving the effort to the few, we all put our energies and brains into our trade organisations, our reward would be sure and our established position certain. No house can be in order when some of the inmates only sit and grumble at the rent; and the bulk do not trouble even to do that. Really they would be better with a corporation job.

Perhaps I have been too vague for Mr. Gilbert, so I will say definitely, as my own opinion, that we are making some progress towards bringing districts into line with regard to good wiring practice. When the ground has been further prepared we shall get the set of generally acceptable rules we require. When we work to rules it logically follows that inspection is necessary, and it seems to me right that the insurance people, who are paid to take life and property risks, should provide the salaries of inspectors, perhaps conjointly with the National Register, the main *raison d'être* of the latter being the protection of the public.—I am, etc.,

DONALD SMEATON MUNRO.

Edinburgh,
October 21st.

[TO THE EDITOR.]

SIR,—I was very interested in Mr. T. C. Gilbert's excellent article "Our House in Order" in the current issue of THE ELECTRICIAN, and am entirely in agreement with the author and Mr. Morris that the need in the contracting branch of the trade is compulsory registration. I also consider it desirable to have compulsory licensing of wiremen, and H.M. Inspectors of Domestic Electrical Installations.

Compulsory registration is needed to protect the whole trade in general, and the legitimate contractor and efficient workman in particular. It would also protect the general public from the dangers of fire, shocks and burns which are always present wherever installations are carried out by the "jerry" contractor with semi-skilled labour. Compulsory registration would *not* give registered contractors a monopoly, because all good and efficient contractors, some of whom consider the voluntary register worthless, would apply for registration. We should then have more than enough to ensure wholesome competition.

Compulsory licensing of wiremen is also needed to protect the wireman, the contractor and the general public. There is a certain quantity of work which *must* be done either by efficient or non-efficient workmen. If the semi-skilled man is relegated to his proper sphere, it is to the benefit not only of the skilled workman, but to the general public and what is really far more important, the danger of using electricity in the farm and home would be reduced to a minimum. The contractor would also be insured against rival cheap-jack firms cutting him on labour by employing semi-skilled and boy-labour at wages less than the trade union rate.

H.M. Inspectors of Domestic Electrical Installations are needed to keep a check on the contractor who is likely to do inferior work. Although Mr. Morris is of the opinion that to do this it would require an inspector to sit on every job, and no doubt to inspect thoroughly such a thing is necessary, it is, of course, impracticable. All electrical work, whether executed by the supply authority, contractor or anyone else, should be inspected before connection to the mains, by a Government Inspector who could demand a thorough inspection of the installation (floor boards taken up, etc.). This would very largely foot the bill, and would give an independent expert opinion as to whether the work was satisfactorily done or not. If we can have H.M. Inspectors of Mines, and H.M. Inspectors of Factories, etc., why not H.M. Inspectors of Electrical Installations?

Living, as I do, in the heart of a mining district with several relations employed in coal mines, I am conversant with the danger of their calling. The miner is protected by H.M. Mine Inspectors from injury whilst at work, but upon his return home is exposed to endless risks of shock if his house has been wired by one of these cheap "plumtricians."—I am, etc.,

W. J. RHODES.

Pilsley, near Chesterfield.
October 21st.

[Other letters on this subject are unavoidably held over.—ED.]

Capital Urgently Wanted.

[TO THE EDITOR.]

SIR,—The Electrical Trades Benevolent Institution is sadly in need of additional capital, and I earnestly appeal to everyor e connected with our great industry to assist in bringing the amount up to a minimum of £50 000. The present fund, £37 000, is wholly inadequate to meet the rapidly growing volume of claims. The number of grants made has increased sixfold during the last four years and now exceeds one per day.

Every possible effort is being made to place the fund upon a wider base of small annual subscriptions from the class which derives most benefit from the Institution, but for many years to come this source of income cannot be expected to do more than meet the immediate claims for relief of temporary distress, and the more serious necessity for pensions in cases of permanent disablement must remain unprovided for if our capital fund is not greatly increased.

There are at present on the books totally incapacitated claimants drawing small temporary relief, renewed from time to time, who could, if blessed with a small pension, retire to the country to spend their remaining days in comfort and at less expense.

Every year hundreds of good-hearted people help the institution with their donations. To these I do most earnestly appeal to reconsider the amount of their donation in the light of their own position in the industry and remembering the vast army who when they fall upon evil days have a claim upon our benevolence. The majority of these people are earning little more than a living wage and cannot provide the necessary capital themselves.

Many employers subscribe large sums for the assistance and superannuation of their own staff—a splendid solution of much of our difficulty, but this does not help the employees of innumerable small firms and many large ones which have no such provision. At one time or another we do business with and make profit by all these people, so that although, no doubt, charity begins at home, we still have a responsibility towards others. I appeal, then, to those who are so generous to their

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own staff not to harden their hearts to the cry of the multitude without.

We are particularly wanting ten donors of £500 each to take up the ten vacant vice-presidencies of the Institution. Several gentlemen have already offered to do this, and I shall be very glad to hear from any reader of THE ELECTRICIAN who will come forward and do likewise.

We are also wanting fifty donors of £100 to take up life governorships. There are a great many who can afford this sum, and I am most anxious to get in touch with these to explain the great assistance this help will be at the present time.

The subscription for life membership is £10. Cheques for this or any amount larger or smaller will be most gratefully received.

A recent ruling has made it clear that gifts to the Institution will be added to previous gifts to qualify the donor for a life governorship or vice-presidency.

Full details of the Institution, with particulars of receipts and distribution, will be forwarded at once upon application.

Will readers please address donations to the Secretary, Electrical Trades' Benevolent Institution, 9, Southampton Street, Holborn, W.C.2, the Editor of THE ELECTRICIAN, or to the undersigned at 40, Hatton Garden, London, E.C.1.—I am, etc.,

London, October 16th. H. MARRYAT.

"Cooker Hot Plates."

[TO THE EDITOR.]

SIR,—I read with very great interest Mr. McRae's letter in your October 18th issue, as it undoubtedly raises the most important point in connection with electric cookers.

As manufacturer of a range of electric cooking utensils which increase the electric cooker efficiency anything between 50% to 200%, I find a remarkable amount of apathy among engineers. Not only do they entirely neglect the whole subject, but they actually go out of their way to ridicule and criticise scientific construction of electric cooking utensils upon which have been sunk thousands of pounds of capital.

The new totally-enclosed surface plates have revolutionised electric cookers and brought them within the reach of the million as an efficient cooking stove. They are, however, being rejected by the public, in some cases due to excessive current bills. Why not examine the cause, which is undoubtedly due to the use of light weight spun saucepans and kettles, which quickly buckle and warp, resulting in increased consumption. An efficient pan or kettle must be in contact with these plates all over, and must be "buckle-proof." Most of the "totally enclosed" surface plates are machined flat, and the utensils should be the same.

Why is it that there are such high percentages of failures in this country, against those of the Continent where the failures are only 1%? It is entirely due to use of the wrong type of kettle and saucepan. The public are in the hands of the showroom manager for advice; he usually thinks his work finished when he has persuaded his customer to instal an electric cooker, but he forgets that efficiency and moderate current consumption are a necessary constituent of success and confidence. If current accounts are high, the electric cooker is a commercial failure, but in fact, there is no reason for it. The showroom manager is led away by the bogey that the extra cost of proper utensils will frighten his customer away, whereas in fact, they are an investment which will earn high dividends and safeguard his customer.—I am, etc.,

London, N. October 22nd. S. DAVIS NICHOLLS.

Advertising for Electrical Contractors.

[TO THE EDITOR.]

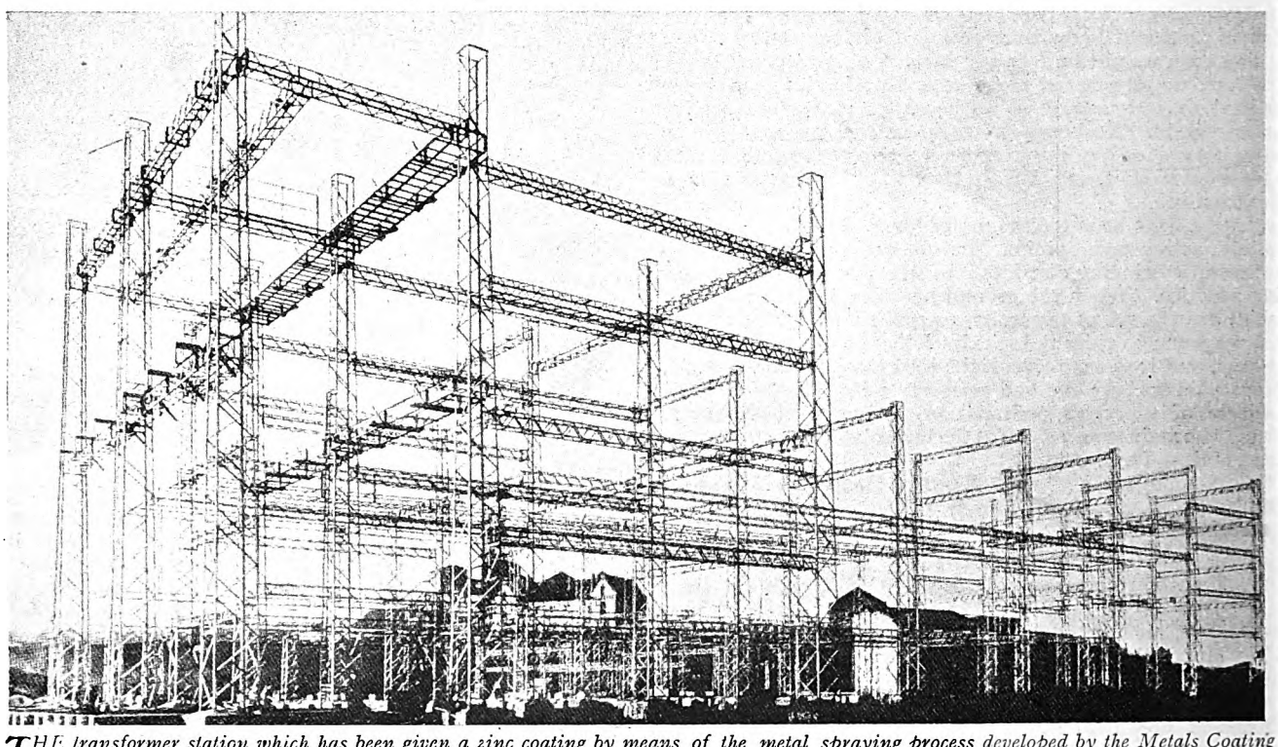
SIR,—In the article on Advertising in your issue of October 18th, "Publicity Consultant" reproduced an advertisement issued by a firm of contractors, which begins: "Safety first, Electricity may be either a treacherous or a trustworthy servant," and goes on to suggest that the average householder will be safe in the hands of the particular firm advertising.

My Council have on several occasions expressed the view that this type of advertisement is likely to discourage electrical development. It seems probable that many people will absorb the idea that they are not safe under certain conditions, while a few only will be satisfied that the advertiser is likely to keep them out of trouble.—I am, etc.,

W. A. VIGNOLES,
Director and Secretary,
British Electrical Development Association.

London, W.C.2.
October 21st.

[As the statement to which Col. Vignoles refers was not a solitary advertisement, but a page from a booklet, we cannot agree that it would discourage development. There is, we know, a sharp division of opinion as to whether we should safeguard the public by discreet warnings against the dangers of shoddy workmanship or treat consumers as children and hope for the best.—ED.]



THE transformer station which has been given a zinc coating by means of the metal spraying process developed by the Metals Coating Co., Ltd. It is claimed that the steel framework will be protected for about 15 years. Since it was unnecessary to provide for corrosion losses, comparatively light steel was used, and it is claimed that the saving in steel alone practically paid for the coating process. The various members are coated before assembly, and then, after erection, the work is completed by coating the rivets.

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NEWS IN BRIEF.

Extension of Croydon Electricity Works—Irish Hospital Lighting—Wireless Communication with Lifeboats—Rural Supplies in Holland—Electrical Equipment for Baths—Metropolitan Asylums Board's Electrical Requirements.

ELECTRIC lighting is to be adopted in the church at Easebourne, at a cost of £275.

Croydon Electricity Committee recently accepted a tender amounting to £20 900 for extensions at the power station.

Amongst the imports to Nicaragua in 1928 were included electrical goods valued at 119 935 cordobas (equal to U.S.A. dollars) from the U.S.A. and Germany.

The managing committee of the Limerick Mental Hospital has decided to invite tenders for lighting the institution electrically. The estimated cost is £2 500.

At a meeting of the Television Society on November 5th, at the Engineers' Club, London, Mr. F. Langford-Smith will deliver a lecture entitled "Amplification and Television."

Consumers at Sydney, N.S.W., who suspect their electrical installations of being defective may now have them examined by one of the Council's engineers by making a request to the Electricity Department.

Electric lighting is to be adapted at the Parish Church, Greenhithe, Kent.

Glasgow Health Committee recommends X-ray apparatus at Meanskirk sanatorium, at a cost of £1 955.

Reigate Board of Guardians has authorised an electric light installation in a portion of the institution, and in the Board-room, etc.

Dundee Electricity Committee has accepted a British tender for cables, valued at £5 796, against £5 344 quoted by foreign firms.

The Postmaster-General announces that telephone communication from London has been extended to Trento, Merano, Trieste, Verona, San Remo, Parma, and Florence (Firenze).

The first lifeboat to be fitted with a wireless telephone has been formally handed over to the inhabitants of Stornoway by Captain R. L. Hamer, on behalf of the Royal National Lifeboat Institution. The new lifeboat is 51 ft. long and is propelled by two 60 H.P. engines.

Mr. J. N. Waite, city electrical engineer, Hull, reports that he is proceeding with the equipment of the temporary showrooms at the city hall, which will be available for demonstrations on the inauguration of the cooker hiring scheme. He proposes to sell fittings and apparatus, subject to a satisfactory arrangement with local contractors on the assisted wiring roll.

At the recent annual meeting of the Incorporated Municipal Electrical Association (Mid-East England Centre) it was decided to ask the Council of the Association as to the procedure to be adopted to secure just treatment for undertakings which have been refused permission to extend their generating stations and are unable to obtain supplies from municipal sources.

Sir Clement Hindley, chairman of the Racecourse Betting Control Board, states that, by means of portable mechanical equipment, upon the final designs of which contractors are now working, the Board will be able to provide fully electrical totalisators on all important and medium sized racecourses. The buildings, cabling and wiring will be permanent, but the mechanical parts of the apparatus will be transported to a particular course when required.

It is reported that the Commission for Agriculture Co-operation of the Union of Co-operative Dairy Works in North Holland will endeavour, in co-operation with the Provincial power station, to supply the machinery necessary for using electricity to as great an extent as possible on farms in a district where the current is supplied directly by the Provincial power station. The plant will be loaned and the installation work carried out free of charge by the Provincial power station.

Barnsley Electricity Committee is to improve the electricity showrooms at a cost of £270.

The New England Power Association produced 147 859 000 kWh in August, or 39% more than in August last year.

Swansea Electricity Committee has authorised the purchase of an electric vehicle battery, at an estimated cost of £200.

The $1 850 000 generating station being built by the Saskatchewan Government at Saskatoon is expected to be ready for operation by November 15th.

The output of central generating stations in Canada during August last totalled 1 444 314 000 kWh as compared with 1 410 709 000 kWh in July and with 1 313 556 000 in August, 1928.

Public baths and washhouses are to be established in Oakdale Road, Wallasey, at a cost of £16 500. The equipment will include 47 electric drying courses and electric mangles, and the whole of the other machinery will be driven electrically.

Hastings Electricity Committee has voted £775 for adapting premises at York Buildings as electricity offices.

Walton-on-Thames U.D.C. has authorised the electrical engineer to purchase further cookers up to the value of £500.

At a meeting of the Birmingham Electric Club, to-night, Friday, at 7 p.m., at the Grand Hotel, Mr. T. A. Windibanks will read a paper entitled, "Motor Users and the Frequency Change."

Gravesend electricity department's new offices and showrooms in Harmer Street, Gravesend, were opened on October 23rd by the Mayor, Councillor R. McGregor. Cooking demonstrations are being given daily.

The Metropolitan Asylums Board recommends the installation of call bell systems, at the Eastern, North-Western, Grove, Brook, Park, South-Eastern, South-Western and Southern (Upper) Hospitals (estimated cost £1 262), and at Queen Mary's Hospital for Children (£350) and the installation at the Southern Hospital of 10 electrically-driven sewing machines and adaptation of two darning machines to electric power (£235). Electric motors are to be substituted for gas engines in the industrial workshops at Darenth Training Colony and £400 has been voted for this purpose.

It is announced that, pursuant to the various agreements between the Shanghai Municipal Council and American and Foreign Power Co., Inc., and the Shanghai Power Co., signed on August 8th last, the Shanghai Power Co. has succeeded to the business of the Shanghai municipal electricity department. The following have been appointed as the executive officers of the Shanghai Power Co.: Mr. T. H. U. Aldridge, vice-president and general manager; Mr. C. S. Taylor, deputy general manager; Mr. H. Gordon Wright, secretary; and Mr. E. J. Edgar, chief engineer. Communications should be addressed, Shanghai Power Co., 17, Foochow Road, Shanghai.

According to an announcement by the Hon. J. R. Cooke, representative of the Ontario Provincial Government on the Ontario Hydro-Electric Power Commission, consideration is being given by the Commission to the transfer to municipalities in the Central Ontario hydro-electric power zone of physical assets and reserves valued at $15 000 000, as soon as these authorities have set up their own distribution systems. An underlying principle of the legislation under which the Commission was set up is that power must be supplied to each municipality at cost. The legislation in question, it is considered, contemplates that reserves built up by the Commission in respect of operations in any particular area must ultimately pass to those municipalities owning their own local system of distribution.

D

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated October 25th,* 1879:

Ten electric lights were installed on Waterloo Bridge. They were worked by a 20-light Gramme machine in two circuits.

Details were given of Edison's sewing machine motor.

Three different telephone companies were competing in Paris, viz., the Gower (magnetic), Bell and Edison, the two latter working with the microphone.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *of October 28th,* 1904, *reported that:*

Brighton's municipal telephones made a net profit of £98 7s. 7d. in six months.

Mr. P. P. Wheelwright was appointed borough electrical engineer of Blackburn.

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W. E. HIGHFIELD SHIELD.

THE results of the 1929 competition for the W. E. Highfield Shield and prizes, recently held under the auspices of the A.S.E.E., were announced in our last issue, and we reproduce above portraits of (left) Mr. D. J. Williams, of Pontllanfraith, Mon., winner of the shield and first prize; (centre) Mr. E. E. Gammon, of London, winner of the second prize; and (right) Mr. F. Anderson, winner of the Associates' first prize.

PERSONAL.

CAPT. C. Jackson, manager of Oldham Tramways, has been appointed manager of Plymouth Transport Department.

Unsettled estate of the gross value of £265 689, with net personalty £254 988, was left by the late Sir J. A. Gatti, managing director of the Charing Cross Electricity Supply Co., Ltd., and a past-President of the Electrical Development Association, who died on September 14th, aged 57 years.

Mr. S. E. Monkhouse has been appointed chief assistant to the general manager of the Newcastle-upon-Tyne Electric Supply Co., Ltd. Mr. Monkhouse, who has been with the company for 25 years, has, during the past few years, acted as chief of the company's power department. Mr. E. H. E. Woodward, who has been with the company over 20 years, has been appointed technical assistant to the general manager. See page 511.

The Kelvin Medal Award of the Institution of Civil Engineers, which has this year been awarded to M. Andre Blondel, will be presented by Sir Donald Macalister of Tarbert, Principal and Vice-Chancellor of Glasgow University, in the Great Hall of the Institution of Civil Engineers, on November 5th, at 5 p.m. The French Ambassador will receive the medal on behalf of M. Blondel, whose health does not permit him to travel to London. Sir Brodie H. Henderson, President of the Institution and Chairman of the Award Committee, will take the chair.

Owing to the calls of his legal practice Mr. T. Trimnell, who has acted as solicitor and secretary of the National Register of Electrical Installation Contractors since its inception six years ago, has relinquished the secretaryship, but will continue to act in a consultative capacity. Mr. Trimnell was personally responsible for a very large part of the preliminary organising and legal work, and his enthusiasm and experience have proved invaluable in building up the National Register to the position of influence and authority which it occupies to-day. Mr. Trimnell is followed in the secretaryship of the National Register by Mr. A. Montgomery, who has had considerable experience in the electrical industry. See page 511.

Blackburn Corporation has confirmed the appointment of Mr. Wm. Arden Royle as engineer and manager of the electricity undertaking, in succession to Mr. P. P. Wheelwright, retired. There were 40 applicants for the post, and three appeared before the Electricity Committee—namely, Mr. Wm. Arden Royle, assistant engineer and manager to Sunderland electricity department; Mr. C. E. Greenhalgh, of Watford; and Mr. Irwin Shuttleworth, of Hull. Mr. Royle spent his early years at Southport, but is a native of Manchester. He is 39 years of age, and was a pupil of the Southport Electric Lighting Co., afterwards becoming assistant and chief assistant engineer to Monmouth Corporation. Subsequently he was for 7½ years with the British Westinghouse Electric and Manufacturing Co., and later was in the service of Ferranti, Ltd. In 1918 he secured a position as substation superintendent to Sunderland electricity department, and became, successively, distribution engineer, technical assistant, sales manager and assistant engineer and manager.

BUSINESS ITEMS.

NEW DISTRIBUTORS OF EDISON STORAGE BATTERIES, LTD., have now settled into permanent offices on the sixth floor instead of the temporary offices on the fourth floor, at their same address, Victoria House, Southampton Row, W.C.1.

The ENGLISH ELECTRIC CO., LTD., Queens House, Kingsway, W.C.2, has received a contract from the South Indian Railway Co. for the rolling stock required for the electrification of the Madras suburban services. The order comprises 17 three-coach articulated units, each unit consisting of three all-steel coaches, together with the necessary electrical equipment. The total value of the contract is about £170 000.

The WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD., 82, York Road, King's Cross, London, N.1, has been informed that advices have been received that the United States Court has declared that the "Kuprox" rectifier is an infringement of the Grondahl patent, under which "Westinghouse" metal rectifiers are manufactured, such court also declaring the patent valid. The WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD., is the owner of the British rights in such patent.

The D. P. BATTERY CO., LTD., Bakewell, advises us that in order to demonstrate the manner in which the plates in "Kathanode" bus lighting batteries retain their active material, a battery which had been in use for nearly two years on a corporation bus was opened up recently for examination, with the result that the positive plates were found to be in very good condition and the active material intact and firm. The negative plates were also in good condition, while the separators showed no signs of breaking down.

With reference to the "Ever-Ready Week" which was held from October 7th to 12th, the EVER-READY CO. (GT. BRITAIN), LTD., has awarded first prizes to Mann, Egerton and Co., Ltd., 21/23, King Street, Norwich; Pollock and Co., 222, Argyle Street, Glasgow; Mr. T. M. Kingdon, 97, High Street, Winchester; Hardy Bros., Ltd., Commercial Street, Hereford. Other prize winners are:—The Electrical Supplies Co., Cavendish Street, Chesterfield; Mr. Eric Thomson, The Electric Shop, Thirsk; Mr. R. Hazelton, Portadown; and Mr. Andrew McRobb, Aberdeen. See pages 511 and 513.

In connection with a new underground railway in Buenos Aires (Ferro Carril Central Terminal de Buenos Aires), the GENERAL ELECTRIC CO., LTD., of Magnet House, Kingsway, W.C.2, has been awarded the contract for the complete electrical equipment of the rolling stock, covering the motors and control gear for the total of 56 motor coaches. The latest type of (Oerlikon system) traction equipment will be fitted; the motors will be of the self-ventilated interpole type, arranged for field tapping, and the control will be of the unit-switch electro-pneumatic type. The G.E.C. is also supplying the equipment for the lighting and the automatic door control of the coaches. The main contractors for the rolling stock are the METROPOLITAN-CAMMELL CARRIAGE, WAGON AND FINANCE CO., by whom the contract for the electrical equipment was placed with the G.E.C.

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LEGAL INTELLIGENCE.

Marconi and General Electric Companies' Agreements.

THE question of the continuance of two agreements, one between Marconi's Wireless Telegraph Co., Ltd., and the General Electric Co., Ltd., and the other between these companies and the M.O. (Marconi Osram) Valve Co., Ltd., came before Mr. Justice Eve in the Chancery Division on October 16th, on a summons taken out by the General Electric Co. to which the other companies were respondents.

Mr. Gavin Simonds, K.C., and Mr. Peel appeared for the General Electric Co., and Mr. Wilfrid Greene, K.C., and Mr. Uthwatt for the Marconi Co. The M.O. Company did not appear.

Mr. Simonds said the summons was for the purpose of having construed these agreements, and the question of construction was whether, as the General Electric Co. said, the agreements were subsisting and permanent, or whether, as the Marconi Co. said, either the agreements were for a definite term, or they had been determined. The first agreement, dated August, 1919, recited that the General Electric Co. owned a factory at Brook Green which was equipped for the manufacture of wireless valves and was used for such manufacture. The two companies agreed to form a private company for the purpose of acquiring this business. The capital of the new company was to be £100 000 subscribed for by the two companies in equal shares, and the General Electric Co. was to let the factory to the valve company for ten years at a rent of £1 400 a year, and to sell the plant, etc., for £17 000. Each company agreed with the other not to manufacture valves or to import valves for sale. The valve company was duly formed in October, 1919, and the second agreement, contemplated by the first, was entered into in November. The Marconi Co. said that the obligation of the parties under both agreements were co-terminous with the lease, but he (Mr. Simonds) contended that the term did not end with the lease.

Mr. Greene submitted that the agreement automatically came to an end on the termination of the lease. The parties could not have contemplated entering into an agreement which would last for ever. Mr. Justice Eve reserved his judgment.

Sydney Bribery Charge.

According to "The Times", a full bench of the High Court of Australia has confirmed by a majority the conviction of Babcock and Wilcox, Ltd., on a charge of having at Sydney corruptly given to Mr. Silas Young Maling, deputy general manager of the municipal Electricity Department of Sydney, £10 600 as a reward for his recommending the council to accept the company's tender for certain machinery. Mr. Justice Starke, dissenting, said that the case was suspicious, but suspicion was not proof.

It will be remembered that in December, 1928, at the Sydney Police Court, the local agent of Messrs. Babcock and Wilcox was found guilty of paying the sum of £10 600 to Mr. Maling, and the company was condemned to pay a fine of £1 000 and to recoup the Sydney City Corporation the £10 600. In March last the company's appeal against the conviction was upheld by a majority vote of the Court, and the company was acquitted of responsibility. The Crown Law Department appealed against that decision, with the result stated.

Alleged Patent Infringement.

Suit was filed last month in the U.S. District Court, Eastern District, Brooklyn, New York, against the Aerovox Manufacturing Corporation by the Dubilier Condenser Corporation, charging infringement of patent No. 1 688 478. The patent is claimed to be of value in the radio and allied industries and to cover the manufacture and use of paper condensers. This patent is equivalent to British patent 283 543.

Important Action Pending.

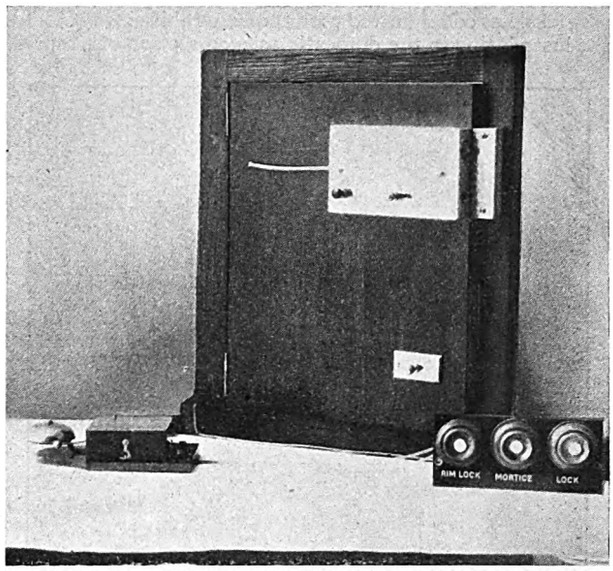
In the Chancery Division, on Monday, Mr. Tyldesley Jones, K.C., asked Mr. Justice Romer to fix a day for the hearing of an action by the Oxford Corporation against the Oxford Electric Co., Ltd. He said it was in Mr. Justice Maugham's list, but, for personal reasons, he could not hear it. He asked that it be fixed for November 12th.

It was a case in which questions arose on the construction of a purchase clause, and there was a counter-claim on which expert evidence would have to be called.

His lordship said he would have it put into the list for hearing on November 12th, subject to anything part heard.

AN ELECTRIC LOCK.

IN connection with the International Exhibition of Inventions, held in London recently, and reviewed in THE ELECTRICIAN of October 11th, it is interesting to note that the first prize in the Electrical Section was awarded to Messrs.



The locking device which was awarded the first prize of the Electrical Section of the International Exhibition of Inventions.

E. W. Porch and J. T. Knight, of 222, Dalston Lane, London, E.8.

The lock can be applied to doors, blinds, grilles, etc., and, in addition to the ordinary mechanical operation common to all locks, a remote control device permits the locking unit to be released, at the same time sounding an alarm. Where desired an indicator board may be used in connection with the lock and the alarm may be either intermittent or continuous as desired. After the summons has been answered the door or blind may be again locked either from the inside or the outside whichever is convenient or more appropriate.

The lock is operated by means of a battery and in cases where remote control can be dispensed with 2 V are sufficient for security. Where distant control is required, however, then 6 V must be applied.

The lock itself consists of a bolt held in an extended position by a lever canted by two springs arranged in such a way that any attempt at forcing the bolt causes the canting movement to become automatically tighter. When the control button is pressed from a distance the canted lever is pulled into an upright position by a small electro-magnet; the bolt is then forced back by a spring and makes contact with the alarm circuit. When operated from the door contact is made or broken as the case may be.

MANCHESTER ELECTRO-HARMONICS.

The Manchester Electro-Harmonic Society opens its eleventh season to-day, Friday. Once again the main hall of the "Manchester Limited" restaurant, Royal Exchange Building, has been engaged for the series of concerts, and the applications for membership to date promises a still further increase in the number of members. Mr. J. A. Robertson, as President, will occupy the chair on the opening night, when The "Duds" Concert Party provides the entertainment. The dates of other concerts are November 15th, December 13th, January 17th, 1930, February 21st, and March 31st. The Liverpool Electro-Harmonic Society will again visit the Manchester Society at the December meeting. A Ladies' night has been arranged for February 1st, as the experience of the last two proved their popularity and success. It might be pointed out that this function has now become an annual feature and is additional to the six monthly concerts regularly arranged for. It is intended this year to recognise in some tangible form the long and efficient service rendered by the Hon. Secretary, Mr. C. E. Leak, and the Hon. Treasurer, Mr. L. H. Marlor. A Sub-Committee has been appointed to deal with this, and it is hoped to make these presentations before the Christmas recess. Once again the balance sheet shows a good reserve on the year's working, and the Society is flourishing from all points of view.

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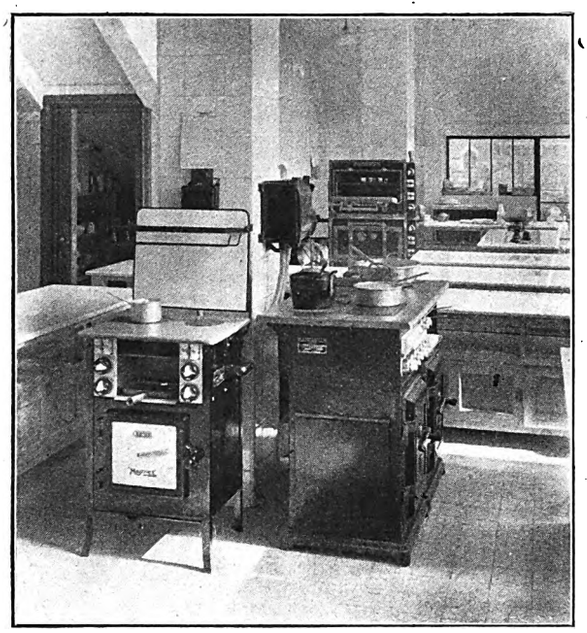
REGENT POLYTECHNIC.

Some of the Electrical Equipment in the New Extension.

FROM the earlier stages of the construction of the new extension of the Regent Street Polytechnic, which was opened on October 10th, the Director of Education (Major T. Worswick), has collaborated with the General Electric Co., Ltd. in the installation in the domestic science section of a represen-



A "Magnet" double oven range and 2-deck pastry oven in the cooking school.

tative assembly of cooking, baking and laundry apparatus. In the housewifery section for instance, is a series of demonstration cabinets staged all along one side of the room in which the working parts of ten household appliances are separately assembled and mounted and their relative functions diagrammatically explained. Similarly, batteries, electric bells, and the evolution of the gasfilled lamp are also explained. The practical application of electricity for domestic heating is demonstrated by the use of five fires of various design and loading. While the cookery lecture and demonstration theatre is filled with double oven range, a double deck baking oven, and four types of cookers, including a model de-luxe table cooker for a household of ten persons. In the laundry school, equipped by the G.E.C. throughout, the washing and wringing machine obtains the necessary hot water from an electric 10 gallon water heater alongside it, while correct methods of ironing and finishing are imparted by the use of an "Apex" electric ironer or by the more usual hand iron, several 5½ lb. and heavier laundry irons being available for this purpose. Other items included in the equipment are an electric fan and an "Eco" drying cabinet to expedite the drying of articles immediately they are released from the wringer. The restaurant kitchen premises are in the basement in immediate proximity to the sub-station of the Marylebone electricity supply undertaking, and an extensive range of heavy cooking apparatus has been installed.

SULZER BROS., 31, Bedford Square, London, W.C.1, have installed their system of thermal storage heating, the underlying principle of which is the employment of high or low tension alternating current in an electrode boiler in which water forms the resistance, and after being heated by the passage of the current from electrode to counter electrode is delivered into vessels storing this accumulated heat for use at any desired time. The boiler is of 1 850 kW capacity, and operates off the 6 600 V, three-phase, 50-cycle mains. The plant is automatic in its operation, changes in load being counteracted by means of three insulating cylinders surrounding the electrodes. These cylinders are raised or lowered automatically by means of a small hydraulic motor, in this way varying the effective distance between the electrodes so as to maintain a constant load on the boiler. The latter feeds the heated water into three large, well-lagged storage tanks, the total capacity of which is 27 000 gallons.

ELECTRICITY AND EGGS.

Electrical Devices for Use in Hatching and Testing.

FARMERS interested in the breeding of chickens will be attracted by the "Inventum" electrically-heated "foster mother" marketed by Mr. ALAN WRIGHT (Inventum Electrical Appliances), 117, Victoria Street, London, S.W.1. The unit is of robust construction, having an outer casing of heavy gauge galvanised iron. The element is totally enclosed, and of large dimensions relative to the loading. thus preventing the surface temperature becoming too high for safety. A 3-heat switch is provided, and normally this can be kept at "medium" or "low." The cost of running is stated to work out at approximately half a unit per chick over the complete period during which they require a foster mother. The loading is as follows, F.M.1 and F.M.2 referring to the two sizes of machine available :—

	Watts maximum	Watts medium	Watts low
F.M.1 ..	400	250	150
F.M.2. ..	700	450	250

F.M.1 has a capacity of 150 chicks, and F.M.2 a capacity of 400 chicks. The heights and diameters are respectively 27½ and 31, and 29 and 51 inches, and the weights 77 and 174 lb.

Dishonest persons who attempt to evade the Merchandise Mark Order by deleting the stampings on eggs which show the country of origin are given short shrift by the K.B.B. ultra violet fluorescence cabinet. This device is manufactured by KELVIN, BOTTOMLEY AND BAIRD, LTD., of 18, Cambridge Street, Glasgow, and Imperial House, Regent Street, London, W.1. In this fluorescence cabinet the eggs are seen in their natural pink colour, and any mark which has been formerly applied to the shell is shown up distinctly. The cabinet consists essentially of a metal housing for the quartz burner (of the K.B.B. atmospheric type) mounted on a base fitted with supports so arranged that a large compartment beneath is flooded with ultra-violet light, the visible light being filtered off by a removable light filter let into the floor of the lamp enclosure. A curtain excludes light from outside, thus allowing the fluorescences of substances to be shown up strongly. In the front wall of the housing another removable light filter is fitted to provide a horizontal beam, in order that materials may also be viewed by transmitted radiation. A slide shuts off the beam when necessary. Another slide carries an adaptor in which may be placed quartz cells, special filters or substances to be examined by transmitted radiation.

ELECTRICAL WOMEN.

A new branch of the Electrical Association for Women has been formed in East Devon and the inaugural meeting was held yesterday, Thursday, at the Nisi Prius Court, Exeter Castle, Exeter. The speakers were Mrs. J. M. Phillips, the President, Mrs. Wintringham, Coun. A. E. Brock, Mr. Selwyn S. Grant, Miss M. Partridge, and Miss C. Haslett. The local secretaries are Miss Wilson, 181, Sidwell Street, Exeter, and Miss M. Binney, 57, Hartop Road, St. Mary's Church, Torquay.

A Plymouth branch of the Association has also been formed, and will be formally inaugurated at a meeting arranged for to-day, Friday, over which Viscountess Astor will preside. A committee of twelve has been appointed, with Coun. Mrs. C. Daymond as chairman. Miss M. Hollest, joint hon. secretary, states that it is difficult to say at present whether the programme of the Plymouth branch will include lectures of interest to those in the electrical trade, but it is hoped that Mrs. E. G. Okell, wife of the Plymouth electrical engineer, will address the members on elementary electricity, while visits to the British Broadcasting Corporation's local studio have been arranged. Other suggestions under consideration are a display of electrical Christmas gifts, accompanied by a lecture on them, and a demonstration of electric cooking.

The first annual conference of the Rugby branch of the association was held on October 10th, the anniversary of the inaugural meeting in 1928. Nearly 50 members of the branch were entertained to luncheon and tea by the British Thomson-Houston Co., Ltd., and the afternoon was spent in visiting the Rugby works of this firm. At the annual general meeting, in the evening, with Viscountess Fielding, President of the branch, in the chair, the following officers were elected for the 1929/30 session :—Chairman, Mrs. Knight; Hon. Secretaries, Miss Pedlar and Miss Timms; Hon. Treasurer, Mrs. Kennard.

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BRIGHTON ELECTRICAL EXHIBITION.

Further Brief Descriptions of Some of the Outstanding Items at Brighton — Demonstrations of Varied Interest as Part of Exhibits.

(*Concluded from page 470.*)

METRO-VICK SUPPLIES, Metro-Vick House, 155, Charing Cross Road, London, W.C.2, exhibited the "Met-Vick Tudor" imitation coal fire, incorporating a realistic coal fire effect, obtained by means of a standard flame lamp placed at the back of the fire, and controlled independently from the elements. Each element is controlled by a separate switch. This model is obtainable in two sizes: for 2 kW and 3 kW, and in three finishes:—chromium plated oxidised copper and oxidised silver. Another exhibit was the "Met-Vick" electric automatic kettle, already described in THE ELECTRICIAN. The "Met-Vick" iron-de-luxe is a new model specially designed for the easy ironing of delicate fabrics. It weighs 5½ lb., heats up quickly, and keeps its heat under the heaviest working conditions. Other features are the thumb rest, new type connector, and a pressed steel tablestand, so designed that the iron cannot slip off when not in use. The iron is obtainable nickel-plated and blue vitreous enamelled. A wide range of cookers was also displayed.

MOFFATS, LTD., 15, Victoria Street, London, S.W.1, showed a representative selection of their electric cooking ranges. The standard Canadian models range from the E.396 with three ovens, two warming ovens and six boiling rings, to the E.28 with one oven and two hot plates. They are supplied in two finishes, the standard having porcelain enamel top, front and linings, and the "C" finish, which has, in addition, porcelain enamel sides and back legs. All ovens are provided with top and bottom heating elements. Two new models are E.42 and E.43, which have an outside grill and, in addition, a large warming compartment for plates, etc. In the smaller of these, the E.42, there is a combined grilling and boiling element known by the name of "Pyroy." This is totally enclosed, made throughout of good heat-resisting materials, ensuring that quick boiling and efficient grilling are simultaneously obtainable. For small flats and apartments the E.41 model is a very well-made and convenient range. The oven measures 12 in. by 10½ in. by 11 in. high, and has top and bottom elements. A temperature indicator is fitted on the oven door. The upper element is a "Pyroy" and boils a kettle or saucepan and grills or heats the oven simultaneously.

The REVO ELECTRIC CO., LTD., Britannia Works, Tividale, Tipton, Staffs. An excellent display of domestic electrical apparatus was shown on the stands occupied by this company. In the Dome, a comprehensive display of electric fires was given, including new designs, some of which are fitted with the new "Radiabar" element. "Revo" irons and automatic electric kettles were also shown. Electric cooker and water heaters were also exhibited in all sizes for all conditions.

Domestic and Industrial Switchgear.

A. REYROLLE AND CO., LTD., Hebburn-on-Tyne, showed a representative collection of small metal-clad air-break switches, for domestic and other purposes. All the switches are of the quick-make-and-break pattern, and their covers are interlocked so that it is impossible to open them when the switches are in the "on" position, or to close the switches when the covers are off. The domestic switches included a cooker control board with a red lens and an indicating lamp to show when the switch is on. There was also a change-over switch for those who contemplate water heating as well as cooking by electricity. This switch is arranged so that the supply can be taken to either the cooker or the heater, whichever is desired. A board was also exhibited showing a number of plugs and sockets that have been manufactured to B.S.S. No. 196-1927. Since this specification deals with 5 A, 15 A, and 30 A sizes, it marks an important stage in development, because it provides for metal-clad enclosure of these comparatively small plugs and sockets, and so introduces, for domestic apparatus, a safe connector for portable appliances. Another interesting exhibit was a showboard with a number of fuses mounted on it. These are designed to comply with the H.O. Regulations and to be used on circuits working at pressures up to 660 V. The fuses are built with self-aligning contacts and are ventilated. Some ironclad switch type fuse boxes were also exhibited. These consist of a box containing two clips into which the fuse is inserted. The action of opening the lid of the box withdraws the fuse and isolates the circuit.

SADIA, LTD., 22, Newman Street, London, W.1, displayed the well-known "Sadia" automatic electric water heaters, of which, it is claimed, there are over 30 000 now in use. This apparatus is a self-contained unit, very efficiently heat insulated, similar to a thermos flask. The water is heated by special electrical elements, which take only a small amount of current, and are connected automatically to the supply mains by means of a thermostatic switch until the water in the heater has attained the storage temperature of 190 deg. F. When hot water is drawn from the heater, its place is taken by an equal quantity of cold water, and the thermostatic switch again connects the element to the mains until the contents of the tank once more reach the storage temperature. A complete domestic hot water service for a small house can be provided for 800 to 1 000 W. We are informed that nine gallons of water from the Sadia heater, mixed with 15 gallons of cold water, will provide 24 gallons of bath water at 102 deg. in less than 5 min., and at a cost not exceeding 3d. (with electricity at ¾d. per unit). The heaters are finished in white enamel, with nickel-plated fittings.

Another Water Heater.

SANTON, LTD., 149/150, Dock Street, Newport, Mon., exhibited and demonstrated the "Santon Circulator" hot water system. This, it is claimed, is simple and easily installed and does not interfere with existing regulations of either water or electricity departments. The method of fixing the circulator in the tank was demonstrated on the stand. When the current is switched on the water inside the circulator becomes heated, rises, and flows through the outlet at the top of the tube, remaining at the top of the tank ready to be drawn off at any of the taps in the house. Other exhibits included the "Santon" electric tank belt, which has already been described in these pages. It is supplied in three loadings, 500, 750, and 1 000 W, to fit tanks up to 57 in. in circumference.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38-39, Upper Thames Street, London, E.C.4. The exhibits here comprised a full range of "Xcel" electric domestic appliances, and cooking demonstrations were given. Other exhibits were electric irons, kettles, toasters, milk warmers, shaving pots, fires, etc., including new models of the popular "Cosyglo" imitation coal fires with moving flame and smoke effect. The new "Xcel Minor" cooker was also shown as well as "Ultralite" fittings.

JAMES STOTT AND CO. (ENGINEERS), LTD., of Vernon Works, Oldham, demonstrated their well-known water boilers and café sets for hotels, cafés, canteens, etc. The instantaneous water boilers are specially constructed to give nothing but boiling water at the draw-off tap. The water is heated by immersers which are split up into a main and byepass, each being controlled by a separate rotary snap switch mounted on the base of the boiler. A feature of these appliances is their accessibility for cleaning in hard water districts. By the unscrewing of one nut, which can be done with the fingers, the complete interior can be withdrawn for cleaning and removal of deposit. The construction of the elements has also been specially arranged for use in hard water districts. The top of the boiler can be fitted with a flat bain marie tray for warming teapots, pies, etc., etc. The boiler is fed automatically with cold water from the main. The "Stott" café set comprises the boiler as above, on each side of which is mounted an earthenware or nickel-lined urn, of any desired capacity. One urn is fitted with a specially arranged draw-off tap, and is for milk warming. The other urn is arranged for coffee making and warming.

YOUNG, OSMOND AND YOUNG, LTD., Unity Works, Welwyn Garden City, exhibited a range of "Unity" tubular electric heaters for schools, churches, cinemas, factories, hospitals, public buildings, offices, private houses, etc., towel airers, four bar radiators, anti-condensation window heaters, linen cupboard heaters, car heaters, tubular heaters for traction work, and thermostats to maintain constant air temperature, all of which have been dealt with in previous issues of THE ELECTRICIAN.

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SIR ALEXANDER KENNEDY.

Memorial to Late Pioneer in Engineering Education.

SIR Alexander Kennedy was a pioneer in engineering education, for, during his tenure of the Chair of Mechanical and Civil Engineering (1874–1889) at University College, London, he was largely responsible for the lines and methods which higher education in engineering has adopted. As an engineer in practice, his wide knowledge of mechanical and electrical engineering was always available for the service of the country. There was a strong feeling common to all who knew him and his work, that a permanent and lasting memorial of the affection and esteem in which he was held should be established. The movement was accordingly initiated in 1926, to endow the Chair of Mechanical and Civil Engineering at University College, London, which he held with such distinction. The amount required for this purpose was £30 000, towards which a sum of £18 035 has already been subscribed, leaving the amount of £11 965, still to be raised. A considerable proportion of this sum was subscribed before Sir Alexander Kennedy's death, to a large extent by his old students and personal friends.

Some of the Subscribers.

Since his death, subscriptions have been received from the following: Mr. A. H. Abbot, Mr. R. W. Allen, Mr. G. C. Allingham, Mr. J. Angus, Sir John Aspinall, Mr. L. W. Atcherley, Mr. F. Ayton, Mr. Frank Bailey, Prof. Francis Baily, Mr. H. G. Foster Barham, Prof. Archibald Barr, Mr. Onward Bates, Mr. A. R. Bellamy, Bellis and Morcom, Ltd., Mr. W. M. Bergin, Mr. Rustat Blake, Mr. J. P. Bowen, Mr. C. V. Boys, the British Thomson-Houston Co., Ltd., Mr. R. P. Brousson, Mr. Robert A. Bruce, Mr. Alfred H. Burbidge, Mr. Henry Burkinshaw, Mr. Charles Burnet, Signor G. Carosio, Mr. R. A. Chattock, Sir Dugald Clerk, Prof. W. C. Clinton, Prof. E. G. Coker, Mr. C. E. Commans, Lord Congleton, Mr. W. W. Cook, Mr. Edgar Cox-Walker, Mr. A. C. Cramb, Mr. H. H. Dalrymple-Hay, Mr. F. R. Davenport, Mr. Claud S. Day, Mr. Maurice Deacon, Dr. S. Z. de Ferranti, Mr. Edward W. Dickenson, Capt. J. M. Donaldson, Mr. S. B. Donkin, Mr. Alexander Dow, Mr. R. Dumas, Mr. Walter Dunn, Mr. G. H. Eaton, Mr. A. C. Eborall, Lt.-Col. K. Edgcumbe, Mr. Talfourd Ely, Mr. F. O. Everard, Mr. Sydney Evershed, Ferguson, Pailin, Ltd., Mr. T. J. Fleming, Prof. George Forbes, Sir Henry Fowler, Mr. H. P. Gaze, Sir Alexander Gibb, Mr. Frank Gill, Prof. John Goodman, Prof. J. W. Gregory, Mr. S. K. Gurtu, Sir Robert Hadfield, Sir Brodie Henderson, Mr. J. S. Highfield, Sir Henry Jackson, Mr. Bernard M. Jenkin, Mr. K. J. Kaula, Mr. J. M. Kennedy, Prof. Arthur E. Kennelly, Mr. H. W. Kolle, Mr. Edwin C. Lacey, Mr. W. W. Lackie, Mr. H. C. Lamb, Mr. H. W. Lash, Mr. J. E. Lea, Mr. Edward H. Leaf, Lt.-Col. Henry M. Leaf, Col. David Lyell, Prof. J. C. McLellan, Mr. A. Woodruffe Manton, Mr. Howard Martineau, Mr. Sydney Martineau, Mr. J. W. Meares, Metropolitan-Vickers Electrical Co., Ltd., Mr. C. T. Millis, Mr. T. Mohn, Sir Ernest Moir, Mr. Richard Moreland, Mr. K. S. Murray, Mr. H. F. Newall, Mr. W. H. Newman, Mr. J. C. Peache, Mr. C. D. Pearson, Mr. David T. Powell, Mr. F. E. Proctor, Dr. A. H. Railing, Dr. Mario da Andrade Ramos, Sir Hugh Reid, Mr. W. D. Reynolds, Lord Riddell, Mr. F. W. Roberts, Mr. Arthur Rogers, Sir Ernest Rutherford, Mr. L. Gordon Rylands, Mr. Edwin Seddon, Mr. Joshua Shaw, Mr. W. H. Shortt, Mr. Charles W. Smith, Sir J. Walker Smith, Mr. Roger T. Smith, Mr. J. M. Smyth, Sir John Snell, Mr. C. E. Stromeyer, Mr. A. Struben, Dr. Ambrose Swasey, Eng.-Captain H. R. Teed, R.N., Mr. F. C. Temple, Mr. W. J. Tennant, Mr. J. C. F. Thomas, Lt.-Col. W. A. Vignoles, Lord Weir, Mr. Thomas Weir, Mr. Robert S. Whipple, Mr. T. P. Wilmshurst, Mr. Edgar Worthington, Dr. W. Barton Worthington, Sir Alfred Yarrow, and Mr. F. A. Yerbury.

The movement is supported by the Royal Society, the Institutions of Civil Engineers, Mechanical Engineers, and Electrical Engineers. It is desired to complete the fund as soon as possible by raising the amount of £11 965. Subscriptions should be sent to Lord Meston, at University College, Gower Street, London, W.C.1.

The current issue of the "Henley Telegraph" marks an interesting stage in the life of the magazine. Its price is reduced to 2d. The high standard of matter, production, and printing remains the same, but because of an increased grant from the company it has been possible to reduce the price from sixpence.

LEON GASTER MEMORIAL.

Proposed Fund to Establish Special Illuminating Premium.

NEARLY two years have elapsed since the death of Mr. Leon Gaster, Founder, vice-President and Honorary Secretary of the Illuminating Engineering Society, and during this period the feeling has been present in the minds of many that there is a strong desire among members of the Society to commemorate in a fitting way the services which he rendered to the society and to illuminating engineering during nearly 20 years. The Council has concluded that there is no better way of doing this than by linking Mr. Gaster's name with some scheme which will further the aims which in his lifetime he strove to foster, namely, to increase the reputation of the society, to stimulate a high standard in the papers and contributions which are submitted to it, and to encourage experiment, research and investigation. The Council has accordingly decided to institute a "Leon Gaster Memorial Fund." It is proposed that a fund of not less than £200 shall be collected, the interest on which shall be devoted primarily to the establishment of a Premium to be awarded annually for the best contribution from a subscribing member of the society on any aspect of illuminating engineering which is submitted to the Illuminating Engineering Society during the year. It is proposed that the Premium should be used for the purchase of books, instruments or apparatus, as the recipient may desire, and that it should be accompanied by a certificate on vellum recording the award. It is hoped that the requisite fund will be collected and the necessary Trust completed in time for the first award to be made in 1931.

Promises of contributions to the fund ranging from 5s. to £5 5s. have already been received. If all members of the Society will subscribe, each according to his ability, it should be possible to establish a memorial which will worthily commemorate Mr. Leon Gaster's services to illuminating engineering.

Contributions or promises should be sent to the Hon. Secretary, Mr. J. S. Dow, 32, Victoria Street, London, S.W.1.

THE NEW INDIVIDUALISM.

Definitions of the True Individualist.

THE twenty-seventh Individualist Luncheon took place on October 16th, at the Hotel Cecil, London, when Coun. Miss Bright Ashford, gave an address on "The New Individualism," during the course of which she said that one of the tenets of Socialism was its championship of the bottom dog. The English character exhibited a love of benevolence. She had noticed, however, that members of public bodies loved the opportunity of being benevolent with other people's money. In this regard, Miss Ashford exemplified the parable of the Good Samaritan. The Samaritan did good and spent his own money and energy in so doing. This was Individualism. A Socialist, faced by the same situation, would have called a meeting and passed a resolution. To show the difference between various points of view, Miss Ashford referred to methods of transporting people in use at tube stations at different times. The oldest method was the staircase. This was parallel to the Old Individualism. It was a case of the most active people getting ahead, and the devil take the hindmost. The next method in use, the lift, was parallel to Socialism. Everybody had to wait, whether they could walk swiftly or slowly. In this way, enterprise was kept back to the level of the lowest. The latest method in use, the escalator, was parallel to the New Individualism; it gave opportunities to all. The enterprising and active could hurry on; the slower ones could stand, yet still be carried on their way. In the same way, the New Individualism helped the slow without keeping back the more enterprising. Individualists made use of enterprise and benevolence without vitiating the character of the people.

PATENTS AND DESIGNS.

The committee set up under the chairmanship of Sir Charles Sargant to consider whether any amendments in the Patents and Designs Acts, or any changes in Patent Office practice, were desirable, are continuing their meetings at the Board of Trade for the purpose of hearing evidence from interested parties. Any persons or associations who desire to submit suggestions, or to give evidence, should communicate with the secretary, Mr. R. W. Luce, Industrial Property Department, Board of Trade, 25, Southampton Buildings, W.C.2.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

SMETHWICK EDUCATION COMMITTEE.—Electric or other heating system in the new Uplands School. Further particulars from the Director of Education, 215, High Street, Smethwick.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, October 25th.—One 130 ton, 4-motor, electric, engine room crane, one 15-ton, 3-motor, electric, auxiliary bay crane, and one 10-ton, 3-motor, circulating pump house crane, at Ironbridge power station. Specification (No. 6) from Mr. E. F. Hetherington, chief engineer and manager; deposit £1 1s.

CARLISLE CORPORATION, October 28th.—Electrical installations to 250 houses on Raffles-Newtown and Botcherby estates. Specifications, etc., from the City Engineer, 18, Fisher Street, Carlisle.

GLASGOW CORPORATION, October 28th.—Electric cable, steel poles, lanterns and cast iron bases, for street lighting. Specifications, etc., from the Inspector of Lighting, 20, Trongate, Glasgow.

WEST RIDING EDUCATION COMMITTEE, October 28th.—Electric light installation at Whitwood Mining and Technical Institute. Specification, etc., from the Education Officer, County Hall, Wakefield.

BRAINTREE RURAL DISTRICT COUNCIL, October 29th.—Supply and fixing of electrically driven and automatically controlled high lift centrifugal pumping plant. Specifications, etc., from Mr. J. D. Haworth, 3, Central Buildings, Westminster, S.W.1; deposit £5.

METROPOLITAN ASYLUMS BOARD, October 30th.—Central battery telephone system at South-Western Fever Hospital, Landor Road, Stockwell, London, S.W.9. Specification from the Board's Office, Victoria Embankment, E.C.4; deposit £1.

AYR COUNTY COUNCIL NORTHERN DISTRICT COMMITTEE, October 31st.—Electric lighting work, in connection with erection of 200 houses at Beith, Dalry, Dreghorn, Dunlop, Kilbirnie, Kilwinning, Stevenston and West Kilbride. Intending offerers are asked to communicate with Mr. C. B. Ramsay, District Clerk, Kilwinning, by October 31st.

STAFFORDSHIRE EDUCATION COMMITTEE, October 31st.—Electric light installation in two new elementary day schools in Brettell Lane, Brierley Hill. Specification from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £5 5s.

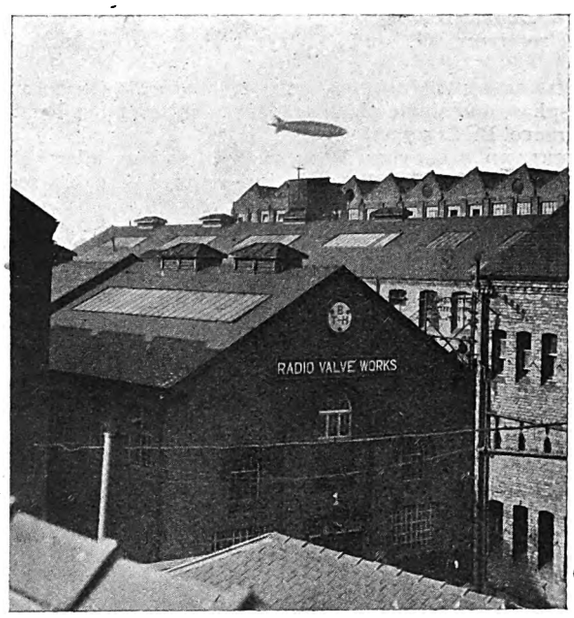
BRADFORD CORPORATION, November 9th.—Twelve month's supply of stores to the tramways department, including electrical fittings for tramcars, insulating material, insulated bolts, copper controller contacts, etc. Schedules, etc., from Mr. R. H. Wilkinson, general manager, 11, Forster Square, Bradford.

CENTRAL ELECTRICITY BOARD, November 9th.—Supply and erection of overhead 33 000 V transmission lines in South Lincolnshire, in connection with Mid-East England scheme. Specification (No. M.E.E.—S.L.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, November 15th.—Supply and erection at Ironbridge power station of (*a*) two 6 000 kVA, 33 000/3 300 V, 50 cycle, indoor type transformers, with off-load tap changing switches; (*b*) two 1 200 kVA, 3 300/400/230 V, 50 cycle, indoor type transformers, with off-load, tap changing switches; (*c*) two 150 kVA, 3 300/400/230 V, 50 cycle, indoor type transformers, exclusive of tap-changing switches. Specification (No. 7) and form of tender from Mr. E. F. Hetherington, at the offices of the Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WAREHAM CORPORATION, November 16th.—Four centrifugal pumps and electric motors, with automatic control, etc. Specifications from Mr. W. E. Blizard (Messrs. Lemon and Blizard), Castle Lane, Southampton; deposit £2 2s.

MID-GLAMORGAN WATER BOARD, November 18th.—Electric lighting work, supply of transformers, switchboards, meters, etc., in connection with construction of pumping station, etc., at Schwyll, Ewenny, near Bridgend, and installation of electrical depth transmitters on various reservoirs, with cables, etc. Specifications, etc., from the Board's Offices, Bridgend, or from Messrs. Thomas and Morgan and Partners, civil engineers, Pontypridd; deposit £2 2s.



THE R.101 over the Rugby works of the British Thomson Houston Co., Ltd., during the flight over the provinces on October 18th. A picture of the kitchen on board is given on page 509.

EAST RETFORD CORPORATION, November 19th.—Electrically driven centrifugal borehole pump (60 000 gall. per hour). Specification from Mr. S. O. Pacey, Gas and Water Electricity Offices, East Retford; deposit £2 2s.

WALLINGFORD RURAL DISTRICT COUNCIL, November 19th.—Electric light wiring of 34 houses at Cholsey, Berks. Specification, etc., from the Clerk, 7, St. Martin's Street, Wallingford.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of time switches, with automatic astronomical dial, electrical operation and winding, for street lighting use (contract No. 263). (Reference B.X. 5 709.)

JOHANNESBURG MUNICIPALITY, October 26th.—Three-phase 6 600 V, draw-out truck type switchboard panels, suitable for installation as single panels or coupled to form a multiple panel switchboard (contract No. 262). (Reference B.X. 5 710.)

DUBLIN UNITED TRAMWAYS CO. (1896), LTD., October 28th.—Twelve months' supply of electric lamps and fittings, etc. Forms of tender (2s. 6d.) from the Company's Offices, 59, Upper O'Connell Street, Dublin.

EGYPTIAN MINISTRY OF THE INTERIOR, October 28th (extension of time).—Erection and equipment of electric power station (about 500 kVA), with overhead and underground networks, for the town of Menouf. (Reference B. 5 758.)

INDIAN STORES DEPARTMENT, October 28th.—House service meters for one year (order No. N. 10 282.) (Reference B.X. 5 749.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, October 29th.—Railway traction motor testing equipment, comprising electric motor, booster, main field excitation generator and

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short field exciter (quotation No. B.E. 508). (Reference B.X. 5 693.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 29th.—Telephone cable (specification No. 256). (Reference B.X. 5 788.)

POSTMASTER-GENERAL'S DEPARTMENT, Melbourne, October 29th.—Supply of v.i.r., lead covered cable (schedule C. 510). (Reference No. 5 759.)

MELBOURNE CITY COUNCIL, October 30th.—Two 2 500 kW motor-convertors and accessories, or two 2 500 kW rotary convertors, with transformers and accessories. (Reference B.X. 5 570.)

NEW ZEALAND POSTS AND TELEGRAPHS, October 30th.—Head receivers (P. and T. 151/1/725). (Reference V.X. 5 603.)

JOHANNESBURG MUNICIPALITY, October 31st.—Outdoor type three-phase and single-phase transformers (contract No. 266). (Reference B.X. 5 736.)

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Distribution pillar shells and link units and cable sealing ends. (Reference B.X. 5 682.)

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Low tension porcelain insulators, etc. (Reference B.X. 5 648.)

EGYPTIAN DEPARTMENT OF PUBLIC HEALTH, November 5th.—Supply of 31 electric refrigerators. (Reference A.X. 8 632.)

TORONTO MUNICIPALITY, November 5th.—One 10 000 000 gallon centrifugal pump, and electric motor, with bedplate, switchboard, etc. (Reference A.X. 8 703.)

EGYPTIAN MINISTRY OF THE INTERIOR, November 30th.—Diesel engine driven electric lighting installation at Abou-Tig (Assiut Province). (Reference B.X. 5 791.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Secondary batteries (schedule C. 505). (Reference B.X. 5 777.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Telephone fuses, heat coils and protectors (schedule C. 498). (Reference B.X. 5 784.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Loading coil pots (schedule C. 499.) (Reference B.X. 5 785.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

Tenders Accepted.

DOUGLAS CORPORATION.—Lawton and Co., electric lighting of abattoir.

GUILDFORD CORPORATION.—A. Grove, wiring 14 houses at Westborough, £82 12s.

BATTLE GUARDIANS.—D. Slade, electrical apparatus for heating board room, £11 5s.

INDIAN STORES DEPARTMENT.—Vaughan Crane Co., Ltd., overhead electric travelling crane, and spares, £698.

AYR CORPORATION.—W. G. Dodds, Ltd., electric light and heating installation at Northpark House, £33 16s. 3d.

LANARKSHIRE COUNTY COUNCIL.—Johnston, Park and Co., Ltd., electrical work at new offices, Glasgow, £1 449 1s. 10d.

GLASGOW CORPORATION.—Belling and Co., supply of 3 800 electric fires; Venner Time Switches, Ltd., 50 time switches.

HUDDERSFIELD GUARDIANS.—E. Rayner, electrician's work in connection with erection of mortuary, etc., at Crosland Moor Institution.

NORTHERN PROVINCES ELECTRICITY CO., HOLLAND.—C. A. Parsons and Co., Ltd., two 30 000 kW turbo-generators and condensing plant.

STOKE-ON-TRENT CORPORATION.—Supply of electric lamps, Blackburn, Starling and Co., Barnett and Soans, and Robinson and Hands Electric Co., Ltd.

LOUTH CORPORATION.—Power Lines Construction Co., Ltd., cable and street works, £12 817; Crompton Parkinson, Ltd., sub-station equipment, £1 311.

STAFFORD CORPORATION.—Callender's Cable and Construction Co., Ltd., supply and erection of cable, £292; English Electric Co., Ltd., supply of transformer, £120.

LIVERPOOL CORPORATION.—British Thomson-Houston Co., Ltd., supply and erection of main and auxiliary switchgear at new Clarence Dock power station, £72 651. (Recommended.)

NEWRY URBAN DISTRICT COUNCIL.—Brooks, Thomas and Co., Ltd., electric lighting installation in town hall, £470; J. S. Loughran, electric lighting installation in technical school, £175.

STOKE-ON-TRENT CORPORATION.—Barnett and Soans, electric services in new cubicle block and garage at isolation hospital, £215 12s. 8d.; Painter and Madew, electric lighting installation at Stallington Hall, £369 12s. 9d.

Mercury Arc Rectifier.

SHOREDITCH (LONDON) BOROUGH COUNCIL.—Hewittic Electric Co., Ltd., supply of 2 000 kW mercury arc rectifier equipment at Hearn Street sub-station, £8 967, plus £85 10s. for spare bulb and fuses. (Recommended.)

METROPOLITAN WATER BOARD.—Macintosh Cable Co., Ltd., 306 yds. of two-core, 0·5 sq. in., shaped conductors, paper insulated, lead covered, 500 V cable, three joint boxes, one pothead cable end, and one cable end box, for Hampton works, £375.

SOUTHEND-ON-SEA CORPORATION.—General Electric Co., Ltd., motors for Hamstel Road sewage pumping station, £246; E. K. Cole, Ltd., rectifiers, for adapting eliminator units to a.c. supply; Union Cable Co., Ltd., a.c. cables, £14 534 15s., less 2%.

MANCHESTER CORPORATION.—Mather and Platt, Ltd., motor-generator, and A. Loudon, electric light installation at Central High School for Boys; Metropolitan-Vickers Electrical Co., Ltd., conversion of two worm-drive tramcar motors to axle suspension.

MANCHESTER CORPORATION.—T. Bolton and Sons, internal rail bonds; British Insulated Cables Ltd., round, flexible face rail bonds; British Mannesmann Tube Co., Ltd., steel tramway poles; Murex, Ltd., Thermit welding of tramway rail joints. (All recommended.)

METROPOLITAN WATER BOARD.—G. A. Sayer, renovations and electric light installation at district engineer's residence and offices, Brookmill Road, Deptford, £490. (Recommended.) Also tendered: T. Crossley and Son, £491; Douglass, Halse and Co., £497; H. Groves and Son, £518; Sidey and Harvey, £544; Hammond and Barr, Ltd., £606.

SYDNEY CIVIC COMMISSIONERS.—British General Electric Co., supply of Osram lamps. The contract covers practically the whole of the street lighting requirements of Sydney for a year, amounting to about 105 000 240 V 60 W Osrams, and some 20 000 larger type vacuum and gasfilled lamps. The whole of the lamps will be made at the Osram Lamp Works, Hammersmith, London.

STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—W. T. Henley's Telegraph Works, Co., Ltd., supply of e.h.t. and pilot cables, £800 per 1 000 yds.; General Electric Co., Ltd., supply of rotary converting plant and switchgear, at southern sub-station, £8 325; Andstro (A.A.) Electric, installation work in private premises under assisted wiring scheme, 18s. per point; Croydon Cable Co., Ltd., supply of l.t. cable for 12 months. (All recommended.)

REIGATE CORPORATION.—Callender's Cable and Construction Co., Ltd., supply and laying of 1 800 yds. of 0·2 sq. in., h.t., concentric, paper insulated, lead covered and armoured cable, from the electricity works to Redhill, £1 574. Also tendered: Macintosh Cable Co., Ltd., £1 625; W. T. Henley's Telegraph Works, Co., Ltd., £1 613; Standard Telephones and Cables, Ltd., £1 611; G. Parfitt and Co., £1 668; Liverpool Electric Cable Co., Ltd., £1 640; Pirelli-General Cable Works, Ltd., £1 630; Power Lines Construction Co., Ltd. (not to specification), £1 487; Johnson and Phillips, Ltd., £1 618; Enfield Cable Works, Ltd., £1 652; W. T. Glover and Co., Ltd., £1 638; British Insulated Cables Ltd., £1 644; Siemens Bros. and Co., Ltd., £1 624.

GLASGOW CORPORATION.—13 rotary convertors, reconstructed, £21 350 4s., Metropolitan-Vickers Electrical Co., Ltd.; new and reconstructed rotary convertor plant, £16 147 12s. 3d., British Thomson-Houston Co., Ltd.; five rotary convertors, reconstructed, £11 428, Bruce Peebles and Co., Ltd.; two rotary convertors, reconstructed, £1 386 os. 6d., English Electric Co., Ltd.; two rectifiers, £2 594, Hewittic Electric Co., Ltd.; re-winding alternator, £9 800, C. A. Parsons and Co., Ltd.; one transformer, £495, Ferranti, Ltd.; 20 000 V cable, £304 4s. 7d., Callender's Cable and Construction Co., Ltd.; 5 000 meters, reconditioned, £4 187 10s., Chamberlain and Hookham, Ltd., Ferranti, Ltd., Edison and Swan Electric Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd. (All recommended.)

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WORK IN PROSPECT.

ACTON.—Large departmental stores, for London Co-operative Society. Architect, Mr. A. Hulbert.

BRIGHTON.—New bank premises, for Barclays Bank, Ltd. Messrs. Clayton and Black, architects.

CHISLEHURST.—Cinema, corner of Albany Road and Red Hill. Architect, Mr. J. B. Ferrugia.

COVENTRY.—Extensions, Stoke Schools, for Borough Education Committee. Particulars from clerk, Mr. Frederick Smith.

CROYDON.—Shops and offices, 87-89, High Street. Mr. E. Bates, architect.

DALSTON.—Block of shops, for L.M. and S. Railway, at Dalston Junction Station. Company's architects.

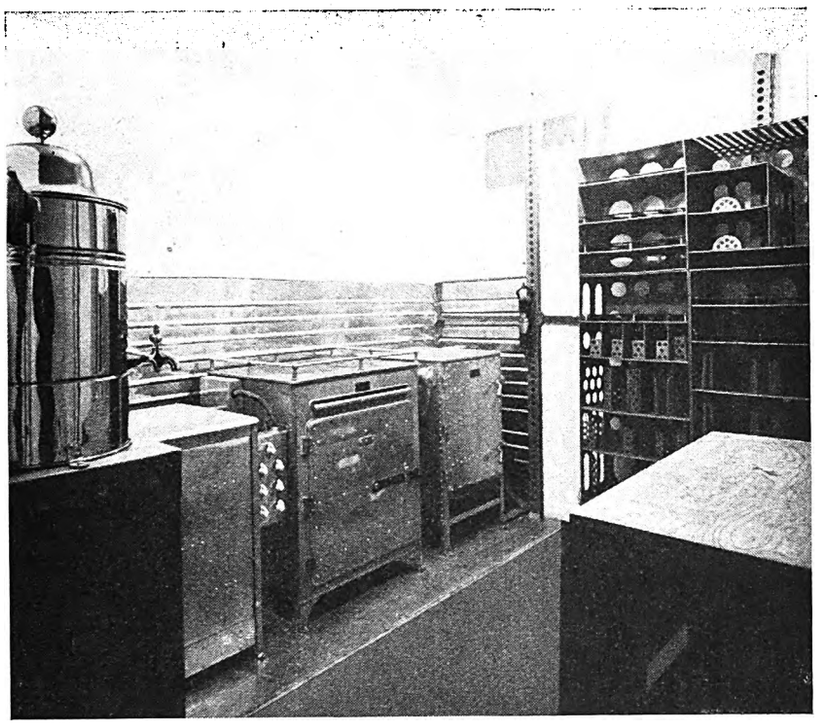
ERDINGTON.—School (576 places). Mr. James A. Swan, Birmingham.

HUDDERSFIELD.—Shops, offices, and warehouse in Burton Road. Mr. N. Culley, architect, Huddersfield.

ROMFORD.—Ward block building, to cost £33 677, for Board of Guardians. Particulars from contractors, S. E. Adams and Co., Westcliff, South-end-on-Sea.

RUGBY.—Church, Hillmorton Paddox, for Wesleyan Trustees. Particulars from Secretary.

SALFORD.—School, Lower Broughton, for Borough Education Committee. Particulars from Director of Education.



GREAT interest attaches to the new British Government Airship R101, *and, as already announced in* THE ELECTRICIAN, *special light-weight electric cooking and water-heating apparatus have been installed by the Automatic Telephone Manufacturing Co., Ltd., Strowger Works, Liverpool. The equipment—into the construction of which duralumin, the lightweight alloy, largely enters—comprises five separate items. The cooking range has four totally-enclosed boiling plates, whilst the hob plate is surrounded by a guard rail to ensure the stability of utensils placed upon it. The oven has a cooking space of 24 in. by 24 in. by 18 in., and the entire range is wired for three-heat control. A vegetable steamer with a capacity 18 in. by 22 in. by 24 in. is installed, with a ball-valve tank attached to the right-hand side for maintaining a continuous supply of hot water to compensate for the evaporation loss. The hot cupboard measures 3 ft. 6 in. by 1 ft. 10 in. by 2 ft. 8 in. It has sliding doors, perforated metal shelves, and the top is recessed to function as a carving table and to facilitate the retention of plates etc., placed upon it. To ensure a supply of hot water for dish washing, etc., a 40-gallon cylindrical hot water storage tank is provided, although it is not visible in the photograph. Smaller demands for tea, etc., are met by a 3-gallon urn, protected against burn-out in the absence of water by a thermal cut-out. Having regard to the importance of weight limitation, it is interesting to record that the total weight of the completed equipment works out within 10-lbs. of the limit set by the Air Ministry. This photograph was taken at Cardington by Siemens Electric Lamps and Supplies, Ltd., the distributors of "Xcel" electrical domestic appliances, and shows the apparatus installed in the galley.*

SHANKLIN.—Houses, for Urban District Council. Particulars from contractor, Mr. H. W. Brown, Newport Road, Lake.

STAINES.—Houses (94), for Urban District Council. Particulars from contractors, Blackwell and Meyer, Bexley Heath.

STRETFORD.—Extensions, Seymour Park School, to cost £3 279, for Education Committee. Particulars from the Clerk.

SUTTON ST. JAMES.—Parish Hall. Particulars from vicar, Rev. J. Callister.

SWINDON.—Bus garage for 40 vehicles, for Town Council. Particulars from architects, R. J. Beswick and Son, 10, Victoria Road.

WEST HAM.—Two nursery schools, for Borough Education Committee. Particulars from architect, Mr. John H. Jacques, 61, West Ham Lane, Stratford, London, E.

WESTON-SUPER-MARE.—Extensions, Public library. Particulars, Messrs. Fry, Paterson and Jones, 28, Waterloo Street.

WEYBRIDGE.—Extensions, including children's ward, for Hospital Management Committee. Particulars from Secretary.

WIGAN.—School (40 places). Particulars from the Secretary.

TRADE PUBLICATIONS.

FURSE WHOLESALE, LTD., of Traffic Street, Nottingham, have issued a new stock list, No. 24/29.

The new price list of the NOX ELECTRIC LAMP CO., LTD., of Clarence Road Works, Hunslet, Leeds, is now available.

A new stage spot-light catalogue has been issued by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.

The A. E. G. ELECTRIC CO. LTD., 131, Victoria Street, London, S.W.1, has published a special leaflet concerning "Furniculus" fires.

"Lisenin" connectors are the subject of a new folder by the LISENIN WIRELESS CO., of 5, Central Buildings, High Street, Slough.

The WEST GLOUCESTERSHIRE POWER CO., LTD., of Gloucester, has issued an attractive booklet for public use entitled "Electricity in the Home."

A. P. LUNDBERG AND SONS, LTD., 477/489, Liverpool Road, London, N.7, have sent us a copy of leaflet E.1, 78, devoted to a description of the "Tripolite" switch.

The WHOLESALE ELECTRIC LAMP CO., LTD., of 37, Vauxhall Bridge Road, London, S.W.1, has issued a leaflet detailing particulars of the company's manufactures in bowl and bar fires.

BAILY, GRUNDY, AND BARRETT, LTD., 2, St. Mary's Passage, Cambridge, have recently produced a thermionic relay, for use in connection with temperature control, and a pamphlet has been published.

The BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2, has issued L.499 dealing with 150 V Mazda lamps.

The EDISWAN ELECTRIC CO., LTD., 123, Queen Victoria Street, London, E.C., has published special literature with respect to the company's lamp sales campaign.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C., has published leaflet No. 6 499, dealing with jack switching diagrams; No. 6 611, concerning h.t. supply units; and No. 6 607, relative to dual wave coils.

SIEMENS BROTHERS AND CO., LTD., Woolwich, London, S.E., have published catalogue 820, section 2, dealing with temperature indicators; section 3, temperature indicators and selector switches for use with thermo-electric pyrometer stems; section 4, thermo-electric pyrometer stems; sections 5 and 6, dealing with the same subject; and section 7, compensating cables and cold junction temperatures. Catalogue 825, section 1, dealing with electrical thermometers and pyrometers for ships, and catalogue 840, section 2, concerning electrical distance thermometers have also been issued.

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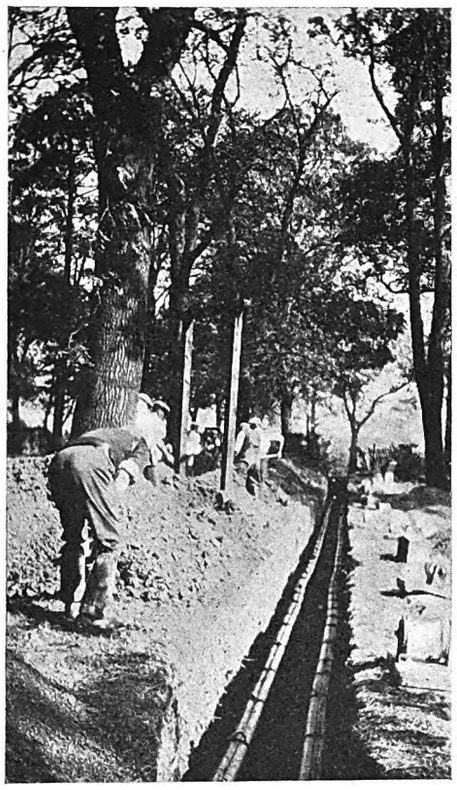
ELECTRICITY SUPPLY.

Bicester Supply Inaugurated—Starting of New Plant at Brighton—Eastbourne Decorative Lighting—Offer to Purchase Wakefield Undertaking.

CHICHESTER T.C. is to apply for a loan of £10 000 for mains extensions.

Worthing T.C. has received sanction to a loan of £20 000 for mains and services.

Barnsley Electricity Committee is to extend the distribution mains to housing estates, at a cost of £6 330.



A SNAPSHOT taken in the "rural area" of Regent's Park during the laying of the 66 kV cables by British Insulated Cables Ltd., for the London "grid" system.

Irlam Council is about to engage an engineer to report on the prospects of a local electricity supply scheme.

Marple U.D.C. has withdrawn its objection to the proposal of the Trent Valley and High Peak Electricity Co. to supply current in Mellor.

Torquay Electricity Committee has adopted a scheme prepared by Mr. T. W. Mackay for the supply current to Stoke Gabriel, at a cost of £2 915.

Torrington R.D.C. has agreed to the application of Bideford Electric Light Co. for powers to extend the area of supply to Alverdiscott, Huntshaw, and Yarnscombe.

Lowestoft Electricity Committee has obtained the consent of the Minister of Transport to the erection of overhead lines to Kessingland for transmission at 6 000 V.

The supply of current to Bicester was formally inaugurated on October 7th, by Mrs. Ruck Keene at the Wessex Electricity Co.'s sub-station at Market Square, Bicester.

Lichfield R.D.C. has consented to an application by the Trent Valley and High Peak Electricity Co. to supply current to Colton and Handsacre, by means of overhead cables.

A system of surface wiring for services to terrace houses, which reduces the cost by approximately one-third as compared with underground cables, is being tried out at Hull.

Mr. C. H. Yeaman, city electrical engineer, Stoke-on-Trent, reports that the extensions at the central power house are nearing completion and that the official opening can take place shortly.

Shoreditch (London) Electricity Committee is to set up an installation department under the control of the Borough Electrical Engineer. The work is at present being carried out, under agreements, by four contractors.

Glasgow Electricity Committee is to instal additional switchgear at a cost of £1 144 16s. at sub-stations at Maxwell Park, Norham Street, Otago Street, and Dunlop Street.

Extensions contemplated by Maidenhead Electricity Committee include the completion of an e.h.t. ring main round the northern half of the area of supply, and the installation of a 96 kW rectifier plant in a brick-built sub-station. The estimated cost is £8 364.

Eston U.D.C. has concluded an agreement under which the E.L.M.A. will supply lamps at special net prices, subject to 1 000 lamps being ordered and delivery taken over eight weeks from the date of order, these lamps to be given to consumers taking supply through prepayment meters under the Council's rental wiring scheme.

Battersea (London) Electricity Committee recommends extensions of the Borough Council's electricity undertaking, estimated to cost £43 756, of which £29 973 is for mains for private consumers. Six wards of the borough, hitherto without mains, are affected, and it is also proposed to convert gas lamps in a number of the streets of those wards.

Rotherham Electricity Committee recommends that for h.t. current the consumer shall have the option of adopting, as an alternative to the flat rate charges, a two-rate tariff comprising a fixed charge of £4 per annum per kVA of maximum demand plus ¼d. per kWh, subject to a coal clause, which will make the total charge, under present prices, 10% above the above-mentioned rates.

The Mayor of Brighton, Ald. H. J. Galliers, members of the T.C., and others visited the Corporation's electricity works at Southwick on October 12th to see the Mayoress start a new 15 625 kW Richardson-Westgarth turbo-alternator. The new equipment also includes Yarrow boilers, bunkers, coal handling plant, switchgear, etc. The generator, which runs at 3 000 r.p.m., has cost £53 840.

Mr. J. K. Brydges, borough electrical engineer, Eastbourne, has submitted to the Electricity Committee proposals for the installation of an illuminated fountain in each of the two large carpet gardens on the sea front. An interesting feature will be an interior colour-changing device over special reflectors in the water. Fairy lamps strip-lighting around the border of the carpet gardens and the use of reflectors in the ceiling of the bandstand equipped with amber colour screens are also proposed. For the Wish Tower slopes, plain standards with two rings, similar to those now employed on the front, and the top fitted with Paisley lanterns are suggested. The cost of the material for this scheme would be £700.

An offer has been made by the Yorkshire Electric Power Co. to purchase Wakefield Corporation's electricity undertaking for £250 000, plus a substantial sum. The offer was made to Ald. G. H. Sherwood, M.P., who has asked the company to repeat it through the usual channel. The company suggests that the ratepayers would get a cheaper supply of electricity from the company and that the acceptance of its offer would be a satisfactory alternative to borrowing money to cover the loss sustained, or to be sustained, by the default of Corporation and General Securities, Ltd., in respect of the issue of the Wakefield 4½% stock. The Corporation, however, decided on Tuesday to promote a Bill in Parliament to authorise the borrowing of the necessary money, and to apply to the Minister of Health for sanction to borrow £250 000.

COOKER COMPETITION RESULT.

In our issue last week (page 462) details were given of an interesting cooker competition, operated at the Brighton Electrical Exhibition by Messrs. Galliers, in conjunction with the Credenda Conduits Co., Ltd., in which visitors were asked to estimate the cost of cooking definite quantities of food for a family for a period of one week, with electricity at 1d. per kWh.

The actual cost, ascertained at the close of the exhibition was 2s. 3·1d. The number of entries totalled nearly 1 000, and though no competitor gave the exact figure, three people estimated a price of 2s. 3d. The estimates varied widely, some being as high as £1 9s. 6d., and others only a few coppers.—but the average of the serious entries was around 5s., which suggests that many people think electric cooking is more than twice as costly as it actually is.

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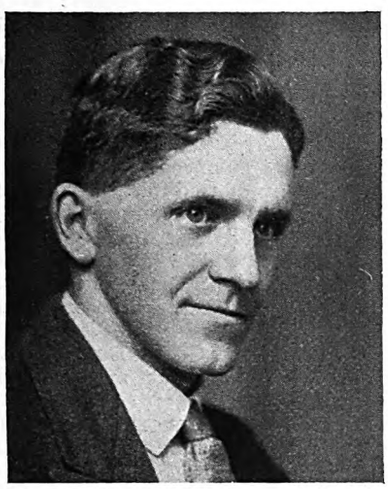
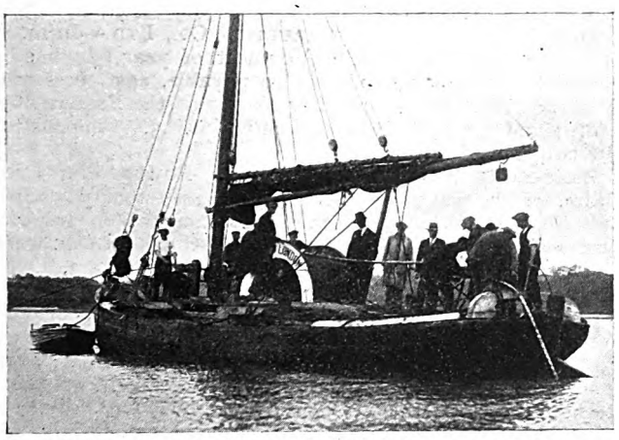
ELECTRICAL NEWS IN PICTURES.



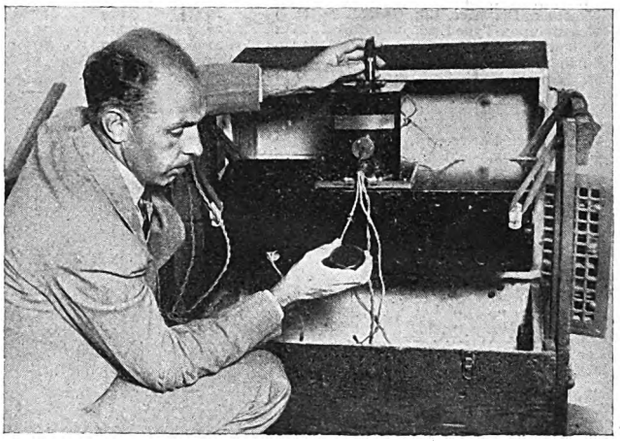
Mr. Howard Long who, as already announced, has resigned his position of manager of the illumination department of Metro-Vick Supplies to take up an appointment with Benjamin Electric, Ltd.

Mr. T. Trimnell, who has acted as solicitor and secretary of the National Register since its inception, has resigned. He will, however, continue to act in a consultative capacity. See page 502.

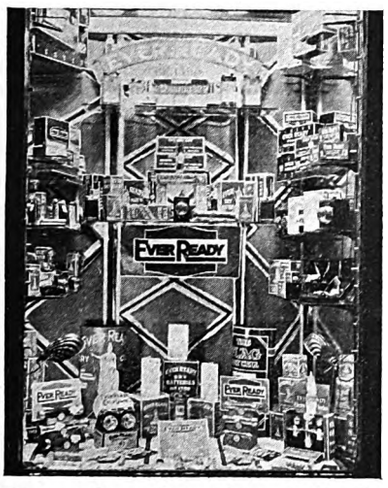
Mr. S. E. Monkhouse has been with the Newcastle-upon-Tyne Electric Supply Co. for twenty-five years and, as announced on page 502, has been appointed chief assistant to the general manager.

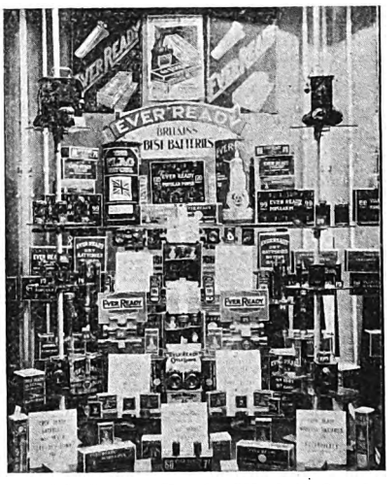


A 3 000 V cable was last week laid between Appledore and Instow across the mouths of the rivers Torridge and Taw, and the "cable ship" used in the proceedings is here seen approaching the Instow side.



An electrical device for use by aircraft which, it is claimed, will record the height of the craft above the ground. Its operation is said to be dependent upon sound waves controlling microphone currents.





We reproduce above three of the windows which were awarded first prizes in connection with "Ever-Ready Week," October 7th–12th. That on the left shows one of the windows of Pollock and Co., 222, Argyle Street, Glasgow, while in the centre is the window of Mr. T. M. Kingdon, 97, High Street, Winchester. Hardy Bros., Ltd., of Commercial Street, Hereford, were responsible for the window on the right. A further first prize winning window is reproduced on page 513, while the full list of electrical prize winners is given on page 502.

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COMPANY NEWS.

Few Changes in Electrical Market—Manufacturing Interests Variable—Electricity Supply Descriptions Mainly Steady—B.I. Cables Improve—London "Underground" Report.

CHANGES in our electrical share price quotations compared with those ruling a week ago are not numerous. Business has continued active in Cables and Wireless issues, the "B" stock at 52½ showing a fall of 5 points, but the "A" on balance being only a point down at 84. Marconi Marine shares are 2s. 6d. lower at 47s. 6d. In the manufacturing section, British Insulateds are 1s. 3d. to the good at 82s. 6d., and Thomson-Houston preference 3d. at 23s. 3d. The other favourites have been weak, under the lead of General Electrics, which have lost 5s. Henleys have shed 2s. 6d. and Siemens 1s. 3d. English Electrics have dropped from 8s. 1½d. to 7s. 6d. County of London Supply ordinary have fallen 1s. 6d. to 54s.

Last Annl. Divd.	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
%	**Electricity Supply.**				
(*a*)	Brompton & Kensington Ord. ..	26/–	26/–	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/–	24/3
4½	" " " 4½% C.P. (£1)	17/–	17/–	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/–	25/–	45/3	24/–
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/–
6	" " " " 6% C.P. ..	22/6	22/6	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	52/6	54/–	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/–	21/3
(*e*)	Kensington & K'bridge Ord. (£1)	26/–	26/–	27/6	23/9
1·92½	Lon. Elec. Sup. Ord. (£1) ..	27/6	27/6	37/6	23/–
1·92½	Metro. Elec. Sup. Ord.	46/3	46/3	53/–	24/9
4½	" " " 4½% C.P. ..	17/–	17/–	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	28/9	29/4½	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	26/3	26/3	30/3	19/3
6	N. Metro. Elec. 6% C.P. ..	21/6	21/6	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	21/6	21/–	—	—
1·92½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/–
4½	" " " 4½% C.P. (£1)	17/–	17/–	17/10½	16/7½
8	Yorks. Elec. Power Ord. ..	35/6	35/6	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	122½	152	117
7·67	" " " 6% Pf. Stk.	124½	124½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4	" " " 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	77½	77½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	76	76	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	" " " 5% Deb. ..	68½	68½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	61	62	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk. ..	73	73	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
7	Underground Electric Rlys. Ord.	22/–	22/6	28/2	11/–
—	Yorks. (W.R.) Trams, Ord. ..	5/–	5/–	16/–	3/–
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.—	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	82/6	81/3	86/3	56/–
6	" " " 6% C.P.	22/6	22/6	23/10	21/–
7	British Thomson-Houston Pref. ..	23/3	23/–	24/9	19/7
7	" " " 7% Deb. ..	104½	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	130½	130½	153½	120
15	Callender's Cable Ord.	80/–	80/–	91/3	66/–
6½	" " 6½% C.P. ..	25/–	25/–	25/9	22/–
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/–
8	Crompton-Parkinson 8% Cum. Pf.	25/–	25/–	27/–	14/–
6	" 6% Cum. 2nd Pf.	18/–	18/–	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/–	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/–	15/–	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/–
—	English Elec. Ord.	7/6	8/1½	15/9	5/–
—	" " 6% C.P.	8/9	8/9	18/9	7/–
7	Ericsson Telephones 7% Pref. ..	20/–	20/–	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/–	19/6	92/3	18/1
6	Ferranti 6% Pref.	18/–	18/–	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	47/6	52/6	46/6	26/6
25	W. T. Henley's Ord.	128/9	131/3	120/–	69/3
10	Johnson & Phillips Ord.	40/–	40/–	67/11	34/–
7½	Lon. Elec. Wire & Smith's Pref.	23/9	23/9	25/–	22/3
7½	Siemens Bros. & Co. Ord. ..	27/6	28/9	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	84	85	—	—
	"B" Ord. Stk.	52½	57½	—	—
	5½% Cum. Pref. Stk. ..	96	96	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Great Northern Telegraph (£10)	30	30½	43½	26
10	Indo-European (£25)	47½	47½	48½	30
15	Marconi's Int. Mar.	47/6	50/–	90/–	16/6
4	Western Tel. 4% Deb. Stk. ..	74½	75	82	76

(*a*) 19¼d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share.

SIMMS MOTOR UNITS, LTD.—Ord. sh. transfer books are closed until Nov. 1, inclusive.

ISLE OF WIGHT ELECTRIC LIGHT AND POWER CO., LTD.—Intm. div. of 8% p.a., tax free, is announced.

JAMAICA TELEPHONE CO.—It is reported that the company's undertakg. is being acquired by a British syndicate.

RIVER PLATE ELECTRICITY CO., LTD.—Intm. div. 3%, less tax, on ord. shs. (same as last year), will be payable on Nov. 1.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Intm. div. of 3%, less tax (same as last year), will be payable on Nov. 15 (coupon No. 50).

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON., LTD.—Int. for half-year ending Nov. 14 on 5% 1st mtge. deb. stk. will be payable on Nov. 15.

COMPANIA HISPANO-AMERICANA DE ELECTRICIDAD.—Company announces that there is no foundation for rumours that it is about to increase its capital.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—Ord. sh. transfer books will be closed from Oct. 28 to Nov. 9, inclusive, for preparatn. of warrts. for intm. div. payable Nov. 15.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. of 5%, actual, for half-year ended June 30, 1929, on ord. shs. will be payable on Nov. 15, income tax being deducted at rate of 2s. in £.

SHANGHAI ELECTRIC CONSTRUCTION CO., LTD.—Intm. div. at rate of 5%, actual, tax free, on acct. of year 1929 has been declared on sh. cap., and will be payable, agst. presentatn. of coupon No. 38, on and after Nov. 1 at the Eastern Bank, Ltd., 2 and 3, Crosby Square, London, E.C.3. Coupons to be left two clear days.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—Hldrs. of sh. warrts. representg. 7% non-cum. participatg. pref. shs. can obtain a sheet of new coupons, in respect of future divs., on surrender of the talon attached to sh. warrts. to the Canadian and General Finance Co., Ltd., 3, London Wall Bdgs., London, E.C.3.

STOTHERT AND PITT, LTD.—Tradg. pft. for year ended June 30, 1929, £35 204, after providg. for income tax, agst. £30 364. Pref. div. of 5% absorbed £3 191; to res., £7 000, agst. £7 500; income tax res., £6 000 (same), written off freehold premises acct., £3 000, agst. nil. Ord. div. 10%, less tax, for year, agst. 6%. Fwd. £5 411, agst. £4 726.

COUNTY OF DURHAM ELECTRIC POWER SUPPLY CO.—Sales and meter and other rentals for 1928, £308 224. Energy purchased in bulk cost £278 689, balance to net rev. acct. was £29 535, plus blce. from last acct. £30 136, less div. paid £27 546. Deferred payments totalled £9, div. payable £31 088 and carry forward £1 028.

AMERICAN TELEPHONE AND TELEGRAPH CO.—Earngs. for nine months ended Sept. 30, 1929, $199 960 370, against $171 724 990 for correspondg. period of 1928. Exes., includ. taxes, at $59 412 976, leavg. net earngs. $140 547 394, agst. $120 911 236. Int., $19 720 460, agst. $16 393 849; divs., $86 648 958, agst. $76 542 747, leavg. a surplus blce. $34 177 976, agst. $27 974 640. Approximately 635 000 telephones and $275 000 000 worth of plant and equipmt. were added to Bell system during period.

NEW AMERICAN RADIO CO.—General Motors announce that they are forming a new radio company associated with the Radio Corporation of America, the General Electric Co., and the Westinghouse Electric and Manufacturing Co. The company is to have a cap. of $10 000 000 preferred stock and one million shares of no par value stock. All companies concerned will continue independently. Wireless sets are being installed in Cadillac and La Salle automobiles, and will be installed in other General Motors vehicles later.

HERBERT MORRIS, LTD.—Pft. on tradg. for year ended July 31, 1929, £95 414, agst. £95 022, after provisn. for income tax, etc., £10 643, agst. £9 323. Div. recommended on ord. shs. makes total of 15%, tax free, for year (same as previous year). To res., £25 000, agst. £20 000. Fwd. £51 605, agst. £52 952. Increased works' facilities have enabled company to mfre. some parts of its products which hitherto have been purchased outside. Directors have decided to extend the new works, and this is now well on the way. Financial positn. is such that cost of extensns. can be readily met without callg. fornew money.

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ATLAS LIGHT AND POWER Co.—Pft. for year ended March 31, 1929, £314 682, increase £13 775. Divs. for year on old pref. shs. absorb £154 000, agst. £131 470, and fin. div. of 3% on the ord. is recommended, makg. 5% for year (same as previous year). Fwd. £39 428, agst. £35 756. Company has during year disposed of its hldgs. in Argentine subsidiary companies to American and Foreign Power Co., though still retaing. its int. in elec. tractn. undertakgs. in Montevideo. Company is now carrying on business of a general investment trust, and to meet new conditions it is proposed to change its name to Atlas Electric and General Trust.

CENTRAL STATES ELECTRIC CORPORATION.—Net income, $22 739 000 (£4 547 800), equivalent to $3.08 p. sh. on average number of common shs. outstandg. during year, is reported for 12 months ended Sept. 30, compared with net income $6 319 000 (£1 263 800) for precedng. year, increase 261%. Total market value of Corporation's investmts. is approximately $340 000 000 (£68 000 000), or $210 000 000 (£42 000 000) in excess of book value, while valuable warrts. are held for purchase of common stk. of various companies at prices below present market level. Fresh cap. was raised for Corporation recently by issue of $25 000 000 (£5 000 000) 5½% debs. In past half-year Corporation's common stk. has been twice split—in April two for one, and in July three for one.

DRAKE AND GORHAM, LTD.—Net pft. for year ended June 30, 1929, after paymt. of all charges and makg. provisn. for contingencies, £8 220, plus £3 570 brt. in. Div. recommended, 5% for year; to gen. res., £2 500; fwd., £3 040. In spite of continuance of abnormal taxatn. and consequent trade depressn., which are responsible for somewhat reduced profits, developmts. to which reference was made last year have resulted in a rapidly increasg. turnover, and demand for company's h.t. switchgear is such as to necessitate the acquisitn. of larger works, the financg. of which is now under consideratn. Company has been entrusted with electrical equipmt. of many large bldgs., includg. new head offices of Martins Bank, extensive additns. to installatn. at Harrods Stores, Junior Carlton Club and Bedford College. The new Bank of England and Lloyds Bank head offices had not advanced sufficiently for much electrical work to be done in connectn. with these contracts durg. financial year.

New Companies.

VECTOR ELECTRICAL Co., LTD.—Cap., £1 000. To acquire business of electrical engineer now carried on by E. E. Walker as the "Vector Electrical Co.," at 40 Broadfield Road, Sheffield.

J. H. MASTERS (NEWCASTLE), LTD.—Cap., £1 000. Manufacturers of and dealers in talking machines, wireless and other instruments, etc. Permanent managing director: L. Freeman, 71, Blackett Street, Newcastle-upon-Tyne.

BELFAST RADIO AND ELECTRICAL Co., LTD.—Cap., £1 000. To take over from R. McFarland business of a wireless dealer, carried on by him as the Belfast Radio and Electrical Co. Reg. Office: 17, Queen Street, Belfast.

ALL BOXES, LTD.—Cap., £1 000. Manufacturers of wireless portable cases, h.t, battery containers, floating cones, and all apparatus relating to or incidental to wireless, etc. Reg. Office: 117, Central Street, London, E.C.1.

SHIRLEYS (NEOGRAPH), LTD.—Cap., £10 000. Designers and manufacturers of and dealers in advertising mirrors, electrical, magnetic, and other signs, etc. A first director: F. Shirley, 171, Shaftesbury Avenue, London, W.C.1.

R. G. HEATON AND Co., LTD.—Cap., £1 000. To acquire business of an electrical and radio engineer heretofore carried on by R. G. Eaton, at 108, Alexandra Road, Moss Side, Manchester. Reg. Office: 108, Alexandra Road, Moss Side, Manchester.

DANIEL FOXWELL AND SON, LTD.—Cap., £20 000. To acquire business of engineers carried on by Daniel Foxwell and Son, at Cumberland Works, Cheadle, to carry on said business and that of founders, electricians, etc. Reg. Office: Cumberland Works, Cheadle, Ches.

WALDRON ELECTRICAL MANUFACTURERS, LTD.—Cap., £1 500. To acquire business of electrical and general engineers, manufacturers, factors and merchants now carried on by G. C. Jeremiah and L. Goldstone at Waldron House, Belle Vue Street, Swansea, as "Waldron Electrical Co."

DOUBLE W. DAIRY EQUIPMENT Co., LTD.—Cap., £2 000. To acquire sole agency in British Isles of Walker Wallace, Ltd., of Toronto, Canada, dairy equipment manufacturers, and to carry on the business of manufacturers and repairers of, agents for and dealers in dairy machinery, electrical apparatus, etc. Solicitors: Woosnam and Callis, Blackpool.

ELECTROTONE TALKING PICTURES, LTD.—Cap., £100. Manufacturers of and dealers in cinematograph films, producers of or dealers in films, either talking or silent, and in all apparatus or mechanism for films, and electrical or other devices for synchronising films and vocal or other sounds, etc. Solicitors: Boyce Evans and Sheppard 14, Stratford Place, London, W.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND Co., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

PEDIGREE.—505 482. Class 13. Metal goods for use in electrical lighting, heating, signalling and power installations. J. A. Crabtree and Co., Ltd., Lincoln Works, Lincoln Road, Walsall; manufacturers. August 23rd, 1929.

INSPRO.—504 350.—Class 50. Electric insulating materials. Cecil Thomas Lewis, Arthur George Falkner, and John William Battersby, trading in co-partnership, 16-17, Devonshire Square, London, E.C.3; manufacturers. July 9th, 1929. (To be associated with No. 504 347 (2 685) and others.)

URANIA.—403 504. Class 8. Dry batteries and cells. Elektrochemische Fabrik Alfred Boehr Gesellschaft Mit Beschrankter Haftung (a joint stock company organised under the laws of Germany), 18 to 19, Lindauer Strasse, Berlin, N.65, Germany; manufacturers. June 13th, 1929.

RHEOGRAD.—504 493. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. H. Clarke and Co. (Manchester), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester; manufacturers. July 15th, 1929.

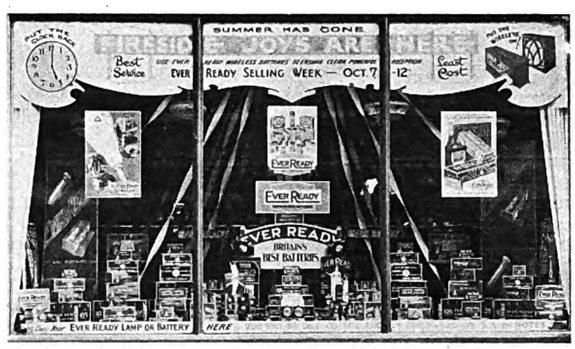
TELEHOR.—504 647. Class 8. Sound reproducing and recording apparatus and parts thereof, wireless telephonic apparatus and parts thereof, and wireless telephonic apparatus in combination with gramophones. Andrew Berger, 10, Holdershill Avenue, Hendon, London, N.W.1; manufacturer. July 19th, 1929.

DAVENSET.—500 350. Class 8. Apparatus for transforming alternating current to direct current. Hubert George Anthony Ross Wilson, trading as Partridge, Wilson and Co., 217A, Loughborough Road, Leicester; manufacturing electrical engineer. February 25th, 1929.

CROLECTRO.—505 151. Class 8. Wireless telephonic apparatus in combination with gramophones. Geo. Crossley and Son, Ltd., 4, South Street, Manchester; manufacturers and merchants. August 9th, 1929.

BULWARK.—505 317. Class 8. Philosophical and scientific instruments. Redfern's Rubber Works, Ltd., Dawson Street and Springbank Street, Hyde, Cheshire; manufacturers. August 15th, 1929. (To be associated with No. 505 318 (2 687) xl.)

CHROMALOX.—505 441. Class 8. Electrical resistances. Geo. Bray and Co., Ltd., Bagby Works, Leicester Place, Leeds; gas engineers. August 21st, 1929.



THE window of Mann, Egerton and Co., Ltd., 21/23, King Street, Norwich, which was awarded one of the first prizes during "Ever-Ready Week." See also pages 502 and 511.

METAL AND CHEMICAL PRICES.

TUESDAY, October 22nd.

	Price.	Inc.	Dec.
Copper—			
Best Selected .. .. .. per ton	£76 10 0	—	£1 15s. 0d.
Electro Wirebars .. .. „	£84 10 0	—	—
H.C. Wires, basis .. .. per lb.	11⅝d.	—	—
Sheet .. .. „	11 13/16d.	—	—
Phosphor Bronze—			
Wire (Telephone), basis .. per lb.	1s. 2⅜d.	—	—
Brass 60/40—			
Rod, basis .. .. .. per lb.	9d.	—	—
Sheet „ .. .. .. „	10⅜d.	—	—
Wire „ .. .. .. „	11¼d.	—	—
Pig Iron—			
Cleveland Warrants .. .. per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „	£14 15 0	—	—
Lead Pig—			
English .. .. .. per ton	£24 10 0	—	5s. 0d.
Foreign or Colonial .. .. „	£23 2 6	—	5s. 0d.
Tin—			
Ingot .. .. per ton	£181 2 6	—	£8 15 0
Wire, basis .. .. .. per lb.	2s. 5d.	—	1¼d.
Aluminium Ingots . .. per ton	£95 0 0	—	—
Spelter .. .. „	£22 2 6	—	£1 2s. 6d.
Mercury .. .. per bottle	£22 12 6	2s. 6d.	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £20 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¾d.
Sodium Bichromate—Per lb. 3¼d.
Rubber—Para fine, 9¾d.; plantation, 1st latex, 9¾d.

*** The metal prices are supplied by British Insulated Cables Ltd., and the Rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

The market was again quiet last week, and according to James Forster and Co., prices, following the tendency in other metals, became easier, £23 being accepted for October, and £23 3s. 9d. for January. Later, prices improved again to £23 7s. 6d. The American price is unchanged at 6·90 cents. Closing prices on October 18th were £23 7s. 6d. for all positions, unchanged to 2s. 6d. per ton lower on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

JONES, Mr. S., 1, Swan Lane, Evesham, wireless dealer. £17 8s. 11d. September 11th.

KING, M. AND H., 338, Coldharbour Lane, Brixton, wireless dealers. £15 18s. 8d. August 24th.

KINGSFORDS, 281, Wimbledon Park Road, S.W., wireless dealers. £16 7s. 11d. September 13.

MANNIX, Louis J. (trading as SUPERLITE ELECTRIC APPLIANCE Co.), 10, Barkly Road, Leeds, electrical appliance dealer. £30 12s. 7d. September 17th.

MEMMOTH, M., 85, The Broadway, Southall, wireless dealer. £16 6s. 5d. August 26th.

PURDY, Mrs. A. L. M. (married), 7, Cross Street, Wakefield, wireless dealer. £20 4s. 3d. September 11th.

SQUIRES AND Co., High Street, Billericay, wireless engineers and dealers. £25 10s. 5d. September 16th.

STAINSBURY, LEONARD, AND SONS, 2, Empire Parade, Clock House, Beckenham, wireless dealers. £44 2s. 4d. September 17th.

WANDLE RADIO Co., Church Row, Wandsworth Plain, S.W., wireless dealers. £35 6s. 3d. August 26th.

WYNDHAM'S WIRELESS AND GENERAL MANUFACTURING Co., 123, Shaftesbury Avenue, W.C., wireless dealers. £10 18s. 4d. August 15th.

Bills of Sale.

BURNELL, John Richard, 2, Chestnut Walk, Harebreaks, Watford, radio engineer. Dated October 10th, filed October 15th. £50.

GOOD, William Ephraim, 130, Bath Road, Southsea, electrician. Dated October 17th, filed October 18th. £37 10s.

Deeds of Arrangement.

CANE, Thomas Phillip, CANE, John Aylwyn, and CANE, Douglas Raymond, trading at Island Garage, Sturry, near Canterbury, as CANE BROS., electrical engineers. Dated October 10th, filed October 17th. Trustees: R. A. Rodgers, Coventry House, South Place, E.C., accountant, and another. Secured creditors, £600; liabilities unsecured, £5 727; assets, less secured claims, £1 150.

PARSONS, Ernest Medcalf, 57, Paragon Street, and 82, Princes Avenue, Hull, electrician. Dated October 9th, filed October 16th. Trustee: J. J. Campbell, Bank Chambers, Lowgate, Hull, C.A. Secured creditors, £50; liabilities unsecured, £4 668; assets, less secured claims, £1 200.

Receiverships.

BRITISH OUTBOARDS, LTD.—R. J. McKenna, of 71, Falkland Road, Kentish Town, was appointed receiver and manager on October 10th, under powers contained in debenture dated October 2nd, 1929.

FULL LIGHT ANTI-DAZZLE LAMP Co., LTD.—P. Mordant, F.I.C.A., of 115-117, Cannon Street, E.C., was appointed receiver and manager on October 7th, under powers contained in second debenture dated September 28th, 1929.

ILKESTON PORCELAIN Co., LTD. T. Higson, of Burton Buildings, Bath Street, Ilkeston, was appointed receiver and manager on October 8th, 1929, under powers contained in debenture dated August 17th, 1928.

METRO TAP AND DIE Co., LTD. A. J. Roberts, of 5, Clements Inn, W.C.2, was appointed receiver and manager on October 10th, 1929, under powers contained in debentures dated December 1st, 1927.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BOROUGHBRIDGE AND DISTRICT ELECTRIC SUPPLY Co., LTD.—Registered October 9th, £3 000 debentures; general charge.

IMPROVED WILSON MICROPHONE AND ELECTRICAL Co., LTD., London, W.—Registered October 11th, £75 debentures; general charge.

SHOREHAM AND DISTRICT ELECTRIC LIGHTING AND POWER Co., LTD. (Sussex).—Registered October 4th, £1 300 10-year notes, part of amount already registered; general charge. *£16 200. April 25th, 1929.

TAMPLIN AND MAKOVSKI, LTD. (late TOWNSEND, TAMPLIN AND MAKOVSKI, LTD.), Reigate, electrical engineers.—Registered October 11th, £13 264 debentures; general charge. *Nil. July 31st, 1929.

THOMPSON RITCHIE AND Co., LTD., London, S.W., electrical engineers.—Registered October 3rd, £800 debentures, part of £4 000; general charge. *£1 500. January 1st, 1928.

WALSALL ELECTRICAL Co., LTD.—Registered October 3rd. Mortgage to Bank; charged on 57, 59, 61 and 63, Bridge Street, Walsall. *Nil. October 29th, 1928.

WARREN BROTHERS (MIDDLESBROUGH), LTD., electricians.—Registered October 14th, £2 000 debentures, to Mrs. L. Lucas, 27, Clifton Avenue, West Hartlepool; general charge. *Nil. October 13th, 1928.

WESTERN COUNTIES ELECTRICAL AND ENGINEERING Co., LTD., Yeovil.—Registered September 26th, £3 000 and £350 mortgages to Frome Selwood Permanent Building Society and A. M. G. Daniel, Frome, solicitor; charged on 18, Princes Street, Yeovil. *Nil. September 27th, 1928.

Satisfactions.

BOWYER-LOWE Co., LTD., London, W.C., electricians.—Satisfaction registered October 10th, all moneys, etc., registered November 14th, 1928.

DORIAN WIRELESS Co., LTD., London, W.—Satisfaction registered October 11th, £2 100, registered August 22nd, 1929.

London Gazette, etc.

Companies Winding-up Voluntarily.

HASLAM (G.) AND Co., LTD. By reason of its liabilities. October 15th. H. J. B. Feist, 12, Eaton Road, Leigh-on-Sea, Essex, appointed as liquidator.

REPRODUCTION, LTD.—By reason of its liabilities, October 11th, H. B. Keeping, of Falk, Keeping and Co., 18, Ironmonger Lane, London, E.C., chartered accountant, appointed as liquidator.

Winding-up Petitions.

ENTERPRISE MANUFACTURING Co., LTD. A petition for winding up has been presented by Max Weinbaum, 56, Amhurst Park, London, formerly trading as the Weinbau Incandescent and Electrical Co.; and is to be heard at the Assize Court, Kingston, Surrey, on Friday, November 22nd, at 10.30 a.m.

TRIOTONE, LTD.—A creditor's petition for winding-up has been presented by the Marconiphone Co., Ltd., Marconi House, Strand, London, wireless manufacturers, and is to be heard at the Royal Courts of Justice, Strand, London, on October 28th.

Bankruptcy Information.

CAMEROFF, Joseph, 147, Spencer Place, Leeds, electrical engineer, First meeting, October 31st, 11 a.m., Official Receiver's Office, 24, Lower Bond Street, Leeds. Public examination, November 12th, 10.30 a.m., County Court House, Albion Place, Leeds.

COLES, Allan James, 2A, Pinner Road, Harrow, Middlesex, electrical engineer and contractor. Receiving order, October 17th. Debtor's petition.

COTTRELL, Thomas Chapman, 31, Autumn Street, Burley Lodge Road, Leeds, electrician, trading as THOMAS COTTRELL. First meeting, October 31st, 11.30 a.m., Official Receiver's Office, 24, Lower Bond Street, Leeds. Public examination, November 26th, 10.30 a.m., County Court House, Albion Place, Leeds.

TURNER, Ivy (Miss), 103A, Little Ilford Lane, Manor Park, E.12, wireless dealer. Receiving order, October 14th. Debtor's petition. First meeting, October 25th, 11 a.m., and public examination, November 19th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

WRIGHT, Ronald Reginald, trading as WRIGHT BROS., 36, Normanton Road, Derby, wireless dealer. Receiving order, October 17th, debtor's petition. First meeting, October 31st, 11 a.m., Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. Public examination, November 26th, 11 a.m., Court House, 20, St. Peter's Churchyard, Derby.

Notice of Dividend.

WILMINGTON, Granville, 75, Railway Street, Nelson, electrical and radio engineer. First and final dividend, 2s. 2½d. per £, payable October 25th, Official Receiver's Office, District Bank Chambers, Blackburn.

Application for Discharge.

LAMBERT, Frederick Victor, 27, Parrock Street, Gravesend, Kent, electrical contractor, trading as LAMBERT AND CURLEY. Hearing, November 13th, 11 a.m., Court House, Eastgate, Rochester.

Partnerships Dissolved.

AUTO ELECTRICAL SERVICE (Charles Victor COOPER and Henry James COOPER), electrical engineers, Garrick Place, Wellington Road South, Stockport, by mutual consent as from October 17th, 1929. Debts received and paid by H. J. Cooper.

STANWORTH AND SHORROCK (Clifford Parker STANWORTH and Thomas William SHORROCK), electrical and radio engineers, 1, Rainhall Road, Barnoldswick, Yorks, by mutual consent as from August 9th, 1929. Debts received and paid by T. W. Shorrock, who continues the business.

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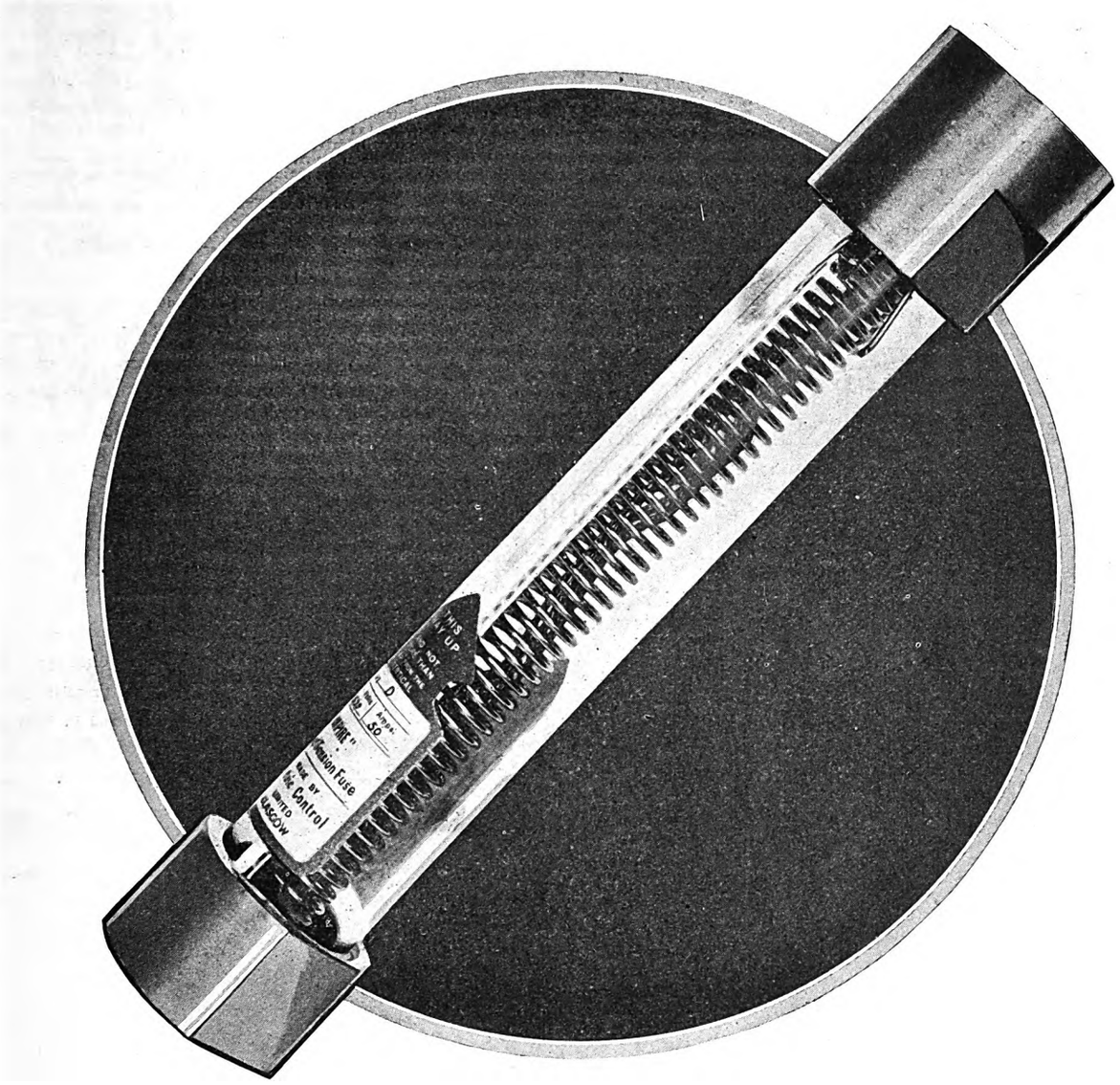

OVERHEAD LINE EQUIPMENT

THE rapid development of E.H.T. overhead transmission and distribution systems has increased the demand for an efficient means of limiting the area of disturbance caused by faults or short circuits.

For thirteen years we have been manufacturing at Glasgow an efficient fuse for pressures up to 132,000 v. and fuse ratings up to 400 amps. The principle of operation is the same as when we first made it, but the mechanical construction has been improved as the result of this experience. Satisfactory operation is proved by the fact that various Power Companies who adopted the fuse thirteen years ago are still installing them.

OWING TO THE SMALL MASS OF MOVING PARTS, A LARGE GAP IS RAPIDLY INTRODUCED, AND WITH THE HIGH DI-ELECTRIC STRENGTH OF THE LIQUID IN THE GAP, ENSURES THE CERTAIN ACTION OF THE FUSE.

ELECTRIC CONTROL

LIMITED, BRIGHTON.

EMPIRE ELECTRIC CONTROL

RAYMOND

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

317 134 W. R. Westhead. Sound reproducing or transmitting instruments. (7/1/29.)
296 771 Landis and Gyr Soc. Anon. Driving system for induction-measuring instruments. (9/9/27.)
316 908 H. A. Whitehorn (Bell Telephone Laboratories, Inc. (in part)). Electrical conductors. (30/4/28.)
316 909 Paragon Rubber Manufacturing Co., Ltd., and G. W. Croot. Plug-and-socket and like electrical connections particularly for panels of wireless apparatus. (1/5/28.)
289 887 Siemens and Halske Akt.-Ges. Diaphragms, more particularly for loud speakers and the like. (6/5/27.)
316 912 Standard Telephones and Cables, Ltd., J. H. E. Baker, and E. P. G. Wright. Automatic or semi-automatic telephone systems. (3/5/28.)
316 915 F. G. Bell. Audible warning and signalling devices. (3/5/28.)
316 921 R. N. Wellington. Combined switch and condenser for wireless aerials. (5/5/28.)
316 923 South Metropolitan Gas Co., and J. H. Smith. Electric ignition apparatus for incandescent gas burners. (5/5/28.)
291 025 Dr. R. Ambronn. Apparatus for electrically exploring the ground or soil. (24/5/27.)
317 120 Standard Telephones and Cables, Ltd., E. P. G. Wright, J. H. E. Baker, and A. H. Cameron. Automatic and semi-automatic telephone systems. (10/5/28.)
290 257 Weitverkehrskabel Ges. Electric cables. (11/5/27.)
290 303 E. Binard. Transmitters for use in wireless signalling. (12/5/27.)
317 130 V. Herold. Secondary electric batteries. (12/5/28.)
317 137 C. H. R. Gower and O'Brien and Partners, Ltd. Electrolytic deposition of chromium. (15/5/28.)
317 143 J. L. Baird and Television, Ltd. Television or like systems and apparatus. (15/5/28.)
317 149 Siemens Bros. and Co., Ltd., F. Baker and E. R. Garrod. Electromagnetic devices. (19/5/28.)
317 151 India Rubber, Gutta Percha and Telegraph Works Co., Ltd., and W. G. Spinks. Electrical indicators. (24/5/28.)
317 153 M.-O. Valve Co., Ltd., and J. W. Ryde. Electric gas-discharge rectifiers. (25/5/28.)
291 383 Associated Electrical Industries, Ltd. Internal-combustion engine electric generator power units. (31/5/27.)
317 158 J. Neale. Construction of selenium bridge or cell. (31/5/28.)
317 160 S. Melton. Power-factor control for electric power-distribution systems employing motor generators. (2/6/28.)
317 167 W. Holmes and Ferranti, Ltd. Electric switches. (9/6/28.)
317 169 F. W. Lanchester. Field magnets or microphones, loudspeakers, and the like. (12/6/28.)
317 174 Igranic Electric Co., Ltd., and D. Sinclair. Transmitters for radio telephony.(19/6/28.)
317 175 A. Preston. Sunk switches as used in electric wiring systems. (21/6/28.)
292 563 British Thomson-Houston Co., Ltd. Electron-discharge devices. (22/6/27.)
317 178 H. Busse. Starting arrangements for electric discharge devices. (22/6/28.)
294 874 Brandes, Ltd. Sound-reproducers. (30/7/27.)
317 186 H. Panzetta. Electric circuit-controlling apparatus. (27/6/28.)
294 877 W. Kunze and Radiofrequenz Ges. Loudspeaker system. (30/7/27.)
317 190 J. Sieber. Illuminating display or advertising apparatus. (3/7/28.)
317 192 F. E. Bancroft and Associated Electrical Industries, Ltd. Fluid-actuated relays. (5/7/28.)
294 476 National Carbon Co., Inc. Vents for electric battery cells. (23/7/27.)

Applications for Patents.

July 17th.

21 984 F. Rother. Gasfilled illuminating tubes. (18/7/28, Germany.)
21 955 Standard Telephones and Cables, Ltd. (C. E. Stevens and A. Mamor). Telephone systems.
21 953 Standard Telephones and Cables, Ltd. (Western Electric Co.). Radio telegraph receiving systems.
21 996 Telefunken Ges. fur Drahtlose Telegraphie. Signal-released alarm devices. (6/8/28, Germany.)
21 922 G. Wilkinson. Electric thermostats.
22 018 E. Williams. Railway signals and train control mechanism. (18/10/28.)
22 003 Wireless Pictures (1928), Ltd. Systems of facsimile transmission and reception.

July 18th.

22 042 P. F. Allan and Macintosh Cable Co., Ltd. Electric cables.
22 083 Associated Electrical Industries, Ltd., and E. N. Johnson. Power systems.
22 086 Associated Electrical Industries, Ltd. Signalling systems, etc. (18/7/28, U.S.)
22 065 P. Brabant. Formation of insulating coatings on electrical apparatus. (18/7/28, Belgium.)
22 090 British Thomson-Houston Co., Ltd. (Victor X-ray Corporation.) X-ray apparatus.
22 105 H. A. Bumke Ges. Insulating carbon rods of dry batteries. (8/4/29, Germany.)
22 082 E. H. Croft, General Electric Co., Ltd., and A. C. Price. Electric power supply systems.
22 156 W. Engelke. Light sensitive cells.
22 088 General Railway Signal Co. Railway Signalling. (18/7/28, U.S.)
22 089 General Railway Signal Co. Train control systems. (18/7/28, U.S.)
22 081 Hermsdorf Schomburg-Isolatoren Ges. High tension condensers. (15/9/28, Germany.)
22 113 Hermsdorf Schomburg-Isolatoren Ges. High tension condensers. (31/12/28, Germany.)
22 110 L. L. von Kramolin. Thermionic valve circuits. (27/7/28, Germany.)
22 145 A. H. Moorhouse. Connector for securing branch wires to electric cables.
22 049 H. H. Seddon and H. W. Sykes. Electrical indicating apparatus, etc.
22 131 Telefunken Ges. fur Drahtlose Telegraphie. Thermionic valves, etc. (27/7/28, Germany.)
22 084 Westinghouse Lamp Co. Coated cathodes for electron discharge devices. (18/7/28, U.S.)
22 085 Westinghouse Lamp Co. Electron emission materials. (18/7/28, U.S.)
22 161 A. E. White (Claude Neon Lights, Inc.) Running light signs.
22 162, 22 163, 22 164 A. E. White (Claude Neon Lights, Inc.) Tube lighting systems.
22 165 A. E. White (Claude Neon Lights, Inc.). Stabilising light emitted by discharge tube lamp.
22 166 A. E. White (Claude Neon Lights, Inc.). Beam beacons.
22 167, 22 168 A. E. White (Claude Neon Lights, Inc.). Vacuum tubes.

July 19th.

22 216 W. Becker. Arrangement for transforming and rectifying electric currents.
22 219 Benjamin Electric, Ltd., and H. T. Harrison. Electric switches.
22 269 F. M. Best. Electric amplifiers for sound reproducing purposes.
22 270 F. M. Best. Variable condensers.
22 271 F. M. Best. Radio receiving apparatus.
22 250 Electrical Research Products, Ltd. Electro-optical systems, etc. (24/7/28, U.S.)
22 240 Electrolux, Ltd. (Platen-Munters Refrigerating System Aktiebolag). Cooling devices, etc.
22 190 E. Felton. Electromagnetic time keeper.
22 305 V. C. From, A. W. Larsky, and C. D. Rowley. Electric lamps.
22 198 S. S. Guy. Electrically driven vehicles.
22 248 W. W. Hancock. Electric switches for internal combustion engines, etc.
22 191 F. H. Reeves and Revo Electric Co., Ltd. Electric lamp holder, etc.
22 187 E. J. Targett and A. T. Withers. Electric switches.
22 293 Telefunken Ges. fur Drahtlose Telegraphie. Potential supply devices. (19/7/28, Germany.)
22 306 Westinghouse Lamp Co. Electron discharge devices. (31/7/28, U.S.).
22 258 H. J. Thomson. Dynamo-electric machinery.

July 20th.

22 385 Allgemeine Elektricitats Ges. Coupling device for transmitting electrical energy to conductors. (21/7/28, Germany.)
22 343 L. Blundell and W. H. Curtis. Electrical sound reproducing apparatus.
22 344 L. Blundell and W. H. Curtis. Frame aerials.
22 370 British Insulated Cables, Ltd., J. L. Packer, and B. Welbourn. Electric cables.
22 371 British Insulated Cables, Ltd., and J. L. Packer. Electric cables.
22 316 H. W. Headland. Electric cooking stove.
22 351 W. G. Moore. Arc electrodes for therapeutic treatment.
22 391 E. R. Ritter, and Scherbuis and Ritter. Electric switch. (7/9/28, Germany.)
22 362 Standard Telephones and Cables, Ltd. Remote indicator and supervisory system.
22 321 H. K. Turner. Electric comb.
22 353 H. C. Tuttle. Telephone mufflers.

July 22nd.

22 509 Aeonic Radio, Ltd., and E. V. Kayley. Radio receiving apparatus.
22 515 Akt. Ges. Brown, Boveri et Cie. Pole-type switches. (21/7/28, Germany.)
22 409 E. Allen. Electrically heated vessels.
22 500 J. L. Baird. Television systems, etc.
22 475 R. Blackburn, L. C. Pocock and Standard Telephones and Cables, Ltd., and H. J. Turton. Telephone instruments.
22 444 British Thomson-Houston Co., Ltd. Electrical discharge devices. (20/7/28, U.S.)
22 445, 22 446 British Thomson-Houston Co., Ltd. Current regulating devices. (20/7/28, U.S.)
22 447 British Thomson-Houston Co., Ltd., F. A. Fossey and D. H. Graham. Electric motors.
22 506 W. Isch. Electric tinder box.
22 471, 22 472. T. S. Kemble. Electric resistances.
22 398 J. F. Lister and Veritys, Ltd. Cooling enclosed dynamo electric machines.
22 480 Oldham and Sons, Ltd., and W. W. Wilde. Galvanic batteries.
22 469 Siemens-Schuckertwerke A.G. Synchronising synchronous machines. (2/8/28, Germany.)
22 493 Siemens und Halske A.G. Impulse transmitters for telephone systems, etc. (21/7/28, Germany.)
22 476 Standard Telephones and Cables, Ltd. Electric wave amplifying and translation systems. (8/8/28, U.S.)
22 491 Telefunken Ges. fur Drahtlose Telegraphie. Radio signalling. (20/7/28, Germany.)
22 500 Television, Ltd. Television systems, etc.
22 454 Thermal Syndicate, Ltd. (Deutsch Englische Quarzschmelze Ges.) Mercury vapour lamps.
22 507 Westinghouse Lamp Co. Coated cathode for electron discharge devices. (20/7/28, U.S.)

COMING EVENTS.

Friday, October 25th (to day).

Institution of Railway Signal Engineers.—Criterion Restaurant, London Annual dinner.

Birmingham Electric Club.—Grand Hotel, Colmore Row, Birmingham. Lecture by Mr. T. A. Windibank on "Motor Users and the Frequency Change." 7 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W. Paper by Mr. H. Bruff on "Electric Welding as Applied to Bridges and other Structures on the L. and N.E. Railway." 7.30 *p.m.*

Institution of Electrical Engineers (West Wales-Swansea Sub-Centre).—Corporation Electrical Showrooms. Chairman's address by Mr. J. W. Burr. 6 *p.m.*

Monday, October 28th.

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Systematic Research by Industrial Undertakings." (Opened by the President.) 7 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Chairman's address by Mr. B. A. Robinson. 7 *p.m.*

E.L.M.A. Lighting Service Bureau.—15, Savoy Street, Strand, London. Twentieth Illumination Design Course.—Lecture II, by Mr. F. Marsh on "Illumination Design." 7.30 *p.m.*

Electrical Association for Women (Bristol and District Branch).—New Physics Theatre, Bristol University. 8 *p.m.* Lecture by Dr. A. P. M. Fleming on "Milestones in the Progress of Electricity." 8 *p.m.*

Tuesday, October 29th.

Institution of Electrical Engineers (East Midland Sub-Centre).—College of Science and Technology, Leicester. Paper by Sir C. A. Parsons, F.R.S., on "Direct Generation of Alternating Current at High Voltages." 6.45 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, King Street, Leeds. Chairman's address by Mr. T. Roles. 7 *p.m.*

Association of Supervising Electrical Engineers.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Lecture by Mr. W. J. Jones on "Various Applications of Indirect Lighting, with Special Reference to Public Buildings."

Wednesday, October 30th.

Electrical Contractors' Association (Croydon Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*

Friday, November 1st.

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. Thomas Hawksley Lecture, by Prof. H. L. Callendar, F.R.S., on "Critical Relations Between Water and Steam." 6 *p.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Institution, Savoy Place, Victoria Embankment, London. Chairman's inaugural address by Mr. E. W. Hill. 7 *p.m.*

Saturday, November 2nd.

Electrical Power Engineers' Association (West Yorkshire Section).—Great Northern Hotel, Leeds. Seventh annual dinner. 5.30 for 6 *p.m.*

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THE ELECTRICIAN

Vol. CIII.—No. 2683. Friday, November 1, 1929. [Registered at the General Post Office.] Sixpence

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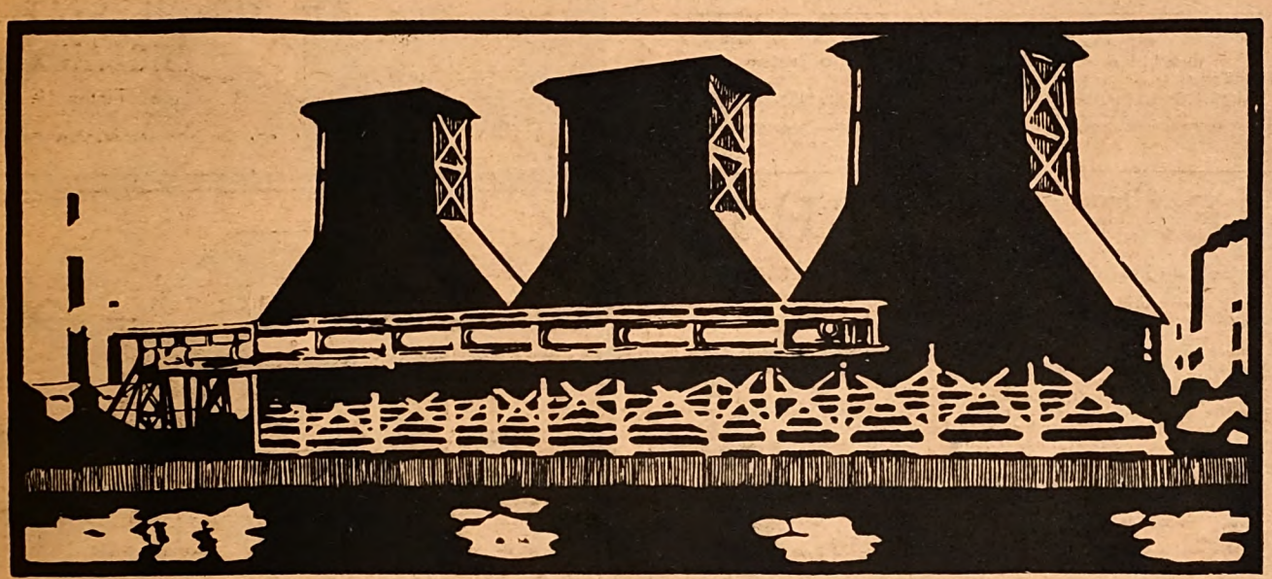

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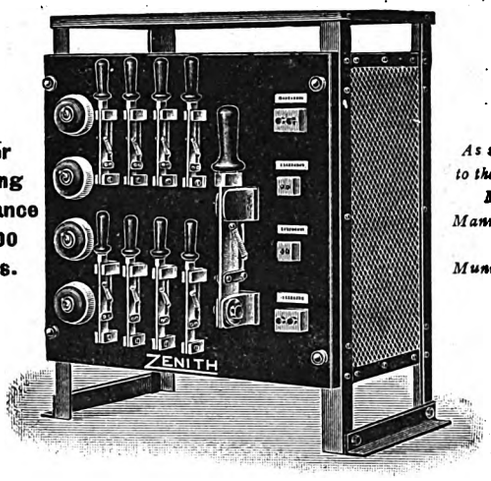

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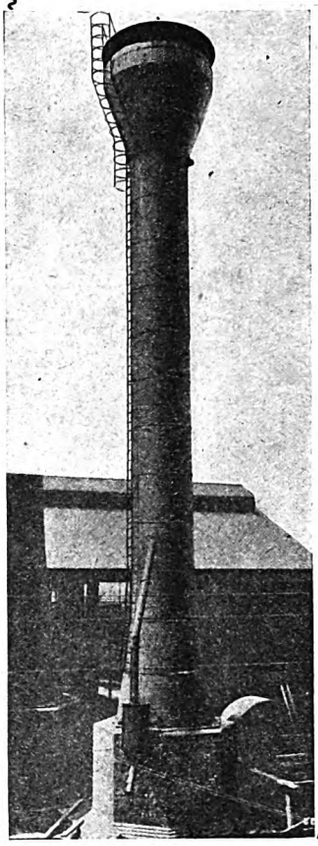

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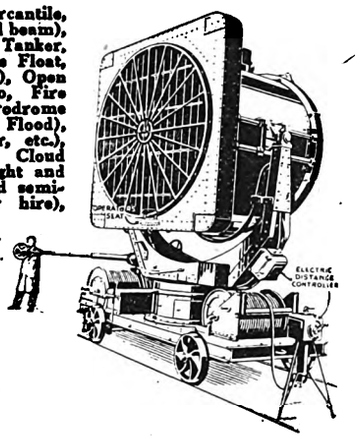

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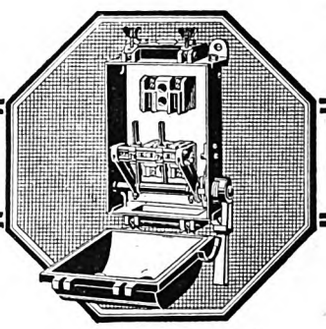

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

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Current Topics.

A Fine Address.

IT was singularly appropriate that a Presidential Address which was heard simultaneously by local centres throughout the country by the aid of recent developments in electrical communication, should have dealt almost exclusively with this aspect of electrical activities. But apart from the novelty of the circumstances under which COL. PURVES'S remarks were delivered, the subject matter was of very great interest. Some of the developments that have been made in communications engineering during the past few years have been sufficiently spectacular to break down the mistaken prejudices of those electrical engineers who deemed themselves a race apart from the "weak current" men, but, for all that, some of the lesser-known, but still remarkable, achievements in telephony and allied communication systems to which the President referred must have surprised many of his hearers, and prepared their minds for acceptance of the undoubted fact that the work of the communications engineer, by reason of the intricacy of the problems which confront him, and the delicacy of the means and methods which he has devised for dealing with them, will bear comparison with that of any other branch of electrical engineering. This work is, however, of more than mere comparative interest to the "heavy" electrical engineer, and the President gave several illuminating examples of its bearing on other branches of electrical endeavour, as instanced by the contributions which the study of telephony has made to alternating current transmission theory. It is also interesting to note that the last I.E.E. President to deal with electrical communications was Mr. FRANK GILL, and that the remarkable recent progress in international telephonic communication now recorded by COL. PURVES is very largely due to and founded on Mr. GILL'S 1923 Address.

I.E.E. Lighting.

IN spite of repeated assertions by those best qualified to judge that the lighting of the lecture theatre of the Institution of Electrical Engineers was the embodiment of lighting ideals, we have always experienced a species of eye-strain mingled with a degree of melancholy not strictly in keeping with the earliness of the hour whenever we have sat in that dignified hall. At last week's inaugural meeting, however, we noticed a change, as we thought for the better, and it later transpired that the increased sense of well-being, then felt for the first time, was due to the combined labours of Messrs. PATERSON and YOUNG, who have spent a considerable amount of time on the problem. Assuming that the former lighting was technically perfect, which we very much doubt, the above-named gentlemen seem now to have succeeded excellently well in reconciling perfection with comfort.

Brighter Seaside Resorts.

SCHEMES costing many thousands of pounds will be considered by south coast seaside authorities during the next few months: Open-air bathing pools, municipal dance halls, pleasure gardens, and promenade extensions are among the improvements to be considered. There is growing realisation at such resorts of the attractive value of spectacular schemes of electrical illumination, and, with Blackpool as a shining example of properly exploited ornamental lighting, it should not be difficult for electrical firms to play a practical part in the provision of a brighter seaside for next season.

Another Gas Attack.

ALL who admire enterprise, even in a mistaken direction, will pay ungrudging tribute to the excellence of the full-colour advertising of gas which appeared in the special Printing Number of "The Times" on Tuesday. The full page coloured picture by CLIVE GARDINER, with a caption which somewhat equivocally stated that "Gas is banishing the curtain of smoke that keeps the

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sunshine from our cities" was a sheer delight to the eye. Another colour page, sponsored by the Gas Light and Coke Co., had a well-written and delightfully illustrated account of the applications of gas in a printing works and there was an article on the uses of gas in printing which mentioned, incidentally, that "to-day almost any printer will tell you that he prefers to work by gaslight rather than by any other artificial illuminant." As those responsible for collective electrical propaganda seem to have neither the money nor the inclination to make a show on an occasion of this sort, electricity only received incidental mention in the issue on the machine driving side. There are numerous other possible electrical applications in typesetting, stereotyping and a variety of printing operations requiring heat. It certainly looks as if industrial electric heating specialists will need to pay more attention to this field.

The Shannon Scheme.

THE good progress which is being made with the Shannon Electricity Scheme is indicated by the fact that last week the Irish Free State Electricity Supply Board took over from the Minister for Industry and Commerce the whole of the electrical and mechanical equipment at the Ardnacrusha power station. The Supply Board has already taken over the 38 kV transmission system and the 10 kV lines on the Limerick Waterford-Cork-Tralee-Limerick route, which means that the Ardnacrusha station can now go into operation and transmit energy over the network south of Dublin to Limerick, while the civil engineering side of the work is being completed. For this supply scheme to become an economical proposition, 110 000 000 kWh will have to be sold per annum, as against the present consumption of the whole of the Irish Free State of 68 500 000 kWh, though the price per kWh on which the Supply Board has based this calculation is not yet known. Ireland may rest assured that the eyes of the electrical world are watching with sympathetic, if critical, attention, for apart from the fact that the scheme was the first real constructive task undertaken by the Free State Government, the means adopted for developing sales of energy by nearly 50% are likely to prove of more than local interest.

Britain and the South African Market.

THE views already expressed in these columns regarding our neglect of local requirements in the overseas markets, received further substantiation last week when Mr. KARL GUNDELFINGER, president of the Associated Chambers of Commerce of South Africa, spoke at the annual congress at Capetown. In reference to South African imports it was stated that the partial failure of the British manufacturers in maintaining their share of trade was largely due to their unwillingness to meet South African needs, as against their foreign competitors. The British manufacturer enjoys not only certain preferential tariffs in dealing with South Africa but more important still, he also enjoys a considerable amount of good will, and if he does not secure the larger share of patronage he must, in the words of Mr. Gundelfinger, "search nearer home for the causes."

Sussex Again!

HAVING come to an end of arguments intended to show that the erection of overhead lines would desecrate the amenities of the Sussex Downs, the anti-pylonists have changed their ground, if we are to attach any significance to the letter which LORD BUXTON contributed to Wednesday's issue of "The Times." In this remarkably worded statement, asking for an entirely new inquiry into the whole scheme, he claims that, apart altogether from the amenities of the downs and marshes, there is a strong case for delay and consideration. An effort is made to show that the scheme will not provide cheap electricity, and that even if it did, Sussex doesn't want it. The economic arguments now introduced emphasise the danger of a little knowledge in a wrong application, for while it is correct to point out that distribution (in which transmission should in this case be included) is far more costly than generating, the objectors to the Sussex scheme would automatically increase distribution costs to an entirely uneconomic level. Again it is pointed out that "neither the main lines nor the subsidiary lines can be tapped at any point whatever in their route from town to town." Although we have not yet got down to the tapping of main lines for very small loads, the position is not quite so bad as the above quotation suggests.

Australia and the Communications Company.

THE existence of a peculiar position between Australia and the Communications Company is revealed this week by Amalgamated Wireless (Australasia) Ltd. The Communications Company, it will be remembered, is the result of the merging of the chief cable and wireless communication interests in this country, and though it was believed that the Australian Commonwealth had a majority of shares in the Amalgamated Wireless Company, the balance sheet of the company, published this week, shows that this is not so. At the time of the merger the Amalgamated Wireless Company did not amalgamate, and though the Communications Company controls the traffic exchanged between England and all the Dominions both by cable and wireless, it does not control wireless communication *from* Australia. The position in short is that the Amalgamated Wireless Company can only transmit to this country or Canada with the consent of the Communications Company to receive, and though it is expected that the new Australian Government will remedy matters, Australia at the moment has no complete international service of her own.

Empire Trade.

AT a time when industrialists are seriously beginning to view trade problems internationally, special interest attaches to the efforts which are now being made to arouse enthusiasm for a British Empire trading policy. In these columns we have frequently drawn attention to the vast possibilities of the countries comprising the British Commonwealth of nations, both as sources of our raw materials and as consumers of our finished goods. The problem of welding the countries of the British Empire into one interdependent and largely self-sufficing economic unit is by no means as simple as it seems, but a most encouraging feature is the readiness of the Dominions to "buy British" if we will only give them the chance, or, in other words, provide the goods they want at competitive prices. An Empire trade policy should commend itself to everyone, for even the out-and-out internationalists should see in it an important step on the way to the realisation of their aim.

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SLACKS VALLEY POWER STATION.

Constructional and Operating Features of Oldham's New Plant—Good Day-time Light in Boiler House—Obviating Use of Signalling Apparatus to Turbine Rooms.

THE new Slacks Valley power station of the Oldham Corporation Electricity Department, which was formally opened on October 16th, is conveniently situated on land adjoining the main line of the L.M.S. Railway from Manchester to Yorkshire on the west, and the Rochdale Canal on the east.

The entrance to the works is on the new Manchester-Chadderton arterial road. The area of the site is 34 acres, and the present generating capacity of the station is 37 500 kW. The whole site, however, is capable of ultimate extension to accommodate a total of 150 000 kW of plant.

Somewhat difficult problems of foundation construction were offered by the ground on which the station is built, but these have satisfactorily been overcome. The top surface was a layer of peat, with plastic clay and sand below, and necessitated the use of a large number of concrete piles for both the main building and the water cooling towers.

Facilities for coaling are good, as not only will it be possible to transport coal from the Lancashire coalfields by way of the Rochdale Canal, but two short siding connections to the L.M.S. Railway on the west side put the works in direct communication with any railway in the country.

Coal can, therefore, be delivered by rail or canal, the wagons being hauled and marshalled by means of a fireless locomotive and electric capstans over three tracks of rails, one of which passes over two railway-type weighing machines and the coal receiving hopper. Each wagon is weighed before and after emptying.

Coal is unloaded by means of two electrically-driven ram tipplers placed between the rails, and is discharged into the receiving hopper, whence it is carried by an automatic filler into an endless chain gravity bucket conveyor, capable of dealing with 80 tons of coal per hour, to the main storage bunkers in the boiler house, which have a total capacity of 900 tons.

A special feature of the coal handling plant is an auxiliary conveyor having a capacity of five tons of fine slack per hour, which is used for the recovery and return to the main bunkers of riddlings and fine coal which accumulate below the chain-grate stokers.

The first portion of the station consists of the turbine house, which is 143 ft. 6 in. long and 70 ft. wide, with a height of 47 ft. 6 in. to the crane rails and 60 ft. to the eaves of the roof.

Adjacent to, and parallel with, the turbine house is the switch house, which is divided into three floors; the circulating water pumps in the basement, circuit breaker room on the second floor, and control room on the third floor. The administrative offices are at the permanent end of the switch house.

Following normal practice, the boiler house is situated at right angles to the turbine house, and is 140 ft. long, and 120 ft. wide, with a height of 53 ft. to the eaves.

The boiler feed pump house is situated between the boiler house and the turbine house, and is parallel to the turbine house.

The buildings are of steel framework with brick filling, the exterior sides of the walls being faced with Accrington brick and Yorkshire stone, and above the turbine house floor level the inside walls are finished with glazed grey and white tiles.

Boiler House Lighting.

Every effort has been made to provide extremely good day-time lighting, and this is a particularly noticeable feature of the boiler house.

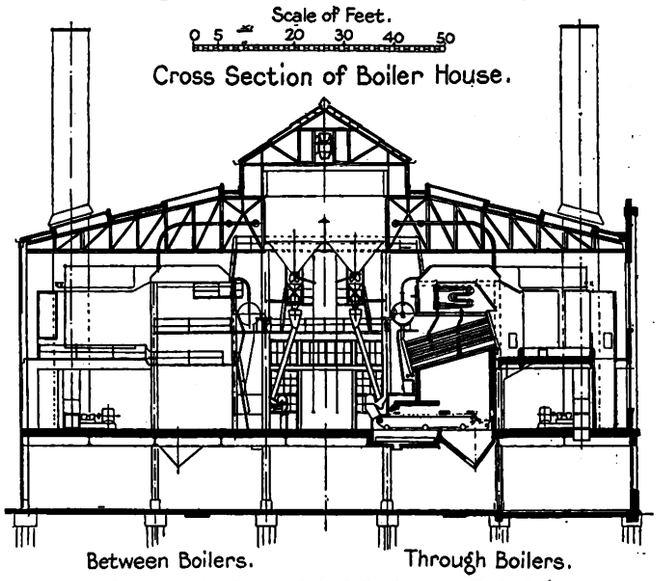
The basement of the boiler house is arranged at ground level. A horse-shoe shaped track provided enables the ashes to be directly removed from the hoppers beneath the boilers by motor or railway wagons and tipped on the site, the contour of which lends itself to this method of disposal for a considerable period.

The steam raising plant consists of eight cross-tube, marine type, water-tube boilers, each capable of evaporating 50 000 lb. of water per hour under normal working conditions.

The plant is constructed to operate at a working pressure of 295 lb. per sq. in., and superheaters are provided capable of imparting a final temperature to the steam of 700 deg. F. at the stop valve.

Each boiler is set singly, is entirely self-contained and enclosed in steel casing. Each unit is equipped with a vertical, cast-iron, steel cased economiser, having an effective heating surface of 4 500 sq. ft., electrically driven induced d aught fan, and a steel chimney, 7 ft. in diameter and 80 ft. high. The flue gases leaving the economisers either pass through the induced draught fan into the steel chimney or can be by-passed to the chimney direct.

In order to provide as much natural light as possible, and



A cross-sectional view of the boiler house at Slacks Valley.

to secure ease of maintenance, the economisers have been placed immediately behind the boilers on an auxiliary floor, and the induced draught plant has been arranged immediately underneath the economisers at firing floor level.

The coal from the main bunkers passes through two 2 cwt. "Avery" coal weighing machines and traversing type chutes to the stoker hoppers.

Boiler Plant.

The boiler furnaces are fitted with automatic mechanical chain-grate stokers, each boiler having two grates with a total grate area of 324 sq. ft. per furnace.

The stokers are arranged to operate under simple induced draught conditions, but arrangements have been made so that the necessary closing-in plates can be readily added to the plant at a later date should it be considered desirable to instal forced draught and air heating plant for operating the stokers under balanced draught conditions.

Steam soot blowers are provided for each boiler and each economiser. A set of instruments to assist the staff in obtaining the highest efficiency from the plant has been provided for each boiler.

The boiler feed pumps are placed in the pump house, which lies, as previously noted, between the boiler house and the turbine house. Six pumps are provided—four being electrically driven and two steam turbine driven—and these have an aggregate capacity of 95 000 gallons per hour. The flow of feed water to boilers is controlled automatically by eight "Copes" feed water regulators.

The exhaust steam from each turbine driven feed pump is led to a feed water heater which is installed in the feed pump suction.

Four condensate surge and make-up water tanks are erected in the upper portion of the pump house. Under ordinary working conditions the extraction water passes direct from main condensers to the feed pumps and thence back to the boilers.

Over one of the tanks a "Lea" recorder is erected. This can be brought into operation as desired by suitably arranged by-pass valves.

The tank at the north end of the pump house can be isolated at any time, and any turbine can be put on load under test conditions. The discharge from this tank can be passed to the tank erected on a weighbridge on the pump house floor, where the whole of the condensate can be weighed from any

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one turbine. This tank, after weighing, is again discharged into a further tank, which is placed on the condenser floor in the turbine house, and the weighed water is pumped from this tank back to the common feed system. A "Permutit" water softening plant is provided for boiler feed make-up. The feed and steam piping has been designed and laid out in the simplest possible manner, for ease of operation and maintenance, special precautions being taken to allow for expansion.

Generating Plant.

The turbine house, which has an 80-ton crane equipped with an auxiliary 10-ton hoist, has an initial installation of three turbo-alternator sets, each running at 3 000 r.p.m., and each capable of giving a normal output of 12 500 kW at 6 600 V, with an overload capacity of 25% for two hours.

The normal conditions for which the turbines are designed are 250 lb. steam pressure at stop valve; 650 deg. F., total temperature of steam at stop valve; and 28·2 in. vacuum.

Each turbine is of the two-cylinder type, designed so that only steel is exposed to high temperature steam. Four comparatively small diameter pipes provide a flexible connection from the steam chest to the turbine cylinder, and pipes with corrugations are arranged on each side of the machines, to give flexible connections between the two cylinders.

The low pressure cylinder is made of cast-iron and incorporates a number of rateau impulse stages and "Baumann" multi-exhaust.

The turbines are arranged for two-stage feed heating. The oiling system of each turbine is complete with pump, tank, coolers and separator, and arrangements are made so that the separator can be put into service whilst the turbine is on load, and also that the oil can be drained from any turbine oil tank to the central storage tank.

The alternators are each capable of a continuous normal full load output of 12 500 kW at 0·8 power factor. The exciter is direct coupled to its alternator and is of the overhung type.

Each alternator is ventilated on the closed air circuit system. The coolers for each alternator are arranged in two units situated directly beneath the alternator, and enclosed by the foundations. At reduced loads it is possible to place the external fan out of commission.

The condensing plants are of the central flow, surface type, with the necessary extraction pump, rotary air pump, stand-by steam-operated air ejectors and circulating water pump. Each condenser has a cooling surface of 16 600 sq. ft.

The extraction pump discharges, through the various heaters, direct to the suction of the boiler feed pumps.

Each condenser is provided with a steam-operated air exhauster, to facilitate obtaining a good vacuum quickly when starting up.

The circulating water pump is capable of delivering 15 690 gallons of water per minute. Cross connections are provided on the discharge side of the three pumps.

The condensers, air coolers and oil coolers are all protected against electrolytic action by means of the Harris Anderson anti-corrosion system.

The condensing water passes through three duplex water cooling towers having a total capacity of 1 800 000 gallons per hour. In addition, sufficient condensing water for one 12 500 kW set can be obtained from the canal on the east side of the station.

Switchgear.

The switch and control rooms, on the east side of the turbine house, are arranged so that the operator in the control rooms has a complete view of the turbine house, which obviates the necessity of installing signalling apparatus.

The switch room is equipped with 6 600 V duplicate busbar electrically-operated draw-out metal clad switchgear, controlling the three 12 500 kW turbo-generators and six group feeders, so interlocked that it can be correctly handled with perfect safety.

The main units have two distinct triple-pole oil circuit breakers (having a rupturing capacity of 1 500 000 kVA), one for each set of busbars. These switches are motor operated. An interesting feature of the main (type JVD) switchgear is that each phase has a complete non-magnetic earthed metal enclosure throughout, so that, should any faults develop they will be earth faults only, the fault current being limited by the neutral earthing resistance.

The smaller units controlling the outgoing feeders have two triple-pole oil circuit breakers (rupturing capacity 750 000 kVA) in the one tank, which allow the feeders to be put on either set of busbars as desired. These switches are solenoid operated.

The generators are fitted with the self-balanced type of protective gear, which is so interlocked with the field suppression pillar that the latter equipment only functions when the breaker opens under an internal fault condition. Stand-by definite time limit overload protection is also provided. Over the feeder panel board is fixed an automatic indicating line diagram.

The supply of energy for auxiliary power and for lighting is obtained from three 1 000 kVA 6 600/400 V transformers. These transformers are connected to a low tension ironclad switchboard arranged on the switch room side of the turbine house at floor level. The supply to the boiler house switchboard is also controlled from this point. An 800 Ah battery is provided to operate the switchgear and to provide stand-by lighting when required.

The principal contractors and sub-contractors for the work were:—Boilers and superheaters, Babcock and Wilcox, Ltd. Economisers, E. Green and Son, Ltd. Soot blowers, Babcock and Wilcox, Ltd., and the British Soot Blower Co., Ltd. Induced draught fans, Davidson and Co., Ltd. Fan motors, Lancashire Dynamo and Motor Co., Ltd. Motor switchgear, Brookhirst Switchgear, Ltd. Instruments, Cambridge Instrument Co., Ltd. Steam flow meters, George Kent, Ltd. Turbo-alternators (three 12 500 kW sets), condensing plant, circulating pump motors, motor generator and switchgear, Metropolitan-Vickers Electrical Co., Ltd. Circulating pumps, Mather and Platt, Ltd. Transforming plant, English Electric Co., Ltd. Switchgear, Ferguson Pailin, Ltd. Battery, Tudor Accumulator Co., Ltd. Coal conveyor, ram tippers and capstans, Babcock and Wilcox, Ltd. Automatic coal weighing machines, W. and T. Avery, Ltd. High and low pressure pipework, Brightside Foundry and Engineering Co., Ltd. High pressure valves, Hopkinson's, Ltd. Low pressure valves, J. Blakeborough and Sons, Ltd. Steam driven feed pumps, G. and J. Weir, Ltd. Electrically-driven feed pumps, Mather and Platt, Ltd. Switchgear, Allen West and Co., Ltd. Cables, Union Cable Co., Ltd. Crane, Clyde Crane and Engineering Co., Ltd. Lifts, Etchells, Congdon and Muir, Ltd. Cooling towers, Premier Cooler and Engineering Co., Ltd. Circulating water pipes, Staveley Coal and Iron Co., Ltd. Canal pump, Mather and Platt, Ltd. Screening plant, F. W. Brackett and Co., Ltd. Water softener, United Water Softeners, Ltd.; Feed Water Regulator, Copes Regulators, Ltd.; Air Compressor, Belliss and Morcom, Ltd. Air compressor motor, Lancashire Dynamo and Motor Co., Ltd.

A BERMONDSEY EXTENSION.

THE new transformer station of the Bermondsey Electricity Department was formally opened by the Mayor on October 26th.

The entire output of the new station is controlled by what is claimed to be one of the largest d.c. switchboards in the country. It was manufactured at the Chelmsford works of Crompton Parkinson, Ltd. and the immense length of its 27 panels, totalling approximately 80 ft., with its duplicate busbars and its provision for the continuance of supply under abnormal conditions, have involved many special problems.

At present the panels control the output of five 2 000 kW and one 1 000 kW rotary converters, 36 three-wire 600 A feeders, 12 public lighting circuits and a panel for the battery to supply emergency lighting protective gear and operating current for e.h.t. switchgear. There is also provision for accommodating the switchgear for a further 2 000 kW rotary converter. The switchboard is of the flat back type with black enamelled slate panels mounted on an angle and flat iron frame. Each rotary panel is fitted with two s.p. interlocked 5 000 A breakers, both poles fitted with o.l. reverse current, time limit and overspeed devices, two dead beat moving coil ammeters, integrating wattmeter, two s.p. 5 000 A change-over switches, neutral switch and paralleling voltmeter. Each main feeder panel is fitted with d.p. o.l. breakers, with the necessary indicating devices and change-over switches.

Special provisions for normal expansion and contraction in addition to bracing and anchoring to withstand short circuit conditions are a feature of the busbar system, which is duplicated throughout.

The design is strikingly clear and simple, with spacious accessibility at the back of the board and easy manual control in front. It is interesting to note that the original Crompton switchboard, supplied at the inception of the undertaking over 29 years ago, is still in service.

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BOOK REVIEWS.

The Universe Around Us. By Sir JAMES JEANS, F.R.S. (London: Cambridge University Press.) Pp. 352. 12s. 6d. net.

For the most part, this extremely fascinating book is of no direct interest to electrical engineers as such, but it will, nevertheless, appeal to members of the profession who can be interested in other branches of scientific work. The methods and results of modern astronomical research, as set forth so simply and clearly in this book, are intelligible to readers with little or no special scientific knowledge, and nowhere could one find a better popular exposition of the problems of cosmogony and evolution, and the general structure of the universe. Those who have heard Sir James Jeans's wireless talks on these subjects will know what to expect in the book. Those who have not heard will find this volume to be a storehouse of treasure and pleasure. W. L.

Steam Turbines. By T. M. NAYLOR. (London: Chapman and Hall.) Pp. viii+207. 12s. 6d. net.

In this book an attempt is made to meet the requirements of engineering students in their final years, and, if young, engineers engaged in the design, construction and maintenance of turbine plants should also find it interesting. As prior knowledge of thermodynamics and the properties of steam is assumed, no reference is made to these matter. The theory of lubrication is omitted for the same reason. There is, however, a chapter on condensers. The book is well and clearly illustrated. G. W. D.

Radio Receiving Tubes. By JAMES A. MOYER and JOHN F. WASTREL. (London: McGraw-Hill Publishing Co., Ltd.) Pp. vii+297. 12s. 6d. net.

In this book the essential principles underlying the operation of radio valves are clearly explained. But as the valve possesses a remarkable variety of functions, the book includes, in addition to the use of two and three element valves for radio reception and transmission, other applications of practical significance. These applications include the remote control of aeroplanes and sea-going vessels by the use of instruments in which the radio valve is an integral feature, as well as methods of applying radio valves to the remote control of humidity and similar uses. H. D. G.

Applied Geophysics in the Search for Minerals. By A. S. EVE and D. A. KEYS. (London: Cambridge University Press.) Pp. viii+253. 12s. 6d. net.

As the modern application of sound physical principles to the discovery of hidden wealth is even now not easily believed, this well authenticated treatise is very welcome, especially as it is founded on actual and varied practice in the field. In spite of conservatism in prospecting methods, there are many and various schemes of exploitation now available. Most of these are described in the book. The general methods described include magnetic, by magnetometer and dip circle, variometers, etc.; and electrical, by the natural current or self-potential, parallel wire, point electrode, leap frog, earth resistivity, porous pot, Gish Rooney and Megger methods, and the single electrode probe. Such electromagnetic methods as elliptic polarisation, equipotential, parallel wires and horizontal and vertical loops are also described. The book is the first we have seen dealing with the theoretical and practical sides of the numerous exploration methods now available. G. S.

Uber Kondensatoren und ihre Richung. By Dr. G. ZICKNER. Pp. 60. 3 Marks. (Leipzig: Hachmeister and Thal.).

This work may be said to be a treatise on the design and construction of condensers as used for wireless receivers. The work is not chaptered, but is divided into several sections, each of which deals with some specific feature in design. The first section is devoted to definitions of capacity and various formulæ are given; the relations between capacity, as well as resistance and impedance at various frequencies, and examples are worked. Table 3 in this section is interesting since it deals with the dielectric strengths of various kinds of insulating media. A considerable portion of the work deals with the calculation of capacity and condenser design. The derivation of formulæ is given for plate condensers with specific dielectrics, and for condensers in which several dielectrics are employed. This section contains several illustrations of condensers of various types and capacities. Some of them appear to be so peculiar in shape that, if the method of calculation were not given, it would be difficult to determine their capacity. The variation of capacity with frequency is also adequately treated. It is shown that the apparent capacity gradually decreases as the frequency is raised, thus tending to a limit of geometric capacity at infinite frequency. The last sections of the work deal with calculations of condensers in series, and in parallel, with inductances; fixed and variable condensers interconnected with inductances and change-over switches, which permits almost any combination of impedance to be obtained. If this book were written in English, we would predict a ready sale for it. CYRIL SYLVESTER.

Dynamische Lautsprecher. By Dr. EUGEN NESPER. Pp. 40. 2 Marks. (Leipzig: Hachmeister and Thal).

This is one of a series of books, by different authors, on wireless apparatus published by Messrs. Hachmeister and Thal, Leipzig. The book under review may be said to deal with the design and construction of loud speakers of various types. The work is divided into four chapters, the first of which deals with the electrical characteristics of loud speaker design. This chapter contains a useful sectional diagram, with appropriate reference numbers, of a cone type loud speaker. Chapter two deals with loud speakers of various types, both ancient and modern. This is useful, since it enables comparisons to be made between various types, and it shows the progress which has been made. Loud speakers for open air use are also described and illustrated in this chapter. The third chapter is, perhaps, the most valuable one in the book, since it deals with the electro-technics of loud speaker design. Several illustrations of the distribution of flux, and graphs showing magneto-motive force plotted against flux density, are given, in addition to calculations and worked examples. Some of the most important calculations deal with the impedance at various frequencies; the calculations are not too mathematical. The last chapter occupies but two and a half pages, but it is valuable from the fact that it deals with a typical circuit diagram of a four valve receiver, and two diagrams of a loud speaker circuit connected in different ways to the receiving circuit by means of change-over switches. To those interested in the design and construction of loud speakers the work is to be commended. C. S. R.

BOOKS RECEIVED.

"Das Rechnen mit Symmetrischen Komponenten." (Leipzig: B. G. Teubner.) Pp. 74. 5 marks.

"The Electrical Contractors' Year Book, 1929-30." (London: Electrical Contractors' Association.) Pp. 499. 5s. net.

"Journal of the Institution of Electrical Engineers." Vol. 67, No. 394, October. (London: E. and F. N. Spon.) 10s. 6d. net.

"Elettrotecnica." By Prof. D. L. Donati and Prof. Ing. G. Sartori. (Milan: Ulrico Hoepli.) Vol. I, Pp. 406. L. 120. Vol II, Pp. 616. L. 120.

SAG CHART FOR COPPER CONDUCTORS.

Sag Values in Terms of Variable Span Length.

By W. T. TAYLOR, M.Inst.C.E., M.I.E.E.

ON the opposite page is reproduced a series of curves giving sag values for copper conductors (⅜ in. ice loading) in terms of variable span length.

To find the stringing tension in still air first find the sag from the chart for the given temperature in deg. F., then calculate stringing tension from formula: $T = wL^2/s$ 0.66 lb. Where, T = tension in lb., L = span length in ft., w = weight of bare conductor in lb./ft. of length, s = sag in inches.

Where it is desired to find the sag for maximum loading conditions (8.0 lb. wind and ⅜ in. ice loading) calculate from formula: $s' = WL^2/T'8$ ft. Where: T' = allowable tension or safe load in lb., L = span length in ft., W = weight of ice covered conductor in lb./ft. of length, s' = sag of conductor in ft. The allowable value of w and T' are given in B.S. Specification No. 125.

The following results of examples are given for the purpose of showing readers how to use the chart. The values of sag are more closely calculated than the average lineman will often be able to hold to, because of changing physical conditions, such as temperature and constants, in the material, etc.:—

Examples:—	Sq. in.	Span (L)	Temp. (t)	Sag (s)
	0.20	300 ft.	40° F.	24 inches
	0.15	350 ,,	40 ,,	35 ,,
	0.10	300 ,,	20 ,,	24 ,,
	0.075	300 ,,	40 ,,	36 ,,
	0.050	250 ,,	20 ,,	24 ,,

It should be noted that A, B, etc. for conductors, correspond with the respective A, B, etc. of spans shown on the left of the chart.

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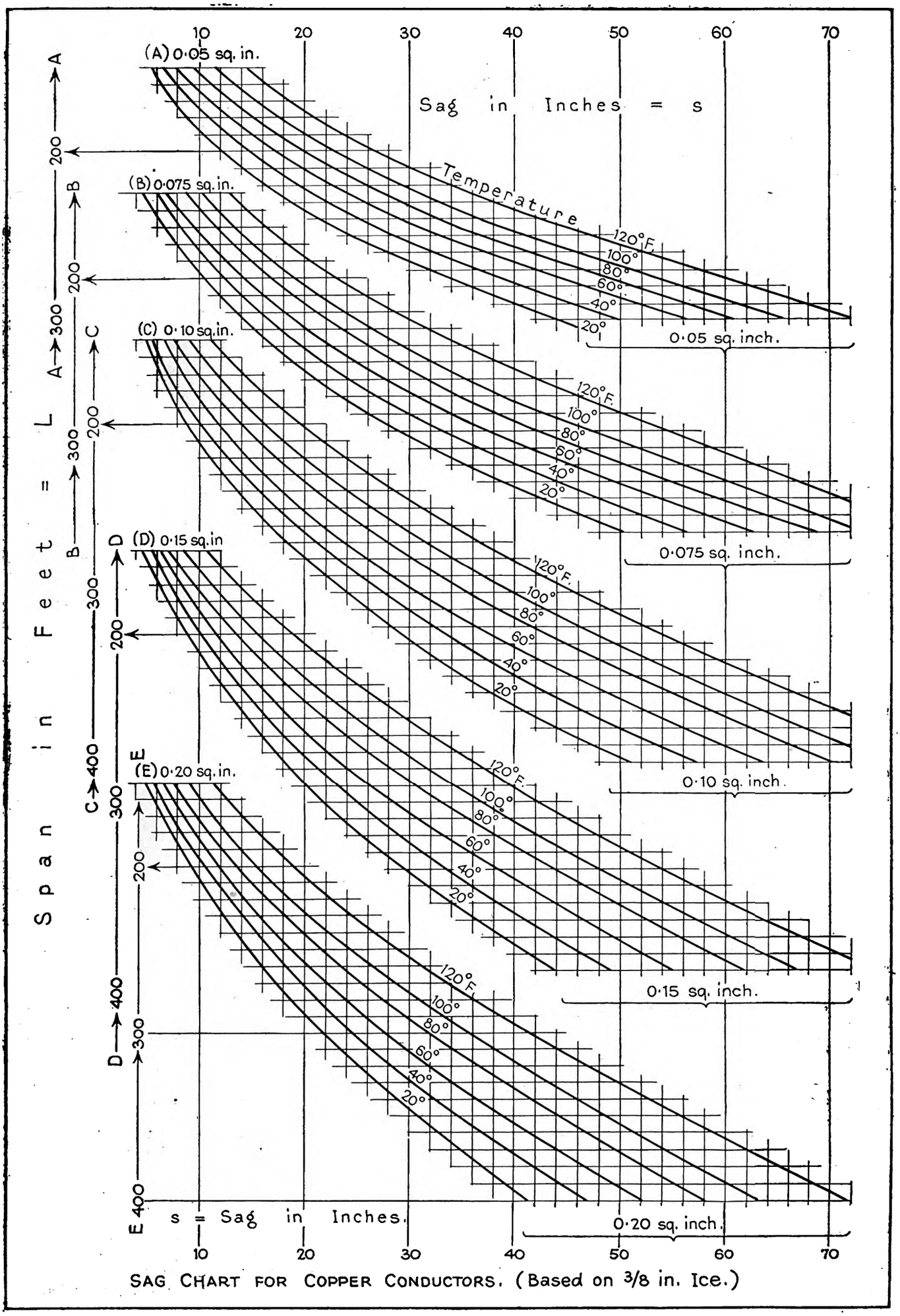

SAG CHART FOR COPPER CONDUCTORS. (Based on 3/8 in. Ice.)

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THE YALLOURN ELECTRICITY SCHEME.

Details of Generating Transmission and Distribution Arrangements—Use of Local Brown Coal Deposits—Remote Control of Hydro-Electric Stations.

By JAMES CASSIDY.

THE name " Yallourn " is derived from two native words, " Yalleen " and " Lourn," meaning " brown " and " coal " respectively. The town lies five miles from Morwell, and it is 87 miles from Melbourne by train, 90 miles by road, and 110 miles via the Electricity Commission's high tension transmission line.

Yallourn is a model town, and an interesting example of applied town-planning ideals. A large number of shade and ornamental trees are planted in streets and reserves. These trees are produced at the Commission's own nursery at Yallourn.

An " Electrical " Town.

Apart from bank and public officials, the population of Yallourn is composed entirely of officers and employees of the Commission. That of the town itself numbers approximately 1 500. The population is housed in dwellings designed, erected and owned by the Commission. The number of dwellings erected and in occupation at Yallourn is 305. It will soon be 370.

The town is perfectly self-contained. It has a fine State school, a fire brigade, the usual postal and banking facilities, and a large general store owned by the Commission. An up-to-date hospital is about to be erected, together with a higher elementary school and technical school. There are football, soccer, cricket, tennis and golf clubs, which, with a Glee Society, horticultural society and various church societies, contribute to the amenities of life.

The town obtains its water supply from the Latrobe River, which lies about two miles to the north of Yallourn. The water is pumped into a reservoir at the top of a hill overlooking the town.

The brown coal fields at Yallourn under the control of the Electricity Commission, cover an area of about thirty square miles, containing 6 000 000 000 tons of brown coal, of an average thickness of 200 ft. lying beneath an average depth of 50 ft. of overburden (the name given to the soil covering the coal deposits).

The coal, being at such a shallow depth, is won by the open-cut method, the overburden being stripped off, exposing the coal, which is then excavated by an electrically-operated power shovel, which takes six tons at a " bite." It is intended to supplement this method by the use of a coal-dredger, which will enable the present output of 4 000 tons a day to be increased to 10 000 a day of two eight-hour shifts.

The present open cut lies about one mile from the township, and is adjacent to the power station. In the area of the one square mile set apart for the initial workings, there are 150 000 000 tons of coal of an average thickness of 180 ft., covered by 30 ft. of overburden.

The open cut is 2 400 ft. long and 1 000 ft. wide. Here a face of 70 ft. of coal is being operated on. There is sufficient fuel in this cut to develop 200 000 H.P. of energy daily for fifty years. In the whole field there is enough coal to generate one million H.P. of energy daily for 400 years.

The present output of coal is 4 000 tons per day. Of this, 1 700 tons provide a daily output of 400 tons of briquettes, the remainder being used to generate electricity.

In addition to the " new " open-cut workings, coal is obtained from the old open cut, which was taken over by the Electricity Commission from the Mines Department. The old open cut is located on the northern bank of the Latrobe River, and serves to supplement the supply of coal to the power station.

The power station is situated adjacent to the weir on the Latrobe River. This weir was constructed in order to raise the level of the water, and also to provide a storage of cold water which can be drawn upon at times of the day when the condensing water is required at a greater rate than the flow of the river.

The power station has an installed generating capacity of 62 500 kW. Its normal operating capacity is 50 000 kW, but during the year it has, on occasion, operated at over 59 000 kW.

The Yallourn power station buildings are mainly steel-framed structures. The boiler house contains twelve boilers, which successfully burn coal containing 65% of moisture, by means of step grates, fitted with pre-drying devices.

The generating plant comprised five main turbo-generators, each rated at 12 500 kW, generating three-phase 50 cycle alternating current energy at 11 000 V. A sixth turbo-generator of similar type is on order, and is expected to arrive about March of next year. It will be ready for next year's winter load.

The main transmission line from Yallourn to Melbourne is 110¼ miles in length. It comprises 591 steel towers, and operates at a pressure of 132 000 V. It commences at the Yallourn switchyard and terminates at the Yarraville terminal station.

The Yarraville terminal station receives and regulates the energy transmitted from the Yallourn and Newport " B " power stations. It provides a link with the 25 cycle distribution system of the Victorian Railways Department, and distributes energy to the various sub-stations in the metropolitan area and surrounding districts.

The Newport " B " station came into operation early in 1924, and is of 15 000 kW operating capacity. It acts as an auxiliary station, functioning at " peak " load periods only.

The transmission systems are made up of three sections, viz.: (1) Main 132 000 V transmission line, carrying power from Yallourn to Melbourne; (2) metropolitan supply system; (3) country district service.

The Commission has approximately 1 300 route miles of overhead and underground h.t. transmission lines now in operation. These lines radiate in all directions, passing through fifty shires en route, and carrying energy for distances up to 300 miles from the source of supply at Yallourn.

The metropolitan supply system covers the supply of energy to thirty-four centres in the metropolitan and outer metropolitan areas, including such centres as Bayswater, Dandenong, Ferntree Gully, Tremont, Sherbrooke, Ferny Creek, Olinda, Sassafras, Mulgrave, Ringwood and Lilydale. It also supplies electricity in bulk to ten metropolitan municipal councils, as well as to the Melbourne Electric Supply Co., Ltd., which will be absorbed by the Commission in 1930.

The country supply system is divided into three areas: Western District, Gippsland, and North-Eastern District.

The first named does not take its energy from the Commission's generating plants, but is supplied in bulk from the Melbourne Electric Supply Co.'s generating plant at Geelong. Gippsland takes power direct from Yallourn.

The North-Eastern District is at present supplied through the transmission line from Melbourne to Sugarloaf. This transmission line will later be used to supply portion of the Melbourne load through a terminal station at Thomastown, from the Sugarloaf-Rubicon hydro-electric undertaking.

In all, about 100 centres and towns throughout the State receive their energy from the Electricity Commission.

Sugarloaf-Rubicon Hydro-electric Scheme.

The rapidly growing demand for electrical energy from the States scheme has necessitated the provision of additional generating plant, and for this reason the construction of the Sugarloaf-Rubicon hydro-electric scheme has been undertaken.

The general location of the scheme is about eighty-five miles from Melbourne. It provides for the harnessing of the mountain streams of the Rubicon and the utilisation of the irrigation water, discharged by the Eildon weir at Sugarloaf, of the State rivers and Water Supply Commission.

The scheme involves the construction of power stations situated at the following points: Sugarloaf, Rubicon, Lower Rubicon, Royston and Rubicon Falls.

The Rubicon Falls power station is already installed. It supplies power for the construction work as well as for the requirements of Alexandra.

The generating voltage will be 6 600 at all stations.

All the power stations will be unattended, being controlled from a centrally-located sub-station, to be known as Rubicon " A."

At present there are about 400 men engaged on the work. Communication is maintained between the main camp and the rail-head at Alexandra, fifteen miles distant by road and by steam-tramway operated by saw-milling companies.

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As indicated above, the North-Eastern District will take its electrical energy from this scheme, and any surplus available will be utilised in meeting the growing demands on the metropolitan system.

The labour of approximately 10 000 men has been employed in the building up of Victoria's scheme of electricity supply. At present it gives employment to about 3 000 electricians, tradesmen and labourers. The work of dovetailing a multiplicity of major and minor operations into one harmonious whole was completed in May, 1924, when a pressure of 132 000 V was put on to the Yallourn-Yarraville transmission line, which has operated without one serious interruption ever since.

The scheme has been in actual operation on a revenue-earning basis for little more than three years. At the present moment it represents a capital expenditure of £11 500 000. Interest was charged against the scheme during the period of construction; losses accumulated during the developmental period; and interest on these accumulations of interest and deficits has had to be charged. During the quarter ended September last all these accumulated burdens were overtaken, and adequate provision was earned for depreciation. In other words, the scheme has begun to pay its way.

The demand for electricity seems insatiable, and each succeeding year has witnessed a tremendous growth.

In five years the consumption of energy in the metropolis, excluding the railways, increased from 190 million units to 350 million units, and it would indeed be hard to fix the future limits of progress, because the people of the State are just awakening to a realisation of the wonderful value of electricity in the home.

There has also been vigorous development in the rural areas, as is evidenced by the extraordinary increase in demand in most of the important centres, and the fact that the State scheme has been the means of giving electric service to no less than fifty-six centres which previously had no supply.

The problem of turning to economic use Victoria's vast resources of very low grade brown coal has been completely solved, and the Commission is now conducting researches into the problem of making even greater commercial use of this fuel than is represented by the generation of electricity and the manufacture of briquettes.

SCIENTIFIC DEVELOPMENTS IN STEAM-DRIVEN POWER STATION PRACTICE.*

Pulverised Fuel Firing—High Pressure Boilers—Substitutes for Water in Boilers—Low Temperature Carbonisation—The Sulphur Problem.

By DAVID BROWNLIE, B.Sc.

DURING the past ten years we have witnessed a revolution in the design, equipment and operation of the standard electrical power station, that is, coal-fired and driven by condensing steam turbines.

In the firing of boilers, however, we have had the most remarkable changes of all. The first power station in the world operated entirely with pulverised fuel was Lakeside, of the Milwaukee Electric Railway and Power Co., started up by John Anderson in December, 1920, which altered the whole situation. Now many of the largest and most famous stations in the world are operating with pulverised fuel, and in consequence boilers of 350 000-800 000 lb. evaporation per hour can be used, and 92-94% steam generation efficiency is being obtained on short test and 88-90% in continuous running, an amazing advance as compared with the general conditions of ten years ago.

For example, in the United States there are now operating 64 large electricity stations for public supply, with aggregate plant of 3 275 000 kW, burning about 10 750 000 tons of coal per annum in the pulverised condition. This corresponds to 26% of the total coal burnt in American power stations and represents nearly 20% more coal than in all the stations of Great Britain put together.

As a result of this formidable competition the mechanical stoker has also made giant strides, especially in the last five years. Multiple retort stokers are operating boilers of 300 000 lb. evaporation per hour, and at the present time there are under construction in Great Britain the largest travelling grate stokers in the world, over 30 ft. wide, for boilers of 200 000 lb. evaporation per hour. This is made possible by the introduction of the suspended arch, which has rendered obsolete the sprung arch, limited to only about 6-8 ft. in width, while the combustion chamber generally has been reorganised out of all resemblance to the standard designs of 1919. The air heater, a very old invention, has arrived as a practical proposition and is superseding the feed-water economiser, while as regards turbo-generators 50 000-65 000 kW is standard practice, 100 000 kW units are at work, and 200 000 kW sets are under construction. Very important also is the fact that the overall thermal efficiency is now 20-28% instead of 14-18%.

Further Developments.

Following these general lines of evolution we may expect still further striking developments in the immediate future. For example, the 1 000 000 lb. per hour evaporation boiler will probably be constructed in the United States, and many more forged drum boilers up to 1 800 lb. pressure installed for operation with existing power station equipment, that is, with small, very high-speed, super-pressure turbines exhausting to the mains at any desired pressure, say, 150-350 lb. per sq. in., so as to improve the overall thermal efficiency from 14-17% to over 20%.

But the design of steam generators may be altered entirely, as shown by the work during the past few years of Benson, Blomquist and Löffler, for example. It will be remembered the Benson generator operates under the actual "critical" conditions of about 3 200 lb. per sq. in. pressure and 706 deg. F. temperature when water is converted into steam at the same volume without any heat being rendered latent. Consequently, a simple narrow tube generator can be employed, since the problem of ebullition no longer exists, and the steam superheated to, say, 900 deg. F., and reduced to any desired pressure below 2 000 lb. per sq. in. if necessary.

Word of Mark Benson.

It is even yet not generally realised that this work of Mark Benson, from the scientific point of view, whatever the commercial results may be, represents the greatest advance in the science of steam since the invention of the high-pressure "Cornish" boiler in 1797 by Richard Trevithick.

The basic principle used by Löffler, of Vienna, and other workers on the Continent, partly developed from the work of Schmidt in Germany, is to generate steam by blowing highly superheated steam into cold water so that a steel coil only can be used for the heat transmission from the furnace. This simplifies considerably the construction of generators for, say, 1 500-2 000 lb. per sq. in. pressure, while another outstanding development is the "Wood" boiler in Great Britain for pulverised fuel firing on "turbulent" principles. In fact, as regards the firing of steam boilers, as well as overall thermal efficiency of steam generation, we are rapidly approaching a "dead end," and in connection with the operation of modern steam boilers it would be interesting to know how many other operations in the world are running at 88-94% efficiency.

Also with pressures of 2 000 lb. per sq. in. and over, and possibly with superheated steam temperatures of, say, 1 000 deg. F., combined with high-speed turbines of 25 000 r.p.m., perhaps operating in series with ordinary low-speed turbines, we may reach 35% continuous overall thermal efficiency with condensing steam practice.

In spite of all the advances of the past ten years, and those one may expect on the same general lines in the immediate future, there are still a number of serious problems in connection with the coal-fired, condensing, steam-driven super-power station even of the latest type, some of which may be insoluble, as follows: (1) The use of water as the liquid in the boiler; (2) over 50% of the total heat of the coal lost in the condenser; (3) low peak load, probably averaging only about 33% in Great Britain; (4) consumption of raw coal without recovery of by-products; (5) sulphur in the chimney gases.

* Extracts from a paper read before the Glasgow and West of Scotland Branch of the Institution of Mechanical Engineers.

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All of these offer fascinating opportunities for detailed consideration and incidentally material for many papers. For example, mercury, or stable high boiling point organic compounds, such as diphenyloxide, are already being investigated in the United States for use, on the " binary " principle, in a boiler instead of water, with an auxiliary combined condenser and boiler containing water to make steam, and two turbines in series, and obviously in any scientifically organised community a power station would sell low-pressure steam and hot water as well as electricity to industrial and domestic establishments, instead of wasting in a fantastic manner more than half the coal in warming up a river, such as the Clyde.

Sulphurous Flue Emissions.

Also it is not exactly an efficient principle for this, or any other country, to have millions of horse-power of machinery which is only used for eight or nine hours per twenty-four hours. However, there will only be discussed the subject of the consumption of raw coal in power stations as mere fuel without any attempt to recover the by-products, which is closely associated with a new problem in the power station world that has suddenly arisen only a few months ago—the serious effects of sulphurous and sulphuric acid in chimney gases. The enormous increase in the size of the modern super-power station has resulted in the two last items being forced prominently upon the attention, not only of the power station world, but also of the whole community.

Not so very long ago, say, in 1919, the largest power stations only consumed about 100-300 tons of coal per twenty-four hours, but to-day 1 000 tons of coal per twenty-four hours is a common figure for a single station, and stations are under construction which will have eventually a consumption of 5 000 tons per day, that is, over 1 250 000 tons of coal per annum. Even in the case of stations taking 1 000 tons of coal per day it is impossible, at any rate in Great Britain, to go on squandering all the valuable by-products that could be extracted from this coal, concentrated in one spot and already having to be stored, handled, crushed and delivered to storage bunkers for the combustion chamber.

As showing the possibilities, we can take the case of Glasgow, consuming a total of about 275 000 tons of coal in electricity stations (including tramways). If low-temperature carbonisation combined with combustion was adopted for the generation of electricity, Glasgow would consume about 340 000 tons of raw coal, and produce every year 510 000 gallons of purified petrol and 76 500 barrels of Diesel oil, as well as large amounts of other products, such as solvents, fuel oil and pitch. For example, the city could run motor buses auxiliary to the trams with her own petrol from Scottish coal, and instal Diesel engines at the power stations to take the peak loads, as well as run Diesel engine motor wagons, quite apart from the installation of low-temperature carbonisation plants to supply solid smokeless fuel, as already considered in connection with the " Maclaurin " process.

Highly important also is that the sulphur problem in chimney gas would be more or less eliminated. Arising out of the litigation in which the Manchester Corporation has been involved concerning the Barton power station, and the uproar against the new Battersea power station, most large coal-using installations will have to take measures to eliminate or mitigate to a considerable extent the trouble from sulphur.

Raw coal varies greatly in sulphur content, generally between about 0·75-2·50%, but anything within the extreme range of 0·25%, or even less, and as high as 8·00%. However, we can take as a fair figure an average of total sulphur for British coal as 1·5%, of which probably 90% is converted during combustion into sulphurous and sulphuric acid, and discharged from the chimney. This corresponds to 1·35% " effective " sulphur, and a station burning 1 000 tons of coal per twenty-four hours will therefore discharge in this time the equivalent of 13·5 tons of sulphur or 41·3 tons calculated as sulphuric acid (H_2SO_4).

At Battersea, for example, on the figure of 2 000 tons of coal per day mentioned, this will correspond to 27 tons of sulphur, or 82·6 tons of sulphuric acid, per twenty-four hours, equal to that from about 120 000 private houses, concentrated in one spot in the heart of London.

With low-temperature carbonisation, however, a large proportion of the total sulphur, probably in average cases well over 50%, is driven off in the gases and vapours, and is easily removed from the gases, after the condensation of the tar, by washing. Under these circumstances, most of the sulphur in the gases is in the simple form of su'phuretted hydrogen (H_2S), and can be removed by water sprays, quite different from the many complicated and difficult sulphur compounds in the gas from high-temperature carbonisation of coal (town's gas and metallurgical coke ovens), necessitating laborious chemical methods of extraction. If, therefore, coal of normal quality is used in the washed condition to reduce the pyrites content, submitted to low-temperature carbonisation, and the gas washed, probably in average cases about 65-75% of the sulphur would be removed.

This new problem also emphasises the many claims for the principle of submitting the raw coal in an adjoining setting to combined low-temperature carbonisation and total gasification in a vertical continuous setting, condensing the tar, scrubbing for light oils, and removing the whole of the sulphur from the gas, which could then be burnt under the boilers in place of solid fuel. In this way sulphur in the chimney gas would be eliminated, and with, of course, also absence of smoke, grit, and dust, all the troublesome ash and clinker being removed from the generator and not the boiler combustion chamber. Alternatively the coal could be submitted to combined low-temperature carbonisation and partial gasification only, with the gas and the solid fuel burnt under the boilers, and the sulphur reduced as before by, say, 65-75%.

Still another scheme also would be to sell all the smokeless fuel for domestic use and instal a plant large enough to give sufficient purified gas to fire the boilers without solid fuel, thus also completely preventing sulphur troubles, recovering all the by-products, and reducing the black smoke of the city by using a smokeless fuel instead of coal.

There are, of course, almost endless methods of combining low-temperature carbonisation, gasification, and combustion for large power stations. For example, any low-temperature carbonisation plant could be erected next to a power station, and the gas and solid fuel merely taken across to the boiler combustion chambers. From this point of view the choice of processes is somewhat bewildering. For example, I have the details of about 600 processes that have been tried, more or less on the commercial or semi-commercial scale, during the past century and a quarter for the low-temperature carbonisation of coal, lignite, shale, cannel, torbanite, general canneloid material, tar sands and bituminous rocks, peat, wood, sewage cake, and general vegetable matter. Certainly about 300 of these processes were regarded as suitable for coal, and at the present time there are nearly 150 low-temperature carbonisation processes in the world of more or less importance under active consideration.

What is now termed the " Babcock " process is of great importance, because a commercial plant of 3 boilers, fitted with retorts having a throughput of 100 tons of coal per twenty-four hours has been operating since 1925 at the Dunstan station of the Newcastle-on-Tyne Electric Supply Co., Ltd. This process was originated by Messrs. Merz & M'Lellan, whose many patents on the subject date from 1917, while they operated experimental retorts at the Neptune bank power station, and later the Dunstan station, before the present commercial installation. In 1928, however, the process was taken over by Messrs. Babcock and Wilcox, Ltd., and it is understood the present plant at Dunstan is to be enlarged.

Financial Results.

It is stated, based on the extensive experience of the burning of 27 300 tons of coal, the total operating and maintenance charges of the plant are 4s. 8d. per ton, and the net profit obtained is 2s. 11·6d. per ton of coal carbonised, taking the smokeless fuel and the gas equal in value to the corresponding amount of raw coal on the heat content basis. In this particular installation the respective figures taken are 12s. per ton for the coal; motor spirit, 1s. 2d. per gallon; white spirit (second grade), 1s. 1d. per gallon; paraffin oil, 3¾d. per gallon; creosote, 8¼d. per gallon; pitch, 5·38d. per gallon; and crude cresylic acid, 1s. 8d. per gallon.

So far as can be ascertained, the " Pintsch " process originated about 1918, and the Julius Pintsch A.G., of Berlin, have developed on scientific lines the principle of combined low-temperature carbonisation in conjunction with water tube boilers and combustion on mechanical stokers, representing the most extensive experience of any firm in this particular field. The first Pintsch plant was erected in 1919 at the old Lichtenberg station, Berlin, and about nine other Pintsch plants are in operation in Germany, Norway, and the Prinzengrube and Trauscholdsegen colliery district of Upper Silesia.

(To be concluded.)

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MARINE ELECTRICITY.

Present Position Eminently Satisfactory—The Weight Question in Large Passenger Liners—Two Years' Operation of a Diesel-electric Ship in the Arctic.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types," etc.)

A brief summarisation of marine electrical news of the last four weeks or so must necessarily include the completion of a large train ferry with electric propulsion for service in the Great Lakes of North America, the completion of reconstruction of a British cargo liner with a novel form of auxiliary electric propulsion, the proposal to build a small ferry boat with battery electric propulsion, and the attention of a large section of the marine community directed towards marine propulsion problems by a paper read by a representative of the General Electric Co. of Schenectady, N.Y., before the Institute of Marine Engineers. As a matter of fact, the problems associated with the electric propulsion of the largest of passenger liners are still continuing to excite a great deal of interest, and this interest is not of a purely academic type but rather of a definitely practical kind because it is gradually being realised that for large high speed passenger liners and for certain of the smaller liners there is a demand for electric propulsion. The "Virginia" and "California" in America and the "Viceroy of India" in this country are good advertisements for electric propulsion of this latter type of ship and although no one would attempt to justify electricity for this purpose on grounds of fuel economy alone (and this is the main point made, for example, for Diesel engine propulsion) its all round economy has been excellent.

The Question of Electric Mammoths.

While for the largest of passenger liner mammoths the question of electric propulsion seems to have for its justification Lord Kylsant's announcement that, when built, the new White Star mammoth would be an all-electric ship and for its confusion the fact that the highly successful record breaker "Bremen" is a steamer, there is very little doubt that electricity must receive very serious consideration in any large ship proposition which comes forward in the near future. But even those engineers who agree with this point are still undecided as to the relative merits of turbo-generators and Diesel-generators. The consensus of opinion would appear to be against Diesel-generators on the grounds of multiplicity of units and the unknown dangers of vibrations, coupled with a somewhat vague and unfounded fear of unreliability. Examined purely from a naval architectural and from a ship arrangement standpoint, there is much to recommend Diesel-electric propulsion, partly on grounds of weight but particularly on grounds of fuel weight saved. This, in a large ship, is an important business. One has stressed in a previous article the possibly superior flexibility which a Diesel-electric power plant gives. Unfortunately, everything of high power in Diesel-electric ships is theoretical, while much that is of high power in turbo-electric propulsion is practical.

Two of the largest electric ships at present afloat are the U.S. Aircraft Carriers "Lexington" and "Saratoga" which are designed for about 180 000 shaft horsepower, and this is important in view of the fact that these ships were designed about 12 years ago. In Italy an electric liner is under consideration with turbo-electric propulsion of 200 000 shaft horsepower. This ship is proposed to have four shafts, each turning at 250 revolutions and having water tube boilers generating steam at 500 lb. per sq. in. pressure and 750 deg. Fahr. superheat. The "Lexington" and her sister ship have a steam pressure of only 265 lb. per sq. in. and 50 deg. F. superheat, which incidentally serves to indicate the strides made in marine steam generation in the last ten years or so, and may well justify the thought now often expressed that in electricity steam will find a new channel and outlet in its battle for superiority with the marine Diesel engine.

Turning again to theoretical considerations we may note that there is also a proposed Diesel-electric proposition in Italy for about 150 000 shaft horsepower with 20 Diesel generator sets delivering power for propulsion to four shafts on each of which five motors are arranged, working in tandem. In Germany, the M.A.N. company, well-known as makers of Diesel engines, have a 180 000 shaft horsepower electric propulsion proposition with 16 generator sets arranged in novel fashion with the generators in groups in watertight compartments, while in Great Britain Messrs. Doxford have a 100 000 shaft horsepower arrangement, referred to already in these notes, in which there are 16 generator sets, each propelled by a two-cycle airless injection opposed piston engine. These proposals are not wildly theoretical and appear to indicate that when a shipowner wants high speed and high powered Diesel-electric propulsion, there it is ready for them. Meanwhile, it is interesting to remark that there are strong rumours of the P. and O. Company being in the market for two new electric liners of moderate size—of turbo-electric type. Turbo-electricity, one feels, will have a big future in ships of this size and class, but in the final analysis it boils down partly to a question of weight. Analysis shows, furthermore, that electric propulsion, when due consideration is taken of all the factors involved, is not as heavy as some of its detractors would have us believe. Not only is the weight of fuel oil required for electric ships less than that for full-powered steamers, but the weight per horsepower of the plant, including fuel for a round trip, is considerably less. In a recent paper read before the Institution of Naval Architects in Italy, a prominent Italian naval architect, General E. de Vito, well bears out this statement.

Considering a 100 000 shaft horsepower 26-knot ship of passenger liner type running between Naples and New York, he finds that a geared turbine ship with oil-fired water-tube boilers has a total machinery and fuel weight of 18 130 tons, a turbo-electric ship has a similar weight of only 16 880 tons, while a Diesel-electric layout weighs only 14 315 tons—a very considerable reduction due to the fact that only 8 515 tons of fuel have to be carried compared with 11 960 tons for both the direct steam-driven and the turbo-generator sets. As far as actual weights are concerned, the direct steam turbine drive weighs 6 250 tons, while the turbo-electric layout weighs only 5 000 tons. The Diesel-electric power plant is 800 tons heavier than the turbo-electric set, but what it gains in weight it loses in fuel consumption, which in the fast transatlantic liner, with a minimum time in port at each end, is very important indeed. It may be directly traced to the fact that both the direct steam and the turbo-electric ship burn 0·7 lb. of fuel per shaft horsepower per hour for all purposes, whereas the Diesel-electric ship uses only 0·5 lb. of fuel per shaft horsepower per hour. Even if Diesel oil is more expensive than fuel oil in some ports it is obvious that a shipowner has got to consider a Diesel-electric proposition very seriously.

Theory and Practice.

But he has so much theory to go on and very little practical information. One of the most useful contributions to contemporary marine electrical literature, therefore, from this latter point of view, was the paper which Mr. Eskil Berg prepared to be read before the Institute of Marine Engineers recently, and while it was far too optimistic and far too biased in favour of turbo-electricity to the entire exclusion of Diesel-electricity, it did justify its *raison d'être* if not its title "Electric Propulsion as Applied to Large Passenger Liners" by a detailed discussion of the operation of the first large American electric passenger liners, now operating on the New York-San Francisco service. Interested people will do well to study the paper in detail on this account only. Further practical operating data, this time of an American electric coastguard cutter operating in Arctic ice is also available, thanks to our American contemporary "Motorship," and because of the arduous service on which the ship (a Diesel-electric ship) is engaged it may be taken as a testimonial of the suitability of electric propulsion for unfailing operation under the most adverse of circumstances. The ship in question is the "Northland" (illustrated in the marine number of THE ELECTRICIAN, July 29th, 1927) a little ship of only 2 050 tons displacement and a waterline length of 200 ft., a beam of 39 ft., and a depth of 24 ft. 9 in. Everything on board (except cooking) is electrically operated, and the power source consists of two 600 H.P. four-cycle single-acting trunk piston Diesel engines, each coupled to a 410 kW generator set. The main propelling motor is a double armature 1 000 shaft horse-power unit and the vessel has a cruising radius of about 11 000 miles at 11 knots, and of 17 000 miles at 7½ knots. The vessel has now been in service about two years and when we examine her operating record and consider that but a few years ago electric propulsion was, comparatively speaking, non-existent, while to-day there are some 60 all-electric ships, we can form some appreciation of the possibilities in front of marine electricity.

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ELECTRICAL COMMUNICATIONS.

Inaugural Address of I.E.E. President Reproduced Simultaneously before Local Centres by Conference Communication Service—Col. Purves Reviews Developments in Long-distance Telephony.

WHENEVER a President of the Institution of Electrical Engineers delivers an Inaugural Address the lecture theatre of the Institution building holds a large audience. Last Thursday, however, the President's audience was not restricted to that building, but included crowded gatherings at the local centres of the Institution at Manchester, Liverpool, Birmingham, Glasgow, Leeds, Newcastle, Cardiff, Southampton and Portsmouth. Transmitters and loud speakers were fitted at each place, so that speech from any point was reproduced at all other points. The occasion furnished a demonstration of an interesting innovation in the British trunk telephone service known as " conference communication." This facility, which is now available to the public, enables conferences and discussions to be carried on by joint participants assembled at several different places. In the course of Thursday's proceedings speakers at all the centres took part, and their speeches were clearly heard at all the other centres.

Colonel Purves's Address dealt with the subject of " Electrical Communications," and especially with the scientific developments which have made possible the recent remarkable extensions in the range of long-distance and international telephony.

Referring to the wonderful expansion of the range of telephony which has taken place since the last reference was made to the subject in Mr. Gill's Inaugural Address in 1922,* Col. Purves recalled that at that time the only places abroad with which a British telephone user could communicate were Paris and Brussels. To-day one could speak from any telephone in this country to nearly 90% of the telephone stations of the world.

At the present day the installation of full automatic telephoning systems was being pushed forward all over the world. The system specially evolved for the service of London was realising in practice the hopes that had been founded upon it. Twenty-one large exchanges with an aggregate capacity for about 132 000 lines had already been brought into service in London, in addition to the main junction switching-centre known as the " Mechanical Tandem " Exchange. The provision of 26 further exchanges, with capacity for about 125 000 lines, was now in hand and it was expected that equipment for about 50 000 lines would be added annually to the London automatic system until the conversion of the area, which at present had a total of about 650 000 working telephone stations, was completed and all the manual exchanges were removed.

In order to effect plant economies it was proposed to provide auxiliary automatic tandem switching-centres, and an automatic switching-centre for " Toll " circuits was also contemplated. It was anticipated that in seven years' time the number of automatic exchanges in the central London business area would have reached 100, leaving only five manual exchanges for subsequent conversion.

Exchange Developments.

In this country as a whole we now had 163 automatic exchanges in operation in urban areas, with an aggregate capacity of about 300 000 lines (say 500 000 stations), and the planning and construction of 126 further exchanges was at present in hand. The manual system remained in use at the present moment at 487 exchanges having a capacity exceeding 300 lines, and at 3 790 smaller exchanges, serving, in all, about 1½ million stations; and exchange equipment of the automatic type capable of serving about 100 000 lines was being installed annually. At the present rate of development, one new public exchange and about 1 000 new telephones were installed for each working day throughout the year.

Rural exchanges had, until quite recently, been entirely manual, but automatic equipment for exchanges serving small communities had now been designed on a basis which promised favourable economic results, and a start had been made in its installation. Up to the present, 60 such village automatic exchanges had been brought into operation, and about 110 more were in hand.

The telephone engineer had to steer the best possible course between over-provision of plant for the future on the one hand and under-provision on the other. For every 100 new stations joined up he found, on the average, that about 30 had gone out of service and that partially useless lines were thrown back upon his hands. Conditions affecting development were not particularly troublesome in the early days when exchanges were small and the lines consisted of open wires strung upon poles or overhouse fixtures, which could be supplemented or rearranged at small cost, but modern conditions had sadly reduced the element of flexibility. Exchanges were now immovably established in large special buildings, and the many thousands of lines radiating from them were embedded in cables carried beneath streets and roadways that could only be opened at great expense and inconvenience. The exercise of the utmost possible foresight in determining the primary quantities and lay-out of plant in a telephone area and all subsequent additions had thus become a *sine qua non*.

Value of Economic Studies.

If the annual increase in the number of telephone users in a section of the area, and the probable trend of the prices of money and materials, were known with approximate accuracy, one could calculate the " economic periods " for which ducts and cables should be provided, *i.e.*, the quantities which should be laid at one time in order that the " ultimate " development of the area would be provided for by the minimum aggregate expenditure. The ultimate period was taken as 30 years ahead in the case of exchange plant, and 20 years ahead in the case of underground plant, and the calculations were made on the basis of the " present value " of the annual charges for interest, depreciation and maintenance, that would apply to the plant if constructed in quantities designed to meet the requirements of various intermediate periods. The object aimed at was, of course, the substitution of scientific calculation for intelligent guesswork, and there was no question that the cost of elaborate development study was richly repaid to such telephone administrations as the Post Office, which sank new capital to the amount of about £10 000 000 annually in the provision of plant to meet its growing requirements, and which would expend very large sums ineffectively if rule-of-thumb methods were depended on.

The number of telephones in use in Great Britain was far smaller than it ought to be in a great commercial nation, and the same remark applied to the amount of use made of the telephones actually in service.

The position of this country among telephone users would not be improved merely by pouring more capital into the system. The additional interest and other annual charges thrown upon the accounts would soon convert the business into a losing one unless the public market for telephones and telephone service were at the same time correspondingly stimulated. It was only upon the estimated results of new salesmanship expedients that increased expenditure of capital could be judiciously regulated and the additional plant required be made available neither too soon nor too late. The system already carried and maintained the margin of spare plant required to meet continued development at the present rate of about 8½% cumulatively, per annum. This rate of increase was in itself a healthy one and compared well with progress in other countries, but it was not sufficient to enable Great Britain to retrieve its arrears of telephone development in a reasonable time.

A feature of communications engineering worthy of remark was the manner in which electrical considerations affecting the transmission line had advanced into prominence. Not very many years ago the indoor apparatus associated with telegraph and telephone systems was regarded as the complex subject, and as the main field for study and invention. The situation to-day was very different. Notwithstanding the wonderful development and performance of the apparatus of modern communication systems, it was overshadowed by the results of the attack which was now being made by research upon the properties with which the line, the transmitting medium and its adjuncts, might be endowed. All the weapons of the most advanced electrical and mathematical technique were being employed, and it might fairly be said that the contributions which the study of telephony had made to alternating current transmission theory were of first-class importance to

* " Journal I.E.E.," 1923, vol. 61, p. 1.

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electrical science and practice in general. It was to the study of the ideal wave-transmission line, and to the efforts made to realise its qualities in practice, that we owed nation-wide telephony and the striking progress which had recently been made towards telephony of world-wide range.

Prof. Pupin was the first to show how the harvest of Heaviside's theorems might be reaped by the practical engineer; and the great advance in the telephone art represented by the addition of inductive loading to long-line circuits would always be associated with his name, as well as with the names of Campbell and others who followed him.

Effective Loading Requirements.

Effective loading called for a high degree of stability in the leakance of the line, and this factor necessarily varied considerably in the case of a wire carried on open insulators, especially if the climate was damp and variable. For this reason, and also for the reason that the policy of placing long trunk telephone circuits in underground cables was adopted in this country as soon as loading methods matured, the loading of open-wire routes had never been resorted to here, and it was now being generally abandoned elsewhere.

So far as underground cables were concerned, the introduction of loading immediately increased the practicable range of telephone communication to three or four times its former limits. Its application was, however, both costly and troublesome. At intervals of about 2 000 yd. an underground manhole chamber had to be substituted for a simple straight-through buried joint, in order to accommodate the sealed cast-iron pots in which the loading coils were fitted, and into and out of which the cables had to be led. Many hundreds of loading-coils had frequently to be accommodated in a single chamber.

One would rejoice to find it possible to supersede inductive loading by some less formidable means of reducing the attenuation and the various forms of distortion appearing in unloaded underground cables.

Methods by which this might eventually be accomplished by compensating devices at the ends of the cables, were appearing and coming into use, in the search for further improvements in the transmission line. Phase distortion due to the unequal speed of propagation of the various component frequencies making up the complex speech wave, which would be eliminated by perfect loading, could also be corrected by the introduction, at the terminals of the circuit, of artificial line networks in which inductance and capacity were so disposed that the propagation characteristics natural to the cable were reversed. The lower-frequency components which would arrive too soon, after passing over a cable in which the ratio of inductance to capacity was too small, might thus be retarded and stepped back into their original phase relationship with the higher frequencies which had travelled more slowly along the line.

Similarly the disproportionate attenuation to which the higher frequencies had been subjected in the cable might be corrected by linked terminal networks, so designed that the lower frequencies were over-attenuated and brought down approximately to their original proportions in the complex wave.

There remained the difficulty of compensating for attenuation as a whole, since the omission of loading-coils and the introduction of such devices as those already mentioned—all of which frittered away the energy of the speech wave—would have increased the attenuation factor of the circuit to 8 or 10 times that of the loaded cable line.

It might be thought that the energy loss could readily be made good by the almost unlimited possibilities of amplification now at our disposal; but in practice the amount of amplification that could be applied at any point in a telephone circuit was severely limited by the necessity for avoiding crosstalk between one circuit and another. It was necessary to pack hundreds of pairs of conductors closely together within the lead sheath of a single cable, and the problem of avoiding crosstalk, even at the ordinary energy levels of telephony, by maintaining symmetry of position and uniformity of electrical characteristics of all conductors throughout the length of a cable between repeater stations, was one which called for the greatest care and accuracy in manufacture.

It had been necessary also to devise an elaborate system of testing the resistances and various cross-capacities of all the pairs in each cable length after the cable was drawn into ducts, in order that pairs having high and low characteristics in each length, and successive groups of lengths, might be selected and matched together in such a way that variations in the manufacturing lengths could be made to cancel each other out as far as possible in the completed cable.

All that could be done at the successive amplifying points in a long line was to restore the energy to a level not much exceeding the energy output of the subscriber's telephone.

The answer to the frequent question whether amplifying and distortion-correcting devices had sounded the death-knell of inductive loading was decidedly in the negative, and it was clear that the art of cable manufacture would need to achieve another order of freedom from crosstalk, before an answer in the opposite sense could be given. This did not imply that telephone-cable design and manufacture were in any sense non-progressive. On the contrary, steady improvement was being made in the mechanical symmetry and electrical uniformity of the circuits and in the means of providing circuits for special purposes, as well as in the economics of production.

Apart from conductors and cables, as such, the study of the transmission line must be credited with a wonderful range of inventions designed solely from the standpoint of improving it as a transducer, and included strictly within the limits of the line quadruple.

A phenomenon which gave a good deal of trouble in connection with the first attempts to provide very long telephone cable circuits was the occurrence of electrical echoes. If the time of transit of the speech waves from the transmitting to the receiving end and back again by reflection exceeded about $\frac{1}{6}$ sec., the effect in the ear of the speaker was very confusing and might be rather disastrous to the intelligibility of the conversation. The effect was equally marked in the case of 4-wire circuits, although on such circuits the possibilities of lighter loading, with consequent increase in the speed of wave propagation, extended the distance that could be covered before the return of the reflected waves was retarded beyond the permissible time. It was at one time thought that such echoes would set a practical limit of about 1 000 miles to the length of cable circuit that could be used for telephony.

The difficulty was overcome by the invention of voice-operated echo suppressors applicable to the 4-wire circuit. These devices utilised a small derived portion of the speech current, passing on the active half of the double line, to energise delicate devices which temporarily blocked the inactive half against the return of reflected current.

In the suppressors first devised by the Post Office the blockage was effected by over-priming the grids of the repeater valves in the inactive line to an extent which put them temporarily out of action. In another type of suppressor, sensitive relays actuated by amplified speech currents were employed to produce an actual disconnection, or a short-circuit, of the inactive line. Both types were in practical use.

Use of the Repeater.

The use of the repeater on long circuits had now become universal throughout the telephone world. Among many refinements which have been developed in association with their use mention was made of devices for ensuring the constant energy-level of the amplified speech, independently of the level of speech incoming to the amplifier. In one such device the amplification was regulated by varying the impedance of a three-electrode valve, the requisite smoothness of control being obtained from a condenser and resistance combination. Thus low levels due to weak voices, or to faulty lines, could automatically be made good at the amplifiers, and unduly high levels toned down.

After paying tribute to the remarkably stimulating effect which Mr. Frank Gill's 1923 address exerted upon the development of European international telephony, and outlining the assistance rendered by the various co-operating nations and by the American Telephone and Telegraph Co., Col. Purves said it would be recollected that Mr. Gill strongly favoured the entrusting of international telephony in Europe to a single company, or in default of that, to a single organisation set up by the existing administrations to carry on the business as a separate entity. No doubt either of these plans would, from the standpoint of efficient working, have been superior to the present system since, even with the best will in the world, co-operation was but a poor substitute for unified control. The co-ordination of the international telephone system by a committee on which all the administrations were represented, on a basis of equality, was Mr. Gill's third alternative, and no doubt the one he loved the least, but it had proved to be the only one realisable in practice, and it could not be said to have been barren of results.

(To be concluded.)

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

The Farce "Light's Golden Jubilee."

[To the Editor.]

Sir,—The curtain came down on the above comedy on October 21st. After a long-drawn-out piece culminating in the biggest wireless "hook-up" (simultaneous broadcast) in history, the world has been well and truly impressed with the fact that the inventor of the electric lamp was an American.

We may regret that Sir Joseph Swan has not received general recognition, but I think that we, in this country, should be heartily ashamed of the manner in which this specious American boost has percolated to and influenced our own people. Of course the electrical industry has been aware of the real facts in this issue, and the technical Press has repeatedly dealt with the imposture. The I.E.E. made a dignified protest, but it was obviously far too mild and ineffective. Can the electrical people of this country be happy over this business? I do not think so.

There is another aspect—perhaps more serious. So far as I was aware, no steps were being taken to make our lay Press cognisant of the true facts of the October 21st ceremonies. Periodically the inspired news from the United States has been published without corrective comment. Here on Tyneside (the scene of Swan's labours) I therefore prepared a very brief account setting forth the authentic historical facts.

I sent these facts to five great British newspapers. *Not one of them accepted the facts.* The Jubilee reports from America came and were published without (so far as I know) any qualification.

This enlightening experiment (or lesson) cost me about one shilling—or rather, a quarter-dollar.—I am, etc.,

Experto Crede.

Tyneside.
October 26th.

"Where *Is* That Battery?"

[To the Editor.]

Sir,—In your issue of August 30th I put forward the suggestion that a large prize would produce a valuable stimulus in the research for the much needed improvement in traction battery construction. This suggestion appears to have been completely ignored, and the discussion has apparently developed into an advocacy of various existing batteries and suggestions for improvements in vehicles. In regard to the first point, no one realises better than I the advantages of a well-made nickel-iron battery for traction work, yet, in spite of superb construction, this form of battery has its own peculiar disadvantages in regard to low energy efficiency, and high first cost, which make it sometimes a debatable point in the minds of unprejudiced engineers as to whether it possesses overwhelming advantages in commercial vehicle application.

Concerning Capt. Durtnall's attack on the apparently slothful attitude of vehicle manufacturers towards improved electrical gear and regeneration, I would like to point out that some ten years ago I was able to fit electrical vehicles with motors of considerably lower weight and greater efficiency than those even now commonly adopted. The machines had a motor weight of 360 lb., and propelled a gross load of 12 tons up any usual gradient, and gave an average speed on good roads of about 10 m.p.h. An electrical efficiency of 88% was established over a wide range of load and over-load. These machines were produced to the designs of Mr. L. Murphy for use on vehicles manufactured by Electricars, Ltd.

It was, however, found in point of fact, that the increased performance value, as against the usual motors having approximately double the weight, and about 4% less efficient, was only a matter of 2 or 3% useful ton miles per charge, and it is not surprising to find that although the original motors did their work well (and the majority of them are still in service), the commercial value of the improved performance was not sufficient to justify the production of special machines of this kind; and I believe I am right in stating that the type has since been discontinued in favour of heavier and slightly less efficient machines, which also cost considerably less to make.

In regard to regeneration, some very careful tests made on a specific vehicle show that on a practically flat road such as the Bath Road, in the early morning, with light wind and no traffic obstruction, a performance of 90 watt-hours per ton mile was possible. The same vehicle running on undulating roads, and with a fair amount of traffic obstruction; would consistently register 100 watt-hours per ton mile. While, therefore, not disputing the advantages to be obtained from regenerative braking, I would point out to Capt. Durtnall that all he can possibly save is a fraction of 10%, and if the scheme includes considerable increase in complication, weight, and possible loss of electrical efficiency in general operation it is quite probable that the effective gain will be nil.

Again reverting to the challenge that no progress has been made in this direction, I am at liberty to say that during the past five or six years I have been privileged to see the development of a system of regeneration which requires only one electrical unit for driving or regeneration and no complication of control, and this gives back to the battery a charge of approximately 70% of the total retardation energy at all useful speeds. It should, however, be clearly pointed out that the object of this regenerative braking system is not so much to save energy as to get a perfect system of control, together with economy in the wear of brake friction linings.

The ultimate ideal to aim for is that all internal city transport shall be conducted by "pure electric" vehicles, i.e., propelled solely by the stored energy of electric accumulators. This must, however, await the advent of an enormously improved type of cell in which specific output (capacity), durability, and cost are all better than we now know.

Meanwhile, in accord with evolutionary principles, it seems to me to be entirely logical to give careful attention to the possibilities of an intermediate type of automobile between the pure electric and the pure internal-combustion types.

If work now being done in this field proves that such a vehicle possesses the merits and commercial advantage anticipated, the type will survive and take us a few steps further. If not, the new type of vehicle will justly be forgotten.

But whatever the outcome of such experiments the question still remains: "Where *is* that battery?" Echo answers "where?"—I am, etc.,

Raymond J. Mitchell.

Taplow.
October 23rd.

"Advertising for Electrical Contractors."

[To the Editor.]

Sir,—I hope you will allow me space to reply to the letter from Col. Vignoles in your issue of October 25th, in which he makes reference to a booklet produced by my company.

Col. Vignoles takes exception to the statement that electricity "may be either a treacherous or a trustworthy servant," but omits to add that the sentence goes on, "it all depends upon the way in which it is installed."

I take it that Col. Vignoles and his Council consider that electricity should always be represented as a trustworthy servant, never as treacherous. This, it seems to me, is a difficult line of argument to maintain in face of the great damage which is beyond doubt caused every year by inferior electrical installations. Moreover, if Col. Vignoles's view is the correct one, then there can be no possible logic in the existence of the National Register of Electrical Installation Contractors—an institution which is pledged to accept for members only those contractors who are beyond reproach in the matter of conscientious workmanship, and who can be counted upon to leave no dangerous installations behind them.

In particular, it is a matter of very much regret to me that Col. Vignoles should not have taken steps to see the booklet as a whole before condemning a part of it. The second page of this booklet is given up to the following:—

Versatility.

"Electricity is no longer merely a medium for the provision of light. If properly handled it can be adapted to almost any business or domestic service. Moreover, the idea that the liberal use of electricity is costly is a tradition passed down from the days of electrical pioneering. Figures disprove this myth to-day."

From this it will be seen that my company has deliberately made a present to the electrical industry as a whole of one valuable page containing no individual advertisement, and that in an eight-page booklet. If the E.D.A. could count upon one-eighth of every trade booklet being devoted to their interests, they would have cause to congratulate themselves.—I am, etc.,

for Thorpe and Bosco, Ltd.
D. Winton Thorpe.

London, W.1.
October 25th.

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"OUR HOUSE IN ORDER."

A Symposium of Electrical Installation Contractors' Views on Compulsory Registration, Wiring Rules and Inspection of Installations.

WE have received from contractors in various parts many interesting expressions of opinion on the points raised by Mr. T. C. Gilbert in his article "Our House in Order," published in THE ELECTRICIAN of October 18th. Some of these views were printed in our last issue, and a further selection from the many letters received is given below.

[TO THE EDITOR.]

SIR,—Mr. T. C. Gilbert's article in your issue of October 18th, under the heading "Our House in Order" is both amusing and interesting, and I hope will also prove valuable. I strongly agree with him that the problem of diminishing the quantity of dangerous and ignorant installation work requires more careful study throughout all branches of the industry than it is apparently receiving, and if such articles will lead to such study, please let us have more of them.

Mr. Gilbert, however, weaves a maze around himself and the issue, and then in effect says, "Look what a tangle we are in."

This is the amusing part, and I should not join in the discussion if it were not that my name and opinions are quoted frequently in his article; and more particularly that part of a 1928 report of the Executive Committee of the National Register is taken from its context and used by Mr. Gilbert to enmesh himself (and possibly others) more than ever; whereas, properly understood, it would have the opposite effect.

The point under consideration on the Report was the setting up or adoption *by the Register of compulsory wiring regulations for Registered Contractors* and Mr. Gilbert quotes the wording correctly that the "Executive Committee are still of the opinion that the time has not yet arrived for making compulsory a set of such regulations." Mr. Gilbert construes these words in a report of a Committee to the National Registration Board into an official pronouncement that the Register is opposed to the *setting up by legislation of a compulsory code of wiring rules for all installation contractors, registered or otherwise.*

So far from this being the fact, I can say that no such statement has been made; and although I have no authority to speak officially for the National Register, I will venture to prophesy that a very large percentage of those conducting its work would support, with every means in their power, the establishment by law of a compulsory wiring code.

Mr. Gilbert's subsequent reference to the "Crime Sheet" set up under the 1929 report of the National Register should alone be sufficient to show that he is entirely misleading himself in his deduction from the words quoted from the 1928 report.

Divergence Practically Non-existent.

Into the intricacies evolved from the (apparent) divergence of view of Mr. Munro, Mr. Shaw, the E.C.A., the N.R.E.I.C. and myself, I do not propose to follow Mr. Gilbert, beyond saying that the divergence is practically non-existent; we all want the same thing and with very minor differences which can very easily be disposed of, it will be found on discussion that we are all agreed on the means of attaining them.

If Mr. Gilbert is determined to be convinced, and to convince others, that we are all mutually opposed and pulling in opposite directions, he will do nothing to help the industry. But if, as I feel sure, he is only endeavouring to make all those concerned *think* on a subject urgently needing their study and consideration, then I can only offer him my congratulations on his amusing tangle of deductions, and my thanks for his timely assistance.—I am, etc.,

H. J. CASH.

London, S.W.1.
October 23rd.

[TO THE EDITOR.]

SIR,—Mr. T. C. Gilbert's article in your October 18th issue is most opportune, and an excellent contribution to the campaign for compulsory registration for which I have been fighting during the past two years or so.

Mr. Gilbert says "My own conclusions are that registration is imperative, without regulations if possible, if not, then with regulations."

In a letter to the "Electrical Contractor," for October, I said, "It appears to me that the supporters of compulsory registration and the other supporters of a compulsory code have the same ultimate object in view."

Whilst I am a firm believer in the abolute necessity for compulsory registration, I don't care which way it comes, whether with or without a compulsory code of rules or wiring regulations.

The general issue now appears to have spread over a much wider field, hence we have not only compulsory rules looming large on the horizon, but the "bogey"—to some people—of inspection. Is it not a fact that we have both compulsory rules and inspection at the present time? Isn't every reasonable sized job carried out to-day to compulsory rules laid down in the specification, and haven't we got inspection before the job is passed?

Inspection of Installations.

Are not many municipalities enforcing certain wiring rules set up, either by themselves or in conjunction with a committee of representative contractors, and don't these supply authorities inspect the installations before connecting up to the supply, and refuse to connect under certain conditions, which are justifiable in the public interest?

I am prepared to say that a standard code of wiring rules, acknowledged and agreed to by all supply authorities, would be better than the chaotic conditions prevailing at present, where every authority appears to have different rules, and contractors are working to different regulations on installations only a few yards apart, where the boundaries of authorities meet.

Some authorities say the fuseboards must only be single pole, with a common busbar on the installations connected to their mains, whilst others say all fuseboards must be double pole. Some authorities insist on a d.p. switch and fuses to control the supply at point of entry, whilst others say a switch and single pole fuse on the live side is sufficient. Some authorities want nothing but stranded wires, whereas single wires are quite permissible in other cases, and, of course, are allowed by the I.E.E. Rules. Others say that nothing less than 7/044 shall be used for a heating or radiator plug circuit, whereas a 7/029 will safely carry 18 A according to I.E.E. Rules, and, of course, is plenty large enough for a 3 kW radiator.

These local "compulsory" rules are worked to by the contractors in their respective areas, but a national code, agreed upon by the I.M.E.A. and accepted by all supply authorities, would be preferable.

But whether we still flounder on with "local compulsory" rules or have a national code, inspection will be necessary; otherwise the "shoddy" man will still carry on his nefarious and dangerous work.

Inspection to-day, on ordinary jobs, appears to be of two classes, that is, the inspection of installations which have been obtained and carried out by contractors, as distinct from those let to a contractor to a definite specification. In some cases the supply authority takes a test between poles, and between each pole and earth, and if "clear" puts the fuses in and leaves the job, whilst another authority will go to the trouble of seeing every wired point in the building, to see if shockproof holders and switches are fitted in "earthed" rooms such as cellars, etc., and bathrooms. They will also check the size of the fuseboards with the number of points wired, and in the case of a metal sheathed system of wiring, will test for "earth" continuity from the furthest point wired in the building. They will also test every switch on the installation to see that it is correctly wired up on the "live" side, examine the main earth connection, etc.

Is this kind of inspection objected to by reputable firms, and is it such a "nightmare" to those objectors to inspection that they don't approve of it? Personally, I have no objection to it, and have found that this kind of inspection is beneficial to the good class contractor, and very objectionable and detrimental to the "jerry" man. Further, how else can it be assured that jobs which are supposed to be carried out to a definite specification have been so done? There are innumerable instances where materials other than, and inferior to those specified, have been installed on contracts by firms who have got the jobs at cut prices, and then adopted such measures as mentioned, in an endeavour to make a profit. If there was no inspection these things would not be found out, and the result would be that there would be more price-cutting, more inferior jobs and less chance of the honest contractor getting work.

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Mr. Gilbert gives opinions of many leading contractors, especially past-presidents of the E.C.A., and now, in the current issue of the "Electrical Review" we have the opinion of Mr. Willoughby Ellis, our present president, who says, "The whole electrical industry, from top to bottom, must set its face resolutely against shoddy installations and shoddy equipment." This is exactly what I have been preaching for some time, and is directly in support of Mr. Gilbert, only that Mr. Ellis thinks that the object will be achieved by the adoption of compulsory rules, without an army of inspectors, which also appears to be the opinion of Mr. Cash.

A Compulsory Rule Weakness.

Mr. Ellis unwittingly gives away the weakness of a compulsory code of wiring rules when he says "All the compulsory rules in Christendom will not prevent the shoddy worker executing his shoddy work, but such compulsory rules, representing the electrical law of the land, would bring the fake installation man within the grip of the law," etc. Exactly, but isn't this putting the cart before the horse? Compulsory registration *would prevent* the shoddy worker from doing any shoddy work, because he would be breaking the law by attempting it, if compulsory registration were the law of the land.

The voluntary National Register has done much to raise the status of the contracting industry, compulsory registration would be a thousand times better, and one wonders if, again in the words of the present president of the E.C.A., "Some such legal control of installation work must be instituted in this country in the near future," it cannot best be attained in the shortest possible time by all parties who are interested getting together and working for the compulsory registration of electrical contractors, with the compulsory code of wiring rules to be adhered to.

It is evident there are many and varied opinions on these matters at the moment, but what an interesting subject for discussion at I.E.E. meetings and E.C.A. meetings all over the country, and how enlightening it would be to have a national ballot of all members of the I.E.E., the E.C.A., the R.I.B.A. and I.M.E.A. on the following points, with definite answers to each question, either "Yes" or "No."

(1) Are you in favour of the compulsory registration of electrical contractors?

(2) Are you in favour of a national code of wiring rules to be adopted by all supply authorities?

(3) Do you consider a system of inspection is necessary and essential in connection with installations, for the protection of the public?

(4) Do you think compulsory registration is more important than wiring rules or inspection?

Although many of us think differently and have varied ideas, it is also evident that what we are all aiming for is vastly improved conditions in the contracting industry; not only conditions that will materially benefit the legitimate contractor in carrying on his business and protect him from the incompetent and shoddy wiring competitor, but conditions that will also help the whole industry in this age of rapid electrical development, and will effectively and safely harness this great power which is now being placed at the disposal of millions of the population, who must of necessity rely on the skill and judgment of those intermediaries, the electrical contractors, to see that this great agency shall be a willing, ever-ready convenient ally, instead of a dangerous destroying enemy, spreading fire, disaster and death in its trail.

"Our House in Order." Yes, it is very desirable, but the electrical contracting house will never be put in order under the present conditions. The longer the delay the more deeply the rot will have set in, but compulsory registration would be a powerful antidote and germ killer, preserving that which is now good but destroying that which is causing pain and decay in what should be a healthy body.—I am, etc.,

HARRY MOSS.

Bradford.
October 21st.

[TO THE EDITOR.]

SIR,—It was with the greatest pleasure and interest that I read Mr. Gilbert's article "Our House in Order" in THE ELECTRICIAN dated October 18th.

We certainly do hear a good deal to-day about bringing electricity into all country places, villages, farms and cottages, but what is the use of an elaborate grid system when so many country people are afraid to use electricity? They have their newspapers and have read of seventeen fires at large country houses having occurred already this year. One of these, which occurred in my own county, is still fresh in their minds. These may not have been caused by defective electrical installations, but we all know how ready the lay Press is, where the cause of a fire is unknown, to jump to the conclusion that the outbreak was caused by "the fusing of an electric wire." It is high time the minds of these prospective consumers were set at rest by the assurance that electricity, properly installed by responsible contractors, is the safest form of lighting and heating, and that only responsible contractors would be allowed to do the work.

Instead of this, immediately the cables appear in a district the village blacksmith, plumber and garage proprietor get busy canvassing for wiring contracts; work which they know very little or nothing about. Take the case of the miner or the factory worker. Whilst at work he is protected by a thoughtful Government against injury from inefficient electrical wiring and apparatus, but upon his return home he is too often exposed to the death traps left by the cheap, inefficient or unscrupulous electrical contractor, or the handy man who has done the work in his spare time. Mr. H. Moss has done excellent work in exposing the dangers of shoddy work. How much longer is this state of affairs going to be tolerated by Government? Mr. Gilbert does not exaggerate the situation when he says "the installation side of our industry is shot through with inefficiency and incompetency."

What is the remedy for all this? As pointed out by Mr. Gilbert, there are really two suggestions, viz., compulsory wiring regulations, with or without inspection; and registration; both of which have their own following. After the ground has been so ably covered by Mr. Gilbert there is little left for me to say beyond offering him my feeble support.

Suppose the compulsory regulations idea was an accomplished fact, how would it work? How would the regulations be made *compulsory*? Would every firm of reputable contractors, as well as the cheap jerry contractor, the plumtrician, the smithtrician, the garagetrician, the curbstoner, and the sparetimer, all be put on their honour to adhere to the regulations? If they could not be trusted, and I venture to suggest there may be a few here and there who could *not* be, then it would seem that their work *must* be inspected to compel them to observe the regulations. To avoid invidious distinctions being made, this would mean that all work would have to be inspected. Is it not also possible that some of the people towards the end of my category would be in blissful ignorance of the existence of any regulations, just as to-day they have never heard of the I.E.E. wiring rules?

If it is proved that inspection would be necessary, what form would it take, and who would be responsible for it? Corporations may make a superficial inspection, even going so far as to pay a visit whilst the work is in progress, but can we reasonably expect other supply authorities who have to pay a dividend to their shareholders to make more than the usual insulation test? But, surely, such inspection would not satisfy anyone that any code of rules has been observed unless such rules are so simple as to be useless.

Cost of Inspection.

As I have said elsewhere, a man who is out to do cheap shoddy work will take good care to hide it before the inspector comes. Inspection, to be thorough, and it must be thorough to ensure that regulations are complied with, would require an inspector at the elbow of every wireman all the time to see that the ends of all tubes are rhymered, that all threads are of sufficient length, that no cables are kinked or insulation damaged whilst drawing in, etc. This is, of course, ridiculous, for who is to pay this great army of inspectors?

Again, suppose a contractor were found evading the regulations on a job, what happens? The worst is that he would have to pull out part or even the whole of the work on that particular job and do it again properly. But is it not worth while for the jerry worker to risk detection? The chances are a hundred to one he will get away with it. So much for the contractor's work which is to be connected to the mains. But what about private plant work? Is the country house wired for 110 V immune from danger? If not, who will see that the regulations are observed? Take the case of work done by supply authorities. Who is to inspect their work? Are they to do it themselves? Would they always be above suspicion when in competition with contractors?

At home I am accused of being "obstinate." Perhaps I am. (I notice that the same trait when appearing in the fair sex is called "strong will.") This perhaps accounts for my blindness in failing to see the "illogical" position of

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Mr. Gilbert and myself, and the blessings which compulsory regulations would bestow all round. I am very sorry I cannot agree in this matter with some of our leaders, for whom I have the greatest respect.

Let us now consider the registration side of the question. There appear to be two camps of opinion again here. Some are in favour of the voluntary register system, which we now have, and others, like Mr. Gilbert and myself, are pressing for the compulsory registration of all contractors before they are allowed to touch any cable over 16 V.

The present voluntary Register is useful as forming the nucleus of a compulsory register and to show the powers that be that there are already a goodly number of competent electrical contractors in the country to allow fair competition and to safeguard the public from a few monopolists. I look upon the voluntary Register, not as an end to which we are aiming, but as one of the means to achieve that end. It is very nice for those contractors who are in the habit of getting Corporation work in the towns and cities where the engineer is in favour of registration, but what about all the other private work and the other corporations and public bodies who are not interested in the Register?

My own town, for instance, disregards the Register, and the Corporation gives its work to members of E.C.A. What guarantee of a really good sound job has the man in the street who does give his work to a voluntary registered contractor?

Mr. Gilbert refers to the power possessed by the N.R.E.I.C. to remove a contractor's name from the Register and also to the list of nine "Thou shalt not's" (known by my staff as "the Electrician's Commandments") to which might be added a tenth, "Thou shalt not be found out," the commission of either or any of which will be sufficient to hurl the miserable offender into outer darkness.

During this month I was called into a place which was wired by a registered contractor within the last four or five years. A gas pipe had melted and the gas ignited. An inspection revealed that the place had been wired with v.i.r., some of which was C.M.A. Non-Association grade and the remainder, with no name on the braid, suggested doubtful origin and poor quality. C.j. tube had been used with screw grip fittings, but the enamel had been left on the ends of the tubes and the grip screws left loose. The ends of the tubes were sharp and there were no bushes, which suggested the cables were probably damaged whilst being drawn in.

At all events, two cables were burnt through and the insulation on another was burnt off for a distance of about five inches when I was called in. In several cases the tubes were lying on the gas pipes and the leaking electricity, for want of a better earth than the tubing of its own system, which from the foregoing remarks will be seen to have had no continuity to earth, "went for" its deadly rival, the gas pipe. Had this occurred during the night one shudders to think of the consequences, but fortunately it was daytime and a smell of burning was instantly detected and smoke was seen rising from the floorboards.

"Who Cares?"

Deplorable as this is, will the offending firm be cast into outer darkness? I think not. Even if their name were struck off the voluntary Register would it do them much harm? It might be rather serious for them if they were in the habit of receiving lucrative work from one of the Corporations who only employ registered contractors, but if not, why should they worry? Who cares besides the few Corporations I have referred to? Perhaps a few consulting engineers and a still smaller number of architects, and no one else. How many architects are interested in the N.R.E.I.C.? Perhaps they have had a circular or two about it which, for lack of interest, have been consigned to the waste paper basket, and the very existence of the Register forgotten.

The great general public, the householder, the shop keeper, house and estate agent, churches and chapels, brewery companies (with their numerous public houses), know nothing of a voluntary Register, much less whether a contractor's name has been struck off, or if it has ever been on.

These are the people that give out the bulk of the work and who are likely in their innocence to accept the lowest tender for electrical work. These are the people that Government should protect from damage to themselves and their property. Whilst the present state of things exists how can a contractor in any but the favoured towns be expected to fall over himself in his anxiety to be registered? What has he to gain? May I suggest to Mr. Gilbert that it appears to me that it is putting the cart before the horse seriously to expect 75% of the reputable contractors to subscribe to this voluntary Register, until they are forced into it by public opinion and legislation.

The Only Cure.

Finally, what about compulsory registration. In the face of what has been said to the contrary, I still maintain that the only cure for the evil is for every electrical contractor to be compulsorily registered in the same way as doctors, dispensing chemists, etc., and I fail to see that it is putting the cart before the horse to consider this without first having a compulsory wiring code. I have yet to learn that a doctor has to write his prescriptions or perform operations according to rule. Before he can practice he must satisfy the British Medical Association that he has the training, and that he is in the possession of the knowledge, judgment and discretion necessary for his life's work.

So should the would-be electrical contractor be compelled to satisfy a registration body that he too has had the training. If we had such a compulsory Register, every contractor would be compelled to apply for registration within a given time, and those who could not satisfy the registration authorities would automatically drop out of the business.

There are, as pointed out by Mr. Gilbert, frequently cases where any hard and fast code of rules would not only be undesirable but impracticable, not only in our calling, but also in that of the doctors. As Mr. Gilbert says, we want brains rather than rules. It would then be up to the contractors to use their knowledge, discretion and brains to ensure that their clients were not exposed to the dangers of shock or burns, loss of life or property.

In the event of this, he, like a doctor who offends, would be hauled before his registration authority to show cause why his name should not be struck off the Register and himself driven out of business. I still maintain that herein lies the way out of our difficulties, and thus, and thus only, can the industry be raised to a proper standard.—I am, etc.,

EDGAR R. MORRIS.

Chesterfield,
October 22nd.

[TO THE EDITOR.]

SIR,—Mr. Gilbert says, "The incompetent and half-trained contractor will, of course, always carry on his nefarious trade until he is forcibly prevented from doing so," and it appears to me the sooner he is put out of action the better for the industry. All I said during my presidency of the E.C.A. was with a view to getting a better standard of work all through.

Mr. Gilbert says "The only standard demanded for registration should be knowledge." I agree there should be knowledge first, and that knowledge should be put into practice and religiously carried out. I have always advocated a national code of rules and standard for materials to be used, so that all contractors would be put on one footing when tendering for work where there is no specification.

We all know that at the present time one contractor may be tendering for good quality English cable and English-made fittings and accessories, and be in competition with another contractor who is tendering for the cheapest foreign wire and cable and cheap continental fittings. Surely a standard is required so that the purchaser may know what he is getting.

Mr. Gilbert makes a great point of inspection. All supply authorities do, or should, inspect work before this is coupled to their mains. They do not and cannot be expected to accept responsibility for this, but I do very strongly suggest that floor boards should always be left so that an inspector can see that the wiring under the floors is what it should be. This would not be a difficult matter in an ordinary sized house. I also suggest that it should be compulsory that floor boards over the wire should be screwed down and not nailed.

Should a national code of rules be adopted—I.E.E. or some other—the engineers in various supply authorities would no doubt interpret some of the rules differently, and this might lead to a little confusion unless means were found to deal with it. This could be got over by small local committees such as we have at present for other purposes.

With respect to the National Register, we must remember that Rome was not built in a day. The National Register is only young and feeling its way, but those who are behind the scenes know that the National Register is doing a great service.—I am, etc.,

W. A. SHAW.

Stockport.
October 26th.

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Induction Furnaces Without Ferro-magnetic Circuit. ("Revue Générale de l'Electricité. M. Gliksman. September 7, pp. 361–370.)

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The Kuppers Altimeter for Long-Span Line Engineering. ("Australasian Electrical Times," July 27, p. 450.)

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The Corrosion and Rusting of Unalloyed and Alloyed Cast Iron. P. Kötzschke and E. Piwowarsky. ("Korrosion und Metallschutz," August, pp. 174–176.)

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NEWS IN BRIEF.

Camouflaged Telephone Wires—Scottish Farmers want Cheaper Telephones—Irish Workhouse Lighting—The Projected New Transatlantic Telephone Cable.

HIRED cookers connected by Manchester electricity department during August numbered 56, making the total on circuit 5 524.

On October 23rd Lt.-Col. W. A. Vignoles, director of the British Electrical Development Association, addressed members of the Advertising Club of Ulster on "Electrical Development."

The next meeting of the Physical Society will be held at 5 p.m. on November 8th, at the Imperial College of Science, Imperial Institute Road, South Kensington, London, S.W.7, when a lecture will be delivered by Prof. Sir C. V. Raman, F.R.S., on "Diamagnetism and Molecular Structure."

A sub-station is being built for Bradford electricity department, at a cost of £2 672.

Armagh Electricity Committee has recommended that steps be taken to have the workhouse premises wired and supplied by electricity.

"Pictures by wireless and television" was the subject of a lecture by Mr. L. A. Sayce, at Armstrong College, Newcastle, on October 23rd.

Cardiff Electricity Committee has decided to arrange for the floodlighting of the Welsh National War Memorial in Cathays Park and of the City Hall on the night of Armistice Day and on other special occasions.

The Standing Committee appointed under the Merchandise Marks Act, 1926, will, at some date, hold an inquiry as to whether lattice reinforcements and stirrups of iron and steel for concrete construction, should bear an indication of origin.

A meeting of the Institute of Wireless Technology will take place at the Engineers' Club, London, on November 11th, at 7 p.m., when Mr. Noel D. Cumming will deliver a lecture entitled "The Maintenance of a Modern Broadcast Station."

The Postmaster-General has authorised the use of bright green insulating covering on the overhead telephone wires in the New Forest area, so that they will harmonise with the surrounding scenery. It is not usual, however, for telephone wires to be insulated, and the uninsulated wires are not to be coloured.

A deputation from the National Farmers' Union of Scotland urged upon the Postmaster-General (Mr. Lees-Smith) last week that there should be one flat rate for telephone service within a radius of three miles. They also thought the revenue should be mainly or entirely from calls, and that the extension of the telephone was retarded by its cost in annual rent.

Mr. E. C. Lennox, of the Newcastle-upon-Tyne Electric Supply Co., lectured to the students of the Domestic Science College in the company's lecture theatre, Carliol House, Newcastle, on October 22nd on the history and development of electricity. This was the first of a course of lectures arranged by Miss Bright, principal of the College, under the auspices of the E.D.A.

Applications are invited for the following appointments: Electrical engineer, for the Public Works Department of the Government of Nigeria. Applications to Crown Agents for the Colonies (Ref. M./1 252); Assistant mains engineer in Bexley electricity department; Full-time lecturer in electrical engineering section of engineering department at Halifax Municipal Technical College; Mains assistant in York Corporation electricity department.

With the installing of a new electric grab, the West Sleekburn pit is now one of the best electrically equipped pits in the North.

Derry Board of Guardians received five tenders for an electric light installation in the workhouse. The prices ranged from £309 to £468, and the lowest, that of a Derry firm, was accepted.

The ocean bed off the coast of Mayo is being tested by engineers of the American Telephone and Telegraph Co., in preparation for the new Atlantic telephone cable. The chief aim of the tests is to disclose deposits of iron ore which, if they exist in any considerable quantity, would seriously interfere with the working of the cable. Several lengths of test cable have been laid experimentally.

Belfast T.C. has placed a contract for the erection of a sub-station at Lisburn Road, at a cost of £1 350.

The contract for the building of the north regional broadcasting station at Moorside Edge, near Huddersfield, was signed by the B.B.C. last week.

A meeting of the Mersey and North Wales (Liverpool) Centre of the I.E.E. will be held on November 4th, at 7 p.m., at the Liverpool University, when a paper by Messrs. Johnstone Wright and C. W Marshall, entitled "The Construction of the Grid Transmission System in Great Britain" will be read.

A Japanese contemporary refers to a method adopted by the Japanese Railway Department for abating smoke in long tunnels. An electric fan with a diameter of 12 ft. is provided in the entrance of the Kobotoke tunnel, and this causes the smoke to pass between the train roof and the top of the arch.

Opening a wireless exhibition in Dublin last week, Mr. M. R. Heffernan, Parliamentary Secretary to the Irish Free State Department of Posts and Telegraphs, said the Department thought the most suitable method of extension of the broadcasting service was a high power station which would give the major portion of the country crystal reception. They had to satisfy the powers that be that the increased revenue would defray the capital charges.

Mr. A. D. Phillips, manager of the Derbyshire and Notts Electric Power Co., in opening an electrical exhibition at the Worksop Town Hall on Monday, referred to the allegation that electricity is out to spoil the beauty of the countryside. Overhead lines, he said, could be made to look quite well. The opposition was delaying development, and increasing the cost, which must be reflected in the charges to the consumer. The exhibition was organised by the Electrical Development Association Local Circle in conjunction with the electricity department of Worksop U.D.C.

The National Federated Electrical Association calls attention to the fact that a 5% increase in wages was granted to men engaged in the electrical industry on May 1st, 1929, for a period of six months; that this period of six months terminated with the last pay day in October, for the period covered by that day pay, and that the Declaration of Wages recently circulated indicated that the present rate of pay would terminate on such date. The Association now announces that it has been agreed to continue the increase, pending further negotiations, and the present rate, therefore (1s. 10½d.) will remain in operation until further notice.

LOOKING BACKWARD.

FIFTY years ago THE ELECTRICIAN, *dated November 1st, 1879, recorded that:*

Prof. Loomis, of West Virginia, claimed to have demonstrated "that at certain elevations there is a natural electric current, by taking advantage of which telegraphic signals may be sent without the use of wires."

* * *

TWENTY-FIVE years ago, according to THE ELECTRICIAN *dated November 4th, 1904:*

The Indian Government made unsuccessful attempts to establish wireless telegraphic communication between Diamond Island and Amherst, a distance of 212 miles.

Plant at the new power station at Stoke-on-Trent included two Willans three-crank engines direct-coupled to Dick-Kerr multipolar dynamos, with an aggregate capacity of 300 kW.

* * *

FIFTEEN years ago it was reported in THE ELECTRICIAN, *dated October 30th, 1914, that:*

Electric battery 'buses were coming into use, following favourable reports from Mr. Birkett on the operation of these vehicles.

A Glasgow builder proposed to erect a number of all-electric houses without chimneys or fireplaces.

* * *

TEN years ago THE ELECTRICIAN, *of October 31st, 1919, stated that:*

Mr. Andrew Rae Duncan had been appointed Controller of Coal Mines.

The Anglo-Belgian telephone service was inaugurated.

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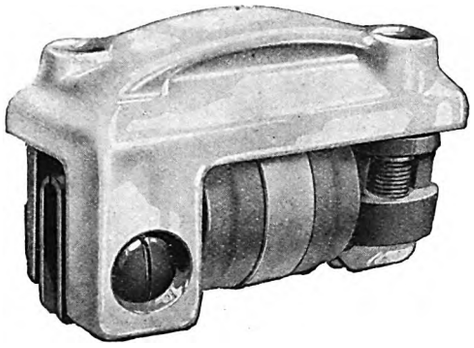
A NEW FUSE.

A NEW cartridge fuse has recently been put on the market by Messrs. W. T. Henley's Telegraph Works, Ltd., which provides a satisfactory protective device against the effects of short-circuits and heavy overloads on distribution systems. These fuses operate at 2·6 times the working current within 30 minutes, whilst they are so designed that they will not blow with twice the working current. One advantage of these new fuses is that, being interchangeable with the standard link fittings in " Henley " underground disconnecting boxes, they can be inserted, if desired, in existing installations, where these boxes were used. Their construction is interesting, both mechanically and electrically. The fuse consists of a barrel-shaped cartridge with U-shaped brass spring contacts projecting at each end. The unit is held in a specially designed carrier by screws passing through the U-shaped contacts, which also secure the wedge clamping device. It is a simple matter to fit a spare cartridge fuse to the porcelain carrier when a fuse has operated, there being no need to discard the porcelain carrier (see illustration). In order to tighten the spring contacts the wedge-shaped pieces are screwed down, using an insulated screwdriver which has been specially designed for this purpose. The range of sizes includes fuses for working currents from 60 to 300 A and for use in disconnecting boxes taking up to 0·15 sq. in. and 0·30 sq. in. conductor cables.



The new "Henley" cartridge fuse.

Tests carried out by Henley's Research Laboratories with fuses for working currents of from 60 A to 300 A showed that at full working current the maximum air temperature inside the box does not exceed 40 deg. C, while as a short-circuit test three 200 A fuses were subjected to a 500 V short-circuit test, and in all cases the fuses cleared the circuit satisfactorily. The circuit resistance was adjusted for a maximum current of 5 000 A, but the actual currents recorded on an oscillograph were 3 260, 3 080 and 3 120 A. Three 200 A and two 300 A fuses were tested connected to an accumulator of 3 000 A capacity, the pressure being 554 V. The resistance of the circuit was adjusted to limit the current to 5 000 A. Each fuse cleared the circuit satisfactorily.

A number of 100 A fuses were tested singly by the Manchester Corporation Testing Laboratories at 500 V d.c. and the estimated maximum short-circuit current available was 4 500 A the circuit being cleared quietly in each case. Other specimens tested by the Westminster Electric Supply Corporation gave a satisfactory performance under most severe testing conditions. A circuit was taken from the l.t. d.c. bars through a circuit-breaker set to break at 1 800 A with a 15 sec. time lag. The current was switched on by first closing the circuit-breaker and then dead shorting the circuit by means of a non-automatic switch. The fuses were mounted in a 4-core 0·15 sq. in. disconnecting box, the case of which was earthed. On closing the circuit the fuses operated satisfactorily and the circuit-breaker remained unopened. A further interesting short-circuit test, carried out by the Kensington and Knightsbridge Electric Lighting Co., consisted of connecting a specimen 300 A size fuse direct to a 210-240 V 6-700 Ah battery without resistance in the circuit. The fuse cleared this heavy short circuit load satisfactorily without leaving any visible evidence of the test to which it had been subjected.

At a meeting held in the Grand Central Hotel, Belfast, on October 22nd, it was decided to form an area committee of the Electrical Development Association for Northern Ireland. Mr. Charles V. Hill presided, and an address was given by Lieut.-Colonel W. A. Vignoles. A lengthy discussion followed, after which it was decided, on the motion of Mr. F. H. Whysall, seconded by Mr. E. Fawthorpe, to form such a committee, and also that Mr. Whysall should be its chairman.

PERSONAL.

MESSRS. J. Neale and C. L. Clutterbuck have resigned from the board of Radiovisor (Parent), Ltd.

Mr. C. L. Faunthorpe, for 26 years mains assistant in Blackburn Corporation Electricity Department, has retired.

Mr. W. G. Davies, sales director of Graham Amplion, Ltd., has been appointed joint managing director of the company.

Mr. H. W. Laing, of Lytham St. Annes Tramways Department, has tendered his resignation after 23 years as general manager.

The Roosevelt Medal for Distinguished Service has been awarded, on his 55th birthday, to Mr. Owen D. Young, chairman of the General Electric Co., of America.

Capt. H. de A. Donisthorpe, of the General Electric Co., Ltd., broadcast a talk on " The Evolution of the Wireless Valve, " from the Dublin station on Wednesday.

One of the employees of the Automatic Telephone Co., Ltd., Mr. Arthur Hankey, has been raised to the aldermanic bench of Bootle T.C. He is already a Justice of the Peace.

The marriage of Mr. H. A. C. Ridsdale, who is on the electrical staff of the Synthetic Ammonia and Nitrates, Ltd., and Miss M. G. Wyman was solemnised at Gloucester last month.

Estate of the gross value of £53 043, with net personalty £45 345, was left by the late Sir Somerset Richard French, at one time manager of the Rhodesian Telegraph Service and of the African Trans-Continental Telegraph Co., who died aged 80 years.

Mr. J. Herbert Edwards, managing director of the Western Electricity Supply Co., Ltd., and associated companies, who is retiring from active management in favour of other appointments, has been presented by the staff with a telescope and an illuminated address.

Miss Freda Nayler, daughter of Mr. G. F. Nayler, chief engineer of the Nelson Corporation Electricity Department, winner of the silver rose bowl at Blackpool Musical Festival, is one of the principals in a production by the Burnley Amateur Operatic Society.

Estate of the gross value of £4 881, with personalty nil, was left by the late Mr. Henry John Sutherland Mackay, managing director of the Stirling Boiler Co., Ltd., and a vice-president of the Batti Wallahs' Society, who died on June 19th last, aged 57 years.

Mr. Alfred H. Morton, commercial manager of R. C. A. Communications, Inc., has been appointed European manager of the Radio Corporation of America and is expected to sail for Europe this month. Mr. Morton was formerly with the General Electric Co., of America.

Mr. Kunihiko Iwatare, chairman of the Nippon Electric Co., has made a donation to the Japanese Institute of Electrical Engineers of a sum amounting to half a million yen. The interest accruing from the principal is to be used for " the purpose of international exchange of knowledge of electrical science and art."

Fifty-three Glasgow Municipal Tramway employees were honoured by the Tramways Committee at a function in the Govan tramways depôt on October 14th. Among those recognised was Mr. Lachlan MacKinnon, the general manager, who is the oldest tramway employee in the city, having completed 43 years service. He was the first boy employed by the old tramways company which preceded the municipal department.

Mr. S. H. Fowles, engineer and manager of the Ilkley Electricity Department, has been recommended, out of 117 applicants, for the post of borough electrical engineer and manager at Loughborough, in succession to Mr. G. J. Hollyer, who has been appointed to Torquay. Mr. Fowles was on the short list two years ago when Mr. Hollyer was appointed to Loughborough.

Many of our readers will be glad to know that Mr. P. P. Wheelwright, until recently engineer and manager of the Blackburn Corporation Electricity Department, who has been ill and confined to bed, is now reasonably well, and about again. Since leaving Blackburn Mr. Wheelwright, in addition to receiving some personal gifts from members of his staff, has been the recipient of a handsome gold cigarette case from the members of the staff and workmen of the Blackburn Corporation Electricity Department as a token of their esteem.

Obituary.

MR. ALFRED BAKER, on October 25th. He was for 24 years general manager of the Birmingham Tramways Department and retired last year.

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LEGAL INTELLIGENCE.

Huddersfield Corporation Electricity Dept. and the Factory Acts.

THE Huddersfield Corporation was fined £10 by the local magistrates on October 16th, under the Factory Acts. The summons arose out of an accident at the works on August 19th, when a man named John Sykes was severely burned while he was cleaning a switchboard.

Mr. G. B. Saywell (for the Director of Public Prosecutions) said Sykes was quite clear that he was not told that the cubicles were "alive" when he was put on the job, and he was certain that his instructions included an instruction to clean the front part of the switchboard, which he did with the aid of a ladder and a handbrush. Sykes was working under the orders of the shift engineer, a man of experience, and he was entitled to assume that he would not be placed in danger.

Mr. W. Brown, a divisional inspector of factories, said that he thought that Sykes' brush must have established contact with one of the links of the cubicles.

In answer to Mr. E. D. Spencer (for the Corporation) the witness said that the regulations laid it down that the switchboard must be "dead" before even the top or back could be cleaned.

Mr. Spencer said that would mean leaving a section of the town without current for a time.

Mr. Saywell said that commercial practicability did not matter.

For the defence, Mr. Spencer said that Sykes undertook work that he was not asked to perform. He was told to clean at the back of the switchboard. The cleaning at the front was done weekly by the trained man who had charge of the board. He contended that the top and back of the switchboard, which were insulated and could not possibly be dangerous, were not part of the board.

Mr. J. W. Turner, borough electrical engineer, said that the cubicles on the switchboard were cleaned out once a year. The job was a serious one, as it meant that a section of the town was cut off for a time. The weekly cleaning of the switchboard was performed by a trained man without the board being made "dead."

The Bench found that an offence had been committed, and convicted on the first of two summonses.

Alleged Valve Infringement.

The case of the Mullard Radio Valve Co., Ltd., against the London Radio Company (Leeds) was before Mr. Justice Eve in the Chancery Division on October 18th. Counsel said it was a motion for an injunction to restrain the defendant company from infringing the plaintiffs' patent by selling valves in breach of the licence. The defendants appeared and consented to the injunction and to treat the motion as the trial of the action. They would pay ten guineas agreed damages and the costs of the action. Counsel added that the notice of motion asked that defendants might be restrained from infringing plaintiffs' patent by selling valves made in breach of the licence. It would be better to amend that by saying "below the price fixed by the licence."

Counsel for the defendants assented, and his lordship granted an order in the terms arranged.

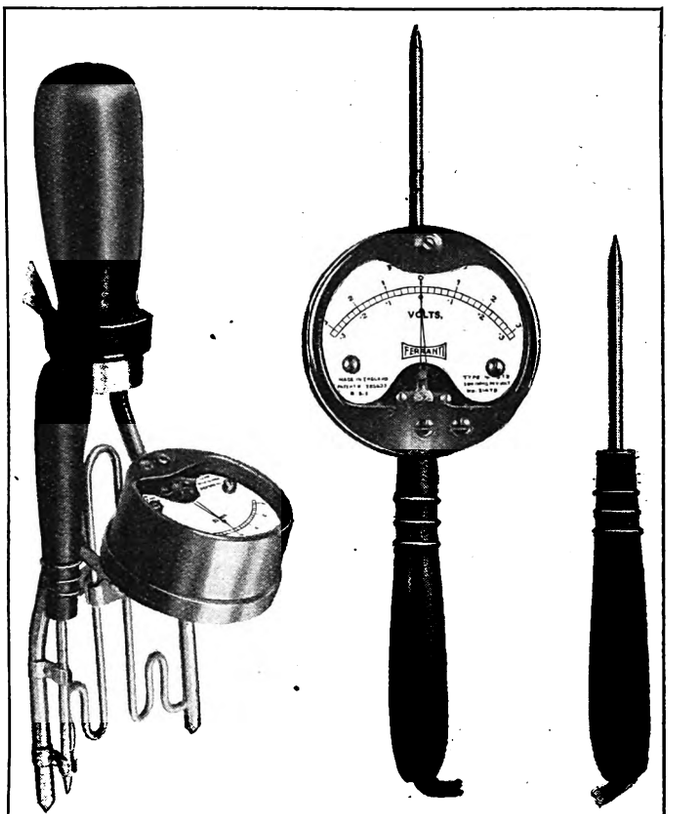
SMOKE ABATEMENT.

Special E.D.A. Exhibit at Manchester in Support of Electric Homes Campaign.

THE Manchester "Daily Dispatch" Smoke Abatement Exhibition will be opened on November 5th at the City Hall, Manchester, by Mr. Arthur Greenwood, M.P., the Minister of Health. One of the most interesting sections of the exhibition will be the display of the Electrical Development Association, and a committee representative of the Association and all branches of the industry, under the chairmanship of Mr. L. Romero, Salford city electrical engineer, and Mr. R. C. Hawkins, of the Association, is in charge of the detail work. The "electric homes (outlet) campaign" will be supported in the exhibition, electrical devices for heating, cooking and ventilation will be shown, and a complete electrical service for the house will be demonstrated as an indication of what a "wired home" should be. A number of shop windows will be featured also, adding to the brightness of the combined exhibit. On the industrial side the E.D.A. will stress the virtues of electricity as a means of supplying hot water in bulk, and for works' canteen equipment. The use of electricity in commercial baking is also to be demonstrated.

TESTING VOLTMETERS.

TWO further developments of the open-circuit cell testing voltmeter are just about to be placed on the market by Ferranti, Ltd., Hollinwood, Lancs, each embodying one of the well-known "Ferranti" 2½ in. dial 2½ in. scale moving coil



Two new open-circuit voltmeters introduced by Ferranti Ltd.

voltmeters. The type CT2 is a two-range instrument reading 3-0-3 and 0·3-0-0·3, the range desired being selected by means of a small switch mounted on the top of the instrument. It is particularly suitable for good cadmium test readings as the same length of scale is available for cadmium-to-positive, cadmium-to-negative and open circuit voltage readings. A cadmium stick adapted for fitting to the instrument can be supplied. As an indication of the robustness of the instrument it is interesting to note that if the 0·3 V scale is used in error instead of the 3 V scale, the voltmeter withstands the overload without injury. The type CTL is a "loaded" cell tester designed to permit of the rapid testing of cells under heavy discharge conditions and is primarily intended for car-battery work. With the "wander-spike" in position in the clips provided, the two prongs are placed across the cell to be tested, and the shunt, which is permanently connected across the two prongs, puts a heavy load on the cell. In this manner it is possible to obtain rapidly an indication of any variation in terminal voltage under heavy discharge conditions. A novel feature is the introduction of a slider which short-circuits a varying length of the shunt, thus giving a different value of discharge current for each position of the slider. An approximate scale is engraved on the back of one of the prongs of the tester, standard settings being 100, 150 and 250 A. It is very important to maintain clean contact surfaces between the slider and the shunt and to screw up the slider as tightly as possible. By removing the "wander-spike" from its clips, open-circuit tests can be made by applying this spike to one terminal of a cell and either of the prongs of the tester to the other.

We have received from the MIDLAND ELECTRIC MANUFACTURING CO., LTD., M.E.M. Works, Barford Street, Birmingham, a new complete illustrated catalogue giving full particulars of the most recent productions and latest improvements, together with latest prices, which are much reduced. The new list claims to be something more than a mere price list, and the publishers have tried to make it something of a book of reference on the design and installation of electrical switch and fuse gear. The new prices came into force on October 14th.

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NEW EQUIPMENT.

Apparatus of Interest to Power and Marine Engineers.

SUPPLY companies and contractors may be interested to hear that a new type of prepayment meter is being marketed by the A.E.G. ELECTRIC CO., LTD., of 131, Victoria Street, London, S.W.1. This meter is intended for use as a slot sub-meter for rooms in hotels, etc. The meter can be supplied for either 6d. or 1s. insertion, and the design is such that the meter switch can be opened by means of a key after the room has been vacated, leaving any prepaid but unconsumed energy as a profit to the hotel proprietor. The latter collects the cash from the sub-meter in each room, but pays for the energy actually consumed, which is recorded by his ordinary master meter. It is stated that on the average a profit of 2d. on each 1s. inserted in the 1s. type of meter may be assumed. The meters can be supplied for continuous or alternating current or for any voltage.

The A.E.G. phase sequence indicator.

An extremely small synchronous self-starting motor for driving clocks has also been put on the market by the A.E.G. The rotor is only about a centimetre in diameter and runs at 3 000 r.p.m. This speed is geared down in an oil chamber to one revolution in 24 hours. This "clock" is thus energised from a.c. mains, and its timekeeping depends only on the frequency of the supply being maintained constant. The ordinary frequency indicator is not, of course, sufficient for the purpose, and the A.E.G. has put on the market also a master frequency control clock, which is installed in the generating station and is claimed to permit perfectly constant frequency to be maintained, thus enabling synchronous clocks to be utilised over the whole area covered by the supply. The master clock consists of a precision "grandfather" clock of the ordinary type, upon whose dial is superimposed a second pointer driven by one of the standard synchronous clock motors connected to the supply circuit. It is the function of the operator to regulate the speed of the alternator so that the two pointers run together. It is stated that by this means every synchronous clock or time switch connected to the supply can be kept as completely accurate as the precision master clock, which has a regulation factor of 15 seconds per month.

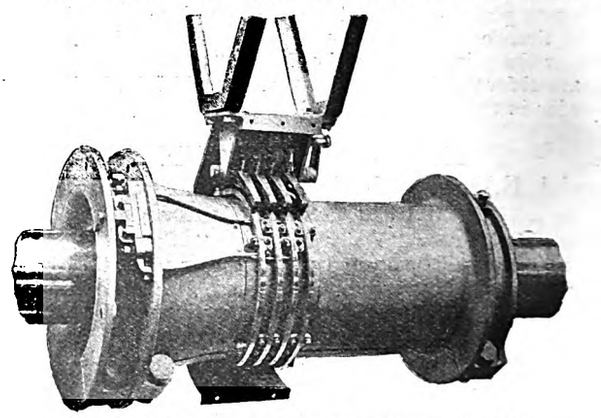
The A.E.G. has also produced recently a phase sequence indicator in portable form, for ascertaining the sequence of a 3-phase supply—that is, the direction of the rotating field—when making meter connections or installing power factor indicators, reverse current relays, etc. In this indicator, two ohmic resistances and one condenser are used, causing the star-point to vary with the phase-sequences. A small lamp is connected in series with each of the two resistances, arranged so that with correct sequence the right-hand lamp is lighted, and with the wrong sequence the left-hand lamp. A press-button switch is used for completing the test: two such switches are provided, one for 100-200 V, and the other for 200-400 V. The indicator measures 80 by 80 by 40 mm.

The POWER CENTRE CO., LTD., 15, Park Lane, Liverpool, is adding to its range of "Turret" systems a means of carrying electric cables for power or lighting, which is claimed to be cheaper and more accessible than methods hitherto available, wherever anything larger than 1½ in. conduit would ordinarily be required. It is known as the "Turret" Patent Trunk Conduit System, and the trunking consists essentially of a heavy-gauge sheet steel trough, fitted with a detachable cover-plate on its front side. The upper side of the trough is so shaped with a continuously projecting lip as to throw off any drip or moisture which may collect on the top, and the cover-plate fits well inside this projection. The cover also has a continuous projecting lip on its lower edge; this again serves to carry away any drip, and the troughing is made of one continuous sheet forming the base, side and top, so should be practically damp-proof. The cover-plate is secured at intervals to steel strips, which can be easily removed to enable the cables to be pushed into place and secured. It is stated that cables cannot be damaged in any way during installation; no draw-in boxes are required, even with very heavy cables. Any type of cable can be used with the "Turret" trunking, which is supplied in 8 ft. lengths in various sizes, and may be fitted with welded block ends or detachable block ends at an extra charge. Special lengths shorter than standard can also be obtained. Each trunk is fitted with one butt strap—a joint piece which is riveted into position and drilled to enable it to be bolted to the next section; the small bolts and nuts necessary are supplied with the trunking. For vertical runs a trunk with a simple overlapping cover is supplied; this type is also useful for laying in floors, where it may be necessary to put in the cable from the upper side. A universal angle box, which can function as an inspection or connecting box, is supplied as standard.

A patent adjustable meter panel is available for use with turret trunking and consists of a channel-section back-plate of sheet steel, with two impregnated teak battens attached to its upper end. One batten can be adjusted either vertically or horizontally so that any type of meter can be attached.

Those interested in radio and other electrical equipment for ships may be glad to be reminded that SIEMENS BROTHERS AND CO., LTD. (of Woolwich, S.E.18), provide a complete radio-telegraph service on various sets of terms and conditions. The ¼ kW spark station is now the standard transmitter of its type, owing to the new regulations which come into force on January 1st, 1930, prohibiting the installation of spark transmitters of greater power than 300 W. The ¼ kW station is of the self-contained cabinet type, with a folding flap which when open forms a writing table, and when closed protects all vital parts from dirt. A 300 W motor alternator supplies power to the quenched spark transmitter, and the other apparatus comprises an emergency battery, a two-valve receiver and the necessary receiver batteries and charging panels. Under the heading of valve transmitters the firm is offering two sizes of station. The 200/300 i.c.w. equipment is tuned to 600, 705 and 800 metres and employs 2 valves. It is supplied complete with motor alternator, control, main switchboard and two-valve receiver. With the 400/500 i.c.w. station two transmitting valves are used to produce interrupted continuous waves on the band 600/800 metres, and there is a large increase in the range as compared with the 200/300 size. By the addition of a two-valve rectifier for supplying a d.c. potential to the plates of the transmitting valves, c.w. is produced on the commercial wave-band of 1 875-2 500 metres.

Other marine equipment now being produced by Siemens Brothers includes ships' telegraphs (electric), navigational and inter-communication telephones, electric helm indicators, navigation lights and "look out" indicators, torsionmeters, distance thermometers and thermo-electric pyrometers. The Siemens helm indicator is operated directly by the movements of the rudder and therefore indicates the actual angle of the helm and not merely the movements of the telemotor or other control gear. Two types of torsionmeter are available.


The "Ford" torsionmeter of Siemens Brothers and Co., Ltd.

The "Hopkinson-Thring" is of the optical type; it provides a simple means of measuring the H.P. of turbine driven shafts, but is not applicable to shafts driven by reciprocating engines. The "Ford" torsionmeter is of the electrical type. Being designed to indicate mean torque it can be used with shafts driven by any kind of engine. For investigation purposes it can also be arranged to indicate the instantaneous value of the torque at any point in a revolution, so enabling a curve of cyclic fluctuations to be plotted.

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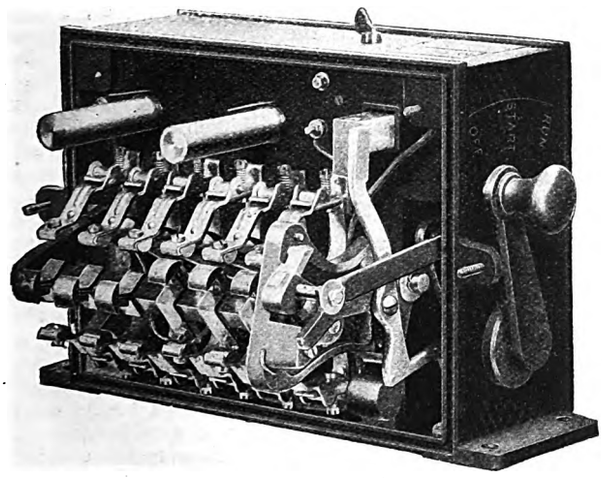
An electric slicing machine, known as the "Scout," is being produced by FRANK V. MAGRINI, LTD., of Phœnix House, 19-23, Oxford Street, London, W.1. It is stated to be equally suitable for slicing hot and cold meats, bacon (up to 11 in. wide), large-size hams, and bread. As a bread slicer it excels—according to the claims made by the firm—owing to the high speed of the knife, which is approximately 940 r.p.m. Enclosed double sharpeners keep the knife edge in condition. The knife itself is made in one piece, of chrome nickel steel. The gauge plate moves parallel to the cutting plane of the knife, and the regulation is universal—that is, any number of different thicknesses between a half-inch and $\frac{1}{100}$ inch can be obtained. The motor is specially constructed, with a consumption of 293 W.

It is normally of the counter type, but can be supplied on a pedestal for ship board or similar purposes. A special feature of the slicer is its ability to handle tomatoes, apples, etc. All parts that come in contact with foodstuffs are of porcelain enamel.

Another useful product of FRANK V. MAGRINI, LTD., is the "Thermotainer," which consists of an electrically-heated food container. The Thermotainer can be adapted to serve as a kitchen unit to replace the old-fashioned steam table; as a hot food conveyor, for marine passenger and similar service; for cafetaria service counters; or for roll, pastry and pie warmers—to keep bakery foods hot and fresh. The various tray-like insets can be changed in size and arrangement according to individual requirements; they can be made in any specified material, standard substances being chinaware, monel metal and aluminium. For hospitals large Thermotainers, sufficient for serving 80-100 patients, can be had; the dimensions of the standard Model H, which has a consumption of 1 200 W are 56 in. long, 28¾ in. wide, and 53½ in. high. Electrically-heated air chambers, under thermostatic control, surround the food compartments and no circulating air comes into contact with the food.

Amongst the industrial equipment of the WALSALL ELECTRICAL CO., LTD., of 61, Bridge Street, Walsall, is a series of oil immersed star delta startors for low and medium pressure a.c. circuits. These units are of the totally-enclosed type arranged for fixing either to panels or upright supports. When arranged as startors they are suitable for currents up to 40 A., and when used as circuit breakers they can be used up to 80 A. The no-volt release coils can be wound to suit any supply up to 600 V, and any frequency from 25 to 60 cycles, while the case and tank consist of heavy cast iron. The tripping mechanism is oil immersed, and is thus suitable for use in damp or tropical situations. The stationary contacts are of the self-aligning type, with renewable hard drawn copper tips

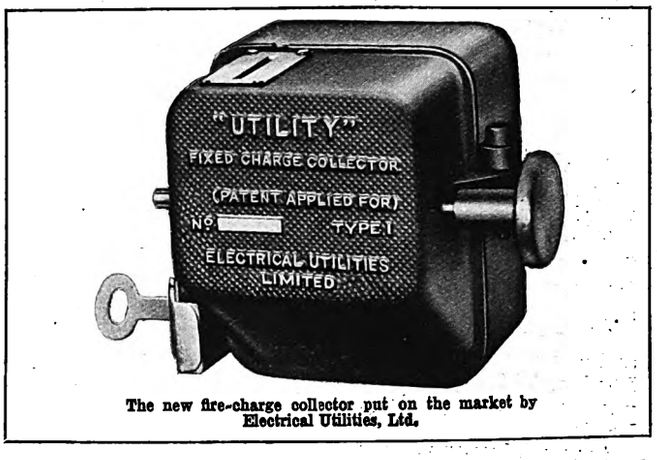


The internal arrangement of the startor equipment of the Walsall Electrical Co., Ltd.

pressing against the moving contacts by adjustable springs, and the drum contacts are clamped on an insulated square steel shaft and also arranged with renewable hard drawn copper tips. The switch is of the free-handle type to prevent its being held in the "running" position against overloads. A sequence device is fitted, so that it is impossible to switch into the "running" position without having passed through the start position. A catch is provided on the front of the case for tripping the startor. The terminals are of ample size and easily accessible when the lid is removed, claw grip washers being used on all terminals.

FIRE-CHARGE COLLECTOR.

A SIMPLE and robust instrument has just been put on the market by ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, London, N.W.10, to take the place of the prepayment meter, which is normally placed in hotel bedrooms to



The new fire-charge collector put on the market by Electrical Utilities, Ltd.

collect the charge for current, where electric fires are provided. In most hotels it is the practice to charge 1s. per night for fires, and when electric fires have been introduced, a separate shilling in the slot prepayment meter has usually been installed.

The instrument which is now being offered has the advantages of being robust, easily re-set and low in price.

In the case of the standard instrument, a 15 A tumbler switch is contained in a cast iron case, with a glass window at the base, which is not visible in the illustration. When the user places the coin in the slot, and pulls the handle over, the coin forces the switch in the "on" position, where it remains until the following morning, when the instrument is unlocked by some authorised person, the coin taken out, and the tumbler switch re-set. This enables the consumer to use an electric fire for a precisely similar charge to that which is normally made for coal fires in hotel bedrooms, and assures the hotel proprietor that his revenue from fires will be at least the same as that which he has received in the past. A complete hotel bedroom fire equipment of this type has been installed in a South of England hotel for £3, a 1½ kW fire being used.

Larger patterns of collector for controlling bigger fires, and for taking coins, such as sixpences or florins, can be supplied.

ELECTRICITY IN CANADA.

THE Dominion Bureau of Statistics at Ottawa in its final report for 1927 on Central Electric Stations in Canada, records an increase of 20% during the year in the output by these plants. The total output in 1927 was 14 549 099 thousand kWh, as compared with 12 093 445 thousand kWh in 1926. The 1927 output was produced to the extent of 9 944 330 thousand kWh in commercial stations, the output of municipal stations during the year aggregating 4 604 769 thousand kWh. The number of central stations operating in Canada in 1927 was 629, capitalised at $866 825 285, having a total primary power equipment of 4 173 349 H.P. and a secondary power equipment aggregating 3 385 227 kVA. Of the 629 stations operating, 302 were hydraulic and 327 fuel-power stations. Commercial plants numbered 432 and municipal plants 197. Although the number of fuel-power plants was in excess of those producing current with water wheels, the primary power equipment of the hydro-electric plants totalled 3 975 012 H.P., as against only 33 788 H.P., represented by steam reciprocating engines; 144 683 H.P. by steam turbines; and 19 866 H.P. by internal combustion engines.

TECHNICAL PAMPHLETS FOR WORKMEN.

The latest addition to the useful series of Technical Pamphlets for Workmen, issued by the Post Office Engineering Department, is one dealing with wireless transmission and reception. The contents cover general principles, systems of generation and transmission, methods of reception, direction finding and directive reception, and the inspection of wireless stations. The pamphlet, obtainable from H.M. Stationery Office, price 6d., also includes details of wave-traps and other methods of improving the selective properties of receivers.

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BUSINESS ITEMS.

MR. H. LITTLEWOOD has commenced business as an electrician at 18, Scholes Road, Birkby, Huddersfield.

HARRY JONES AND CO. advise us that they have removed to new premises at 32, Goodge Street, London, W.1.

S. W. WALKER AND SON, radio engineers, of 47, Jewry Street, Winchester, have opened additional premises at 21B, Southgate Street.

STEATITE AND PORCELAIN PRODUCTS, LTD., announce that all inquiries and correspondence should now be addressed to Bewdley Road, Stourport, Worcs.

Messrs. C. GILBERT AND SON, electrical and radio engineers, of 3, Shouldham Street, Marylebone, W.1, announce that their late manager, Mr. W. Moody, is no longer in their employ.

The HENDON LAMP AND ACCESSORIES CO., LTD., 104, Southampton Row, London, W.C.1, request lists from manufacturers of electric heating and cooking apparatus and accessories.

The new address of Mr. E. KILBURN SCOTT, chartered, civil, and electrical engineer, is Conway Hall, 25, Red Lion Square, London, W.C.1 (rear entrance, 49, Theobald's Road). Telephone: Chancery 8473. Telegrams: Beadlebob, Holb, London.

ALLOY WELDING PROCESSES, LTD., have removed their premises from 14-16, Church Street, Islington, London, N.1, to Ferry Lane Works, Forest Road, Walthamstow, London, E.17. Telephone: Walthamstow 2366-7-8; telegrams: Alweprol Waltstreet, London.

Trolley Bus Literature.

A syndicate in Brazil, having in view the establishment of a service of electric trolley buses over a distance of 100 kilometres, desires to receive literature from British manufacturers. Details can be obtained from the Department of Overseas Trade. (Reference A.X. 8 616.)

The whole of the 10 000 line "Flaxman" automatic telephone exchange equipment was manufactured and installed by the Telephone Works of the General Electric Co., Ltd., Coventry, Warwickshire, the exchange being opened in the London area on September 14th.

The GENERAL ELECTRIC CO., LTD., has opened a new branch at Magnet House, 3, Campbell Street, Leicester, and Mr. W. J. Hodgkins, of the Birmingham branch, has been appointed manager. The telephone number is Central 58778, and the telegraphic address "Electricity."

The UNDERFEED STOKER CO., LTD., Africa House, Kingsway, London, W.C.2, announce that they have secured the sole manufacturing rights for Vibro conveyors under the Schenck-Heymann system, the conveyors being manufactured entirely at the company's works at Derby.

BELLING AND CO., of Enfield, Middlesex, have appointed NUTTER, SON AND EDGE, LTD., of Cromford House, Cromford Court, Manchester, as main agents for the sale of their electric fires and cookers in the Lancashire, Cheshire, and North Wales area and stocks are being carried at the Victoria Bridge stores. Mr. P. Nutter, managing director of Nutter, Son and Edge, Ltd., is giving special attention to the requirements of supply authorities, corporations, and wholesalers, and will call on the supply authorities with regard to the new range of cookers which have recently been brought out.

A Reception Problem.

Some interesting experiments were made by Captain P. P. Eckersley at Jack Straw's Castle, Hampstead Heath, last week, when he sought to demonstrate that even within six miles of the Brookman's Park station, it is easily possible to receive 5 GB without interference, and to bring in several foreign programmes, and this with a reasonably priced set. His contention was proved very convincingly—first on an all-mains "Marconiphone 4" (model 47); later in the evening one of those present challenged Captain Eckersley to produce clear reception of 5GB on a three-valve set, and a model 39 receiver was substituted—with satisfactory results. A 30 ft. aerial, similar to that generally used by the public, was employed in each case.

Madrid is now placed for the first time in direct wireless telegraph communication with both North and South America and, by means of the "Marconi" short wave beam installation which is included in the equipment of the Aranjuez station, a regular commercial telephone service between Spain and the Argentine Republic will be available in addition to high-speed beam telegraph services. For use in these circuits special receivers have been constructed by MARCONI'S WIRELESS TELEGRAPH CO., LTD., on behalf of Transradio Espanola, the Spanish company to which these stations belong. The supply of this apparatus to Transradio Espanola is the second big order for British wireless equipment recently received from Spain, the Marconi Co. having also supplied a short wave station to the Spanish Government to establish a direct wireless service between Madrid and the Spanish colony at Fernando Po, in Africa.

"His Master's Voice," having begun to manufacture radio sets, realise that this, plus the electrical reproducers, makes a fresh demand upon the technical knowledge of dealers and their assistants. In order that all those who handle "H.M.V." products may be able to give the fullest services to the public, the Gramophone Company has started, at the London Polytechnic, a special course of lectures in elementary radio-gramophone production. Capt. P. P. Eckersley has supervised the course of lectures and gave the opening address last month. The evening lectures are delivered by Mr. S. T. Short, and the sixteen discourses and demonstrations will cover the entire field for dealers, salesmen, service staff and others engaged in the radio-gramophone industry. Similar courses of instruction are to be given in such centres as Manchester, Liverpool, Birmingham, Southampton, Hull, Bristol, Cardiff, Glasgow, Edinburgh, Newcastle, Leeds, Bradford, Sheffield, Nottingham, Leicester, Norwich and Brighton, by arrangement with the local technical schools. In each case one pound is charged for the complete course. For those who are unable to attend the evening lectures a correspondence course will be available, and on this matter letters should be addressed to the Technical Education Department, the Gramophone Company, Ltd., whose address is 363, Oxford Street, London, W.1.

Electrical Exhibition.

The claims of electric lighting, heating, and labour-saving appliances in the modern home were prominently featured at the Empire Exhibition, recently held at Tunbridge Wells. The exhibition was formally opened by Sir Derrick Watson, and its object was to demonstrate that goods manufactured and produced within the Empire are superior to those imported from abroad. A high standard of display was noteworthy on all the electrical stands, and the following are some brief notes on the electrical contractors' stands, and others featuring electrical goods. An attractive display of electric fittings and shades was made by the ADVANCE ELECTRICAL CO., Monson Road Tunbridge Wells, while the centre of interest was the "Kelvinator" refrigerator. An added attraction was a demonstration of the "Hoover—" vacuum cleaner. Visitors to the stand of E. POWELL, LTD., 39, High Street, Tunbridge Wells, were introduced to the advantages of "Ericsson's" telephones for domestic uses. "Goblin" vacuum cleaners were featured among a wide range of electric heating and labour-saving apparatus. STRANGE AND SONS ELECTRICAL ENGINEERING CO., LTD., Tunbridge Wells, focussed attention on their installation service, which covers a wide area, and showed the "Marco" refrigerator, "Magicoal" fires, and a variety of clothes washers, driers, water boilers, etc., in addition to a good display of "Marconi," "Pye" and "Symphony" portables, all-mains units, and the new "Mullard" and "Burndept" speakers. Mr. H. FEATHERSTONE, 22, London Road, Tunbridge Wells, occupied two stands with "Manning Bowman" table apparatus, the "Vac-Tric" suction cleaner, "Belling," "Creda," "Heatrea," and "Magnet" fires, a wide range of fittings and shades, and electric toasters, irons, and kettles. Wireless was strongly featured, "Kolster-Brandes" full range and many of the new "Burndept" receivers being shown. Mr. Featherstone handled the amplification in the hall. The "Electro-Vapour" radiator was a centre of interest on the stand of H. A. STONHAM AND CO., LTD., Mount Ephraim, Tunbridge Wells. The full range of the new Kolster-Brandes sets was also shown, the new four-valve portable and the three-valve set for mains operation being featured. The TUNBRIDGE WELLS CORPORATION ELECTRICITY DEPARTMENT gave many demonstrations of cooking by electricity, and displayed cookers, boilers, etc., for hire. In addition to the examples of "Magicoal" electric fires shown on traders' stands, they were also shown in great variety by BERRY'S ELECTRIC (1928), LTD., of 85/6, Newman Street, London, W.1. CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., had a stand specially devoted to their system of electric wiring, including in the exhibits a complete list of the names of local contractors from whom their products are obtainable.

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TEXTILE MACHINERY.

Some of the Electrical Equipment Exhibited at Leicester.

FROM an electrical standpoint the main interest in the Textile Machinery Exhibition, which opened at Leicester on October 16th and closed on October 26th, was in the advance which is being made in the driving of hosiery machinery by means of electricity. As practically all the working exhibits were electrically driven, the manufacturer visiting the exhibition was able to get an excellent idea of the advantages of the electrical drive over other methods. The power for the exhibition was supplied by a rotary convertor taking 500 V d.c. and giving 400 V a.c.

The MIDLAND DYNAMO CO., LTD., Leicester, supplied most of the motors in the exhibition, and perhaps their most interesting drive was that for sewing machine benches. This is a small motor, which fits under the middle section of the bench, and drives by a silent chain running in an oil bath. Most of these fractional horse-power machines are for driving sewing machines, linking machines and small knitting machines. A special group for driving a number of knitting machines were mostly from $\frac{2}{3}$ H.P. The firm also supplied reduction gears with automatic features which give a ratio of 45 to 1.

Mr. R. H. DONALD, the British agent for E. Blaschke of Berlin-Tegel, showed several electrical features in connection with rayon (artificial silk) spinning.

The A.E.G. ELECTRIC CO., LTD., also showed spinning equipment, and the latest spinning motor is considerably cheaper than previous models, said to be due to the mass production methods adopted. A new spinning motor known as the "Tornado," which is very light and enclosed entirely in bakelite, was also shown. The patent "Kuma" brake switch, which is also made of bakelite, was another new feature.

This year the UNIVERSAL WINDING CO., LTD., Manchester, had a special stand devoted to machinery for winding electrical coils. The No. 96 coil winder is for winding field or meter coils of the self-supporting spool-wind type. This will wind rectangular coils up to $3\frac{1}{2}$ in. long and 4 in. diameter with wires ranging in size from No. 18 to No. 44. It is fitted with a special device which stops the winding spindle immediately breaks or other interruptions occur. It has also the usual wire compensating device. The No. 97 winder is for producing self-supporting coils of the spool-wound type.

W. AND T. AVERY, LTD., had a full range of the latest industrial visible weighers.

"HELP YOURSELF."

Many Electrical Prizes Included in Seventh Annual Gift Distribution.

OVER 2 000 prizes, ranging from a 20 H.P. Austin saloon car to a stick, a ball of string, a bent pin, a glass jar, and a tiddler are to be distributed this year to members of the Stock Exchange "Help Yourself" Society.

A number of electrical and radio firms are providing gifts, as will be seen from the list given below :—

CELESTION, LTD.—Two C.24 mahogany model radiophones, three C.14 model mahogany radiophones, five C.14 oak model radiophones, five C.12 radiophones in oak, three C.12 radiophones in mahogany, and six C.10 radiophones.

A. DEAN AND CO.—A two-pint nickel-plated electric kettle, nickel-plated electric iron and a japanese lacquer table lamp with shade, complete with flex and lampholder.

MESSRS. JUPP AND RYAN.—Two electric irons, any voltage.

MESSRS. ORMOND ENGINEERING CO.—Three "Ormond" five-valve suit-case portable wireless sets, 158 cone loud speaker units.

E. K. COLE.—An Ekco-Lectric straight three receiver.

BAIRD TELEVISION DEVELOPMENT CO.—A Baird televisor.

J. J EASTICK AND SONS.—Ten "Eelex" safety wireless aerial earth switches and a box of assorted "Eelex" treble duty wireless plugs and terminals.

GENERAL ELECTRIC CO.—Two "Magnet" electric cleaners complete with all attachments, two breakfast table sets, two "Magnet" Minor-de-luxe model electric table cookers, and six "Magnet" universal voltage electric travelling irons.

MARSHALL, STEWART AND CO.—Working scale model of a locomotive driven by electricity.

SHERIDAN SIGNS, LTD.—Electric day and night box sign.

ELECTROLUX, LTD.—Model XI Electrolux cleaning equipment.

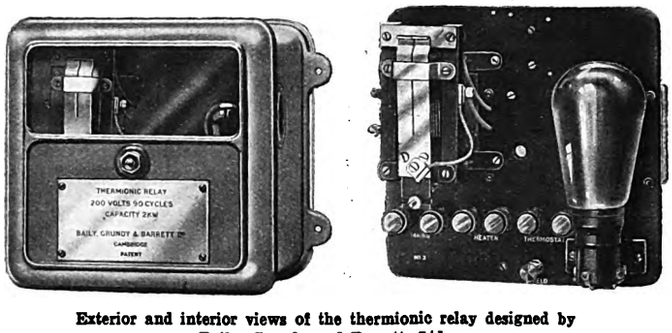
MULLARD WIRELESS SERVICE CO., LTD.—Six Mullard loud speakers, Model "C."

J. DYSON AND CO., LTD.—"Goodwinex" high-tension eliminator for wireless set.

DUBILIER CONDENSER CO. (1925), LTD.—Dubilier h.t. battery (66 V), and Dubilier h.t. battery (108 V).

TEMPERATURE CONTROL.

AN interesting device for the automatic control of temperatures in experimental chambers, is a thermionic relay by BAILY, GRUNDY AND BARRETT, LTD., of 2, St. Mary's Passage, Cambridge. The apparatus is for operation from an a.c. supply, and consists of a thermionic valve, supplied



Exterior and interior views of the thermionic relay designed by Baily, Grundy and Barrett, Ltd.

by a small transformer with filament, anode, and grid potentials, which operates the main contactor switch by means of the anode current; the thermostat, connected in the grid circuit, effecting control by application or non-application of a suitable potential to the grid. By the use of this relay, the following advantages over the usual low voltage magnetic type are claimed: (*a*) Elimination of batteries, and direct operation from alternating current supply; (*b*) reduction of current in the thermostat to a negligible quantity, approximately 10 mA; (*c*) the reduction of moving parts and small contacts to a minimum; and (*d*) a thermostat with a fine mercury column can be used, giving very sensitive control, the surface of the mercury remaining clean after prolonged use; and (*e*) the relay can be operated through an external resistance of from 1 to 2 megohms, enabling a semi-conducting fluid to be employed in the thermostat if required. The device is made for operation from mains of 200-250 V, 40-100 cycles, with a control capacity of 200-250 V, 10 A. The current consumption with the contact open is 0·35 kWh in 24 hours, and with the contact closed, 0·6 kWh in the same period. The thermostat current is 10 mA, and the valve life one to two years. The range of fluctuation in supply voltage allowable is + or −10% of stated voltage.

An adjustable contact thermostat with mercury column is recommended for use with the relay, the temperature regulation being within 1/100 deg. C. This thermostat is similar in construction to a glass mercury thermometer, but in addition contains two contacts, one of which makes permanent contact with the column of mercury, and the other is connected to a small spiral of platinum wire. A small glass capsule, containing a short piece of iron, is located at the top of the thermostat tube, to which is attached a length of platinum wire, passing through and making contact with the platinum spiral. The capsule can be moved up and down in the tube by means of a permanent magnet applied externally, and hence the thermostat can be arranged to make contact at any temperature desired.

N.Z. TELEGRAPHS AND TELEPHONES.

General Increase in Traffic Since Last Year—Automatic Telephone System Extending.

THE report of the New Zealand Postmaster-General for the year ended March 31st, 1929, states that the number of cable messages, excluding press, sent during that period from New Zealand to international offices was 217 033, against 210 662 in previous year, through the Pacific Cable Board's system, and 109 308, against 108 167, by Eastern Co. Press messages, numbering 5 102, were sent *via* Pacific, and 2 381 *via* Eastern, against 4 925 and 2 920 respectively in 1927-8. The total number of international cable messages, excluding press, sent by cable from New Zealand was 179 399, against 170 818, and the number sent to Australia was 146 942, against 148 011. The numbers received were: international 156 115, against 147 325, and Australian 140 597, against 140 899.

The number of telephone stations supplied by the Post Office system grew from 144 552 to 152 541 during the year, in each case including about 5 000 non-exchange stations. Out of this total 42% are on the automatic system.

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INDUSTRIAL HEATING.

Some Exhibits at the Bradford Engineering Society's Exhibition.

WE are advised by the Electrical Development Association that it has been possible to arrange within the last few days a special electric heating section of the Bradford Engineering Society's Engineering Exhibition, which will be held at the Olympia Hall, Bradford, from November 6th to 16th. At the time of going to press the complete catalogue of the section was not available but the scope of the exhibits will be appreciated from the following brief descriptions.

The BASTIAN METER CO., LTD., Farmham Road, Trading Estate, Slough, will show on Stand No. 42, "Mascarini" electro-steam boilers, hot water electrode calorifiers, 10 gal., "Bastian" 500 W., 230 V water heaters fitted with thermostats, 6 electric radiators, fires, samples of tabernacle heaters and samples of electric elements. The BRITISH RESISTOR CO., LTD., Clare Road, Halifax, will exhibit on Stand No. 57, furnace type "Globar" non-metallic heating elements in operation, suitable for working temperatures up to 1 350 deg. C. Another item will be a small "Globar" electric furnace, shown in operation at a temperature of 1 350 deg. C.; electric paint burners, "Globar" electric grills for industrial requirements and photographs of large furnaces will complete the exhibit. BROWNS' DRYERS, LTD., 17, Victoria Buildings, Deansgate, Manchester, will be found on Stand No. 41, but details of their exhibit are not yet available. FERRANTI, LTD., Hollinwood, Lancs, on Stand No. 59 will feature fires, showing details of construction, water heating equipment gear, thermostats, relays, etc. THE GENERAL ELECTRIC CO., LTD., of 11A, Wellington Street, Leeds, will occupy two stands and these will be devoted to displays of double deck bread baking ovens, double deck pastry ovens for fancy pastries, and various industrial heating appliances. The stands are Nos. 58 and 69.

The JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1, on Stand Nos. 57 and 70, will feature 2 deck pastry ovens, 4 ft. hot cupboard 10 D. vertical oven ranges, 24 D. cooker wash boilers, which will be dissembled for examination, electric cooking cabinets and fires complete, cooker and fire elements assembled and dismantled, and typical wiring connections for cookers and switchboard showing arrangement for obtaining series-parallel control. JESSOP AND BOYDELL, 21, Northgate, Bradford, will occupy Stands Nos. 71 and 72 and will show various types of low temperature air warmers with automatic temperature control. LANG BRIDGE, LTD., of Accrington, will feature on Stand No. 20 patent electrically-heated drying cylinders. "Lecfur" electric furnaces for annealing hardening and tempering, normalising, carburizing for temperatures up to 1 050 deg. C., and up to 1 350 deg. C., for melting non-ferrous metals; for vitreous enamelling, firing glazes and colours; for the wire trade, patenting, pot annealing, hardening and tempering (continuous process), annealing bright non-ferrous wires (continuous process), etc., are to be shown by the LEEDS ELECTRIC CONSTRUCTION CO., of Leeds, on Stand No. 36.

Welding transformers and regulating choke coils for alternating current of all periodicities; "Premier" electrodes for welding mild steel; examples of "Belfinish" welds and electrodes. "Flexin" welding tool and welding electrodes and the "Premag" copper welding process will form the exhibits of the PREMIER ELECTRIC WELDING CO., LTD., Abbey Wood, S.E.2, whose stand will be No. 19. YOUNG, OSMOND AND YOUNG, LTD., Welwyn Garden City, Herts, will also show in the heating section of the exhibition and on Stand No. 40 will be featured "Unity" electric heating systems, gas-tight heaters for heating cellulose paint shops, explosive factories, etc.; low-temperature heaters for heating of tar, crude oil, etc., and heaters for traction and other high voltage work, up to 1 500 V.

GLASGOW AND THE COMMISSIONERS.

Glasgow Electricity Committee has been informed that the Electricity Commissioners do not approve of the depreciation method carried out by the Corporation, and that the Commissioners insist on all repayments of capital being confined to the sinking fund method. The Commissioners desire that formal application should be made to them to regularise the sums met out of revenue by way of depreciation during the past two years.—The Electricity Committee recommends that a request by the Education Authority that the experimental heating of schools be continued for a further period of one year, be acceded to.

SAVOY THEATRE.

New Lighting Arrangements of Outstanding Design.

THE decorative lighting scheme at the Savoy Theatre, London, seen by the public for the first time last week, was designed by Mr. Ionides in conjunction with Mr. Arthur T. Earnshaw, of the Strand Electric and Engineering Co., Ltd. The stage lighting equipment supplied and installed by the same firm consists of "Sunray" magazine battens and footlights, the first batten being of the combination type with six 1 000 W spotting lanterns and a number of 12 in. floodlights, each unit being under separate control, both for switching and dimming. A special batten has been installed at the extreme back of the stage for use with transparencies, while a battery of "Strand Electric" panorama horizon lanterns has been fitted on a movable lighting bridge over the proscenium arch. Perch arcs have been dispensed with and replaced with "Boomerangs" (an Americanism for false return perches) on either side of the stage, each fitted with three 1 000 W spotting lanterns. A "special effect" circuit has been fitted at the side of the stage of 100 A capacity for accommodating any special apparatus which may be required. Four 30 A arc dips have been provided for optical effect lanterns, etc., and six incandescent four-colour dips have been installed with stage traps flush with the stage level (3 on either side), each single plug on individual dips being controlled by a separate switch on the stage switchboard. The stage and auditorium decorative switchboard is installed in a special chamber on the side of the stage, and consists of the Strand Electric Co.'s latest design, fitted with 50 "Sunset" pattern metallic dimmers on all circuits with the exception of the dips, which, having a variable load, are supplied with liquid dimmers. The dimmers are mounted in banks for the red, white, blue and amber stage lighting circuits, two further shafts being provided for the spot lighting of the "Boomerangs" and No. 1 batten. Each chamber is capable of master control, which may be obtained through a worm-drive for slow motion or by a handwheel for quick operation. Special four-way multiple switches have been provided for the fly plugs and all the spotting lanterns, so that they may be controlled by any colour master. The scene control switching panel consists of "all-insulate" tumbler switches, operating remote control master clapper switches. These latter are housed in a special sound-proof chamber. Behind each dimmer regulator handle a pilot light has been fitted in order that the operator may be aware of the progress of his dimming. In close proximity to the stage switchboard the front-of-house decorative control board is installed of the same construction as the stage lighting board, but fitted with ten "Sunset" dimmers. A complete set of "cue" lights is installed in the stage manager's corner.

The whole of the battens are suspended on the counterweight system, in order that they may be easily raised or lowered for cleaning and maintenance purposes. Separate circuits are provided in the batten lighting for working lights on the stage independent of the ordinary stage lighting, while a large chamber has been built in the ceiling of the auditorium to accommodate the F.O.H. spotting lanterns. Special signs to the design of Messrs. Easton and Robinson, the architects for the exterior of the building, have been manufactured and installed by Strand and Interchangeable Signs, Ltd., a subsidiary company of the Strand Electric and Engineering Co., Ltd., who have been responsible for the complete installation.

We have received from the WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., South Philadelphia Works, Philadelphia, Pa., leaflet 3 907 D, dealing with 5 to 750 B.H.P. turbines; 20 392 describing cog belt drives for industrial services; D.M.F. 5 154, multiple retort underfeed stokers; 20 342 B, 1½ and 3 kW turbo-generator units, 20 312 A, synchronous motors for centrifugal pump drive; 20 391, type C.S. squirrel cage motors; 20 405, unbreakable terminal blocks; 1 034 D, type S.K. motors; 1 611 B, magnetic starters; 20 403, reversing line startors; 20 386, line start squirrel cage motors; 1 653, speed regulating and starting rheostats; 20 132 B (superseding 20 132 A and 20 133 A), distribution transformers; D.M.F. 5 179, assembled switchboards of steel; 21, winding material for traction armatures; 22, gear cases for mining and industrial locomotives; 23, armature shifts for mining and industrial locomotives; 24, sleeve type armature and axle bearings for similar locomotives; D.M.F. 5 134, multiple unit and articulated car applications; 20 402, railway signal transformers; D.M.F. 5 155, trunk line electrification; and 20 190, 55 ton, 300 H.P. oil-electric locomotives for switching service (sheet 31), and 43·5 ton oil-electric motive power units for similar service (sheet 30A).

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

WARRINGTON GUARDIANS, November 2nd.—Two electrically driven hospital lifts, for Whitecross Institution buildings. Particulars, until November 2nd, from Mr. A. Bottomley, Union Offices, Warrington, or Messrs. W. and S. Owen, Palmyra Square Chambers, Warrington; deposit £5 5s.

BO'NESS CORPORATION, November 4th.—Electric lighting work in connection with erection of 24 houses at Philpingstone Road, Bo'ness. Intending offerers should apply to the Director of Housing by November 4th.

DERBYSHIRE COUNTY COUNCIL, November 4th.—Electric light installation in new block at Bretby Hall Orthopædic Hospital, near Burton-on-Trent. Particulars from Messrs. Martin and Martin and W. H. Ward, 106, Colmore Row, Birmingham; deposit, £1 1s.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, November 7th.—Installation work in connection with Council's assisted wiring scheme. Specification, etc., from Mr. R. Willis, 37, High Street, Cheadle, Cheshire.

BRADFORD CORPORATION, November 9th.—Twelve months' supply of stores to the tramways department, including electrical fittings for tramcars, insulating material, insulated bolts, copper controller contacts, etc. Schedules, etc., from Mr. R. H. Wilkinson, general manager, 11, Forster Square, Bradford.

CENTRAL ELECTRICITY BOARD, November 9th.—Supply and erection of overhead 33 000 V transmission lines in South Lincolnshire, in connection with Mid-East England scheme. Specification (No. M.E.E.—S.L.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

MANCHESTER CORPORATION, November 12th.—Supply and erection of 5-ton electrically driven overhead travelling crane. Specifications, etc., from the General Manager, Corporation Tramways, 55, Piccadilly, Manchester.

SWALLOWNEST HOSPITAL, November 13th.—Electric light installation, for South Rotherham and Kiveton Park District Isolation Hospital Committee. Specifications, etc., from the clerk, Mr. A. H. Styring, 6, North Church Street, Sheffield; deposit £1 1s.

WAREHAM CORPORATION, November 16th.—Four centrifugal pumps and electric motors, with automatic control, etc. Specifications from Mr. W. E. Blizard (Messrs. Lemon and Blizard), Castle Lane, Southampton; deposit £2 2s.

MID-GLAMORGAN WATER BOARD, November 18th.—Electric lighting work, supply of transformers, switchboards, meters, etc., in connection with construction of pumping station, etc., at Schwyll, Ewenny, near Bridgend, and installation of electrical depth transmitters on various reservoirs, with cables, etc. Specifications, etc., from the Board's Offices, Bridgend, or from Messrs. Thomas and Morgan and Partners, civil engineers, Pontypridd; deposit £2 2s.

EAST RETFORD CORPORATION, November 19th.—Electrically driven centrifugal borehole pump (60 000 gall. per hour). Specification from Mr. S. O. Pacey, Gas and Water Electricity Offices, East Retford; deposit £2 2s.

WALLINGFORD RURAL DISTRICT COUNCIL, November 19th.—Electric light wiring of 34 houses at Cholsey, Berks. Specification, etc., from the Clerk, 7, St. Martin's Street, Wallingford.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Distribution pillar shells and link units and cable sealing ends. (Reference B.X. 5 682.)

AUCKLAND ELECTRIC POWER BOARD, November 4th.—Low tension porcelain insulators, etc. (Reference B.X. 5 648.)

EGYPTIAN DEPARTMENT OF PUBLIC HEALTH, November 5th.—Supply of 31 electric refrigerators. (Reference A.X. 8 632.)

TORONTO MUNICIPALITY, November 5th.—One 10 000 000 gallon centrifugal pump, and electric motor, with bedplate, switchboard, etc. (Reference A.X. 8 703.)

INDIAN STORES DEPARTMENT, November 12th.—Battery charging motor generators, transformer and oil switch, for Simla wireless station (order No. N. 10 159). (Reference B.X. 5 774.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 12th.—Four-conductor telephone operators' cords. (Reference B.X. 5 685.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 12th.—Supply of 15 kW generating set for installation on the "Maui Pomare" (tender No. 369). (Reference B.X. 5 683.)

Telephone Material for Australia.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Transmitters and associated parts (schedule C. 477). (Reference B.X. 5 653.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Receivers and associated parts (schedule C. 477). (Reference B.X. 5 656.)

CHILEAN STATE SUPPLY DEPARTMENT, November 14th.—Telegraph material. (Reference B.X. 5 746.)

INDIAN STORES DEPARTMENT, November 14th.—Supply and erection of crude oil engine-driven d.c. generating set motor generator set and switchgear, for Military Engineering Services, Razmak (order Nos. N. 9 886 and 10 075). (Reference B.X. 5 744.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 14th.—Supply of 400 000 lb. of hard drawn copper wire, 2 000 lb. of soft drawn copper wire and 2 000 lb. of soft drawn tinned copper wire (tender No. 173). (Reference A.X. 8 510.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 14th.—Telephone cable, terminal strips and paper sleeves (tender No. 1 565). (Reference B.X. 5 813.)

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., November 15th.—(1) Primary battery supplies; and supply of (2) gasfilled and vacuum lamps, (3) overhead contact wire and stranded catenary cable. Specification (10s.) from the secretary, Mr. S. G. S. Young, The White Mansion, 91, Petty France, Westminster, S.W.1.

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 15th.—Supply of 42 000 lb. of galvanised signal wire and 31 500 lb. of galvanised point wire (tender No. P.S. 2 025). (Reference A.X. 8 712.)

INDIAN STORES DEPARTMENT, November 17th.—Supply of electric cables for 12 months (order No. 9 920). (Reference B.X. 5 808.)

GREAT NORTHERN RAILWAY (IRELAND), November 18th.—Six or 12 months supply of stores, including electric fittings, lamps, cable and wire (form 11), and signalling materials (form 26). Tender forms (1s. each), from the Secretary, Amiens Street Station, Dublin.

INDIAN STORES DEPARTMENT, November 18th.—Supply and erection of two 20 kW oil engine driven d.c. generators, etc. (order No. N. 10 253). (Reference B.X. 5 757.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 18th. Resistance spools (P. and T. 151/1832). (Reference B.X. 5 716.)

EGYPTIAN MINISTRY OF THE INTERIOR, November 19th. Supply of 160 H.P. Diesel-electric generating set for Manfalout power station (Assiut Province). (Reference B.X. 5 720.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 19th.—Telephone transformers (P. and T. No. 151/1807). (Reference B.X. 5 718.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 19th.—Automatic wall and table telephones (P. and T. No. 151/1825). (Reference B.X. 5 717.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Supply of telephone generators and motor generators (schedule No. C. 479). (Reference B.X. 5 662.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Motor generators (schedule C. 486). (Reference B.X. 5 694.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92.) (Reference B.X. 5 614.)

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Victorian Electricity Commission, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

Postmaster-General's Department, Melbourne, November 26th.—Vitreous resistances, each consisting of wire element wound in vitreous spool, for telegraph battery feeds (schedule C. 489). (Reference B.X. 5 696.)

Melbourne City Council, November 27th.—Totally-enclosed, metal clad, 6 000 V, three-phase switchgear (specification No. 1 000). (Reference B.X. 5 708.)

Melbourne City Council, November 27th.—Supply of 600 V d.c. switchgear (specification No. 1 001). (Reference B.X. 5 734.)

Victorian Railway Commission, November 27th.—Indication transformers for railway signalling (contract No. 43 412). (Reference B.X. 5 737.)

Victorian Railway Commission, November 27th.—Supply of automatic oil switches (contract No. 34 411). (Reference B.X. 5 735.)

Western Australia Government, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General for Western Australia, Savoy House, Strand, London, W.C.2.

Egyptian Ministry of the Interior, November 30th.—Diesel engine driven electric lighting installation at Abou-Tig. (Reference B.X. 5 791.)

Bloemfontein Municipality, December 2nd.—Supply of two electrically driven low lift pumping units and two electrically driven high lift pumping units, with cables, starters, valves, etc. (contract No. 18, 29/30).

Indian Stores Department, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

Victorian Electricity Commission, December 9th.—Supply of 3 000 kVA transformers and spares (specification No. 29/119.) (Reference B.X. 5 775.)

Postmaster-General's Department, Melbourne, December 10th.—Switchboard keys and parts (schedule No. C. 496). (Reference B.X. 5 776.)

Postmaster-General's Department, Melbourne, December 10th.—Electric lamps, lamp caps and sockets for telephone purposes (schedule C. 497). (Reference B.X. 5 783.)

Victorian Electricity Commission, December 16th.—Oscillographic equipment (specification No. 29/115). (Reference B.X. 5 692.)

Postmaster-General's Department, Melbourne, December 17th.—Secondary batteries (schedule C. 505). (Reference B.X. 5 777.)

Postmaster-General's Department, Melbourne, December 17th.—Telephone fuses, heat coils and protectors (schedule C. 498). (Reference B.X. 5 784.)

Postmaster-General's Department, Melbourne, December 17th.—Loading coil pots (schedule C. 499). (Reference B.X. 5 785.)

Egyptian Ministry of Public Works, December 28th.—Supply and erection at site of Mankabad Barracks of three Diesel engine driven electric generators, and sinking of two wells. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

Egyptian Ministry of Public Works, January 4th.—Supply and erection at site of Meadi Barracks, Cairo, of two Diesel engines to drive existing generators. Specifications (£1 0s. 6d. not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

Postmaster-General's Department, Melbourne, January 7th.—Supply of testing instruments (schedule C. 504). (Reference B.X. 5 786.)

Equipment Required for Australasia.

Postmaster-General's Department, Melbourne, January 7th.—Supply of timing clocks (schedule No. C. 507). (Reference B.X. 5 762.)

Victorian Electricity Commission, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681).

New Zealand Public Works Department, March 11th.—Switchgear and controlling equipment, for Timaru, Waitaki power scheme, section 75. (Reference B.X. 5 798.)

New Zealand Public Works Department, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

New Zealand Public Works Department, March 11th. Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge power scheme, section 217. (Reference B.X. 5 796.)

Victorian Railway Commission, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

Tenders Accepted.

Brighton Corporation.—Siemens Bros. and Co., Ltd., supply of tube heaters, £190.

Carlisle Corporation.—British Thomson-Houston Co., Ltd., e.h.t. switchgear, £7 961 15s.

Ilford Corporation.—Foster Engineering Co., Ltd., supply of spare transformer, £128 10s.

Portsmouth Corporation.—Johnson and Phillips, Ltd., cable in connection with extensions to Sarisbury.

Taunton Corporation.—Electricars, Ltd., one 2-ton, electric, low loading, refuse collection vehicle, £828.

Fulham (London) Borough Council.—H. Estall, wiring consumers' premises under rental wiring schemes. (Recommended.)

East Ham Corporation.—British Brown-Boveri, Ltd., supply of 500 kW mercury arc rectifier, £2 395. (Recommended.)

Poplar (London) Borough Council.—Standard Telephones and Cables, Ltd., supply of cable, £404 17s. 6d. (Recommended.)

Worcestershire Education Committee.—J. Freeman, electric light installation at headmaster's house, Halesowen Grammar School, £42 10s.

Heston and Isleworth Urban District Council.—Electricars, Ltd., four 2-ton, low loading, electric vehicles, £519 each. (Recommended.)

Liverpool Corporation.—British Thomson-Houston Co., Ltd., supply and erection of main auxiliary switchgear section at Clarence Dock power station, £72 651.

General Post Office.—Cable manufacture, supply, drawing in and jointing: Anglo-Belgian 1930 (land and submarine), Siemens Bros. and Co., Ltd.; Bradford-Huddersfield, W. T. Henley's Telegraph Works Co., Ltd. Telephone exchange equipment: Regent Automatic Telephone Manufacturing Co., Ltd.

London County Council.—Metropolitan-Vickers Electrical Co., Ltd., provision of rotary convertor, with supervisory control, £5 568; British Thomson-Houston Co., Ltd., supply of six rotary convertors, £16 853; Metropolitan-Vickers Electrical Co., Ltd., two rotary convertors, £6 949 2s. 6d.

Birkenhead Corporation.—Supply of transformers: four 100 kVA, £333, and two 100 kVA, £161, English Electric Co., Ltd.; and three 200 kVA, £360, Brush Electrical Engineering Co., Ltd. Supply of cable: W. T. Glover and Co., Ltd., £3 575; Hackbridge Cable Co., Ltd., £1 189, and Liverpool Electric Cable Co., Ltd., £568 14s.

Stoke Newington (London) Borough Council.—The tender of Andstro (A.A.) Electric, for installation work in private premises, under the assisted wiring scheme, at 18s. per point, which we reported in our last issue as recommended for acceptance, has been referred back to the Electricity Committee for further consideration.

St. Pancras (London) Borough Council.—Standard Telephones and Cables, Ltd., supply of l.t. cable required for ordinary extension works, services, etc., and main e.h.t. lead from new 15 000 kW turbo-generator to switchboard, £1 723. (Recommended.) Other tenders: British Insulated Cables Ltd., £1 749; Pirelli-General Cable Works, Ltd., £1 751; Siemens Bros. and Co., Ltd., £1 770; Hackbridge Cable Co., Ltd., £1 806. Holden and Brooke, pump for grit-extracting plant, £65. (Recommended.)

Metropolitan Asylums Board.—Fuller Accumulator Co. (1926), Ltd., installation of storage battery on training ship "Exmouth," £293. (Recommended.) Also tendered: Alton Battery Co., Ltd., £293; Accumulators of Woking (1928), Ltd., £295; Edison Swan Electric Co., Ltd., £346; alternative £330; Tungstone Accumulator Co., Ltd., £369; Hart Accumulator Co., Ltd., £398; Tudor Accumulator Co., Ltd., £409; Chloride Electrical Storage Co., Ltd., £409; D.P. Battery Co., Ltd., £415; Pritchett and Gold and E.P.S. Co., Ltd., £415; Premier Accumulator Co. (1921), Ltd., £418; Shimwell, Alexander and Co., £430; Phillips and Sons (Chiswick), Ltd., £612; Batteries, Ltd., £678.

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WORK IN PROSPECT.

ANSDELL.—Church to cost £5 000, for the Unitarian trustees. Particulars from the architect, Mr. S. Thomas, Fairhaven, Lytham.

AUDENSHAW.—Houses (20), Manchester Road, for Hadfield and Revell.

AYR.—Library extensions, to cost £3 050, for the Town Council. Particulars from Burgh Surveyor.

BEXHILL-ON-SEA.—Church. Particulars from contractors, Pool and Sons, Hartley Wintney, Hants.

BRADFORD.—44 houses on White Abbey site. Particulars from R. J. Packett, Queensbury, contractor.

CHAPELTOWN.—Alterations and additions to picture palace in Station Road. Particulars from Mr. E. Bryan Dean, architect, Mansfield.

COSHAM.—Children's homes at Peaked Field, to cost £30 503. Particulars from Bevis, Ltd., Portsmouth.

HOLBEACH.—Additional 20 houses for Urban District Council. Particulars from Surveyor.

HOUNSLOW.—Houses (126), for Urban District Council. Particulars from contractors, Blackwell and Meyer, Bexley Heath.

LINCOLN.—Additional 34 houses, for Town Council. Particulars from City Surveyor.

MORETON.—School, to cost £6 123. Particulars from contractors, Humphreys, Ltd.

PURFLEET.—Housing scheme (80), for Urban District Council. Particulars from Surveyor.

READING.—Erection of a school in Wardle Avenue. Particulars from Messrs. Ruffle Bros.

READING.—30 houses in Morecambe Road. Particulars from Messrs. Sheppard, Ryder and Taylor.

READING.—2 000 houses, 20 shops, etc., at Whitley Park Estate, for T.C. Particulars from Housing Architect.

SANDERSTEAD.—Telephone exchange, for H.M. Office of Works, King Charles Street, London, S.W.

SEVENOAKS.—Housing scheme (26), for Rural District Council. Particulars from surveyor, Mr. J. N. Prior.

SHANKLIN.—Housing scheme, for Urban District Council. Particulars from architect, Mr. E. C. Cooper.

STAINFORTH.—Alterations and additions to the New Inn, for W. M. Darley, Ltd. Particulars from Messrs. Garside and Pennington, architects, Pontefract.

STOCKPORT.—Telephone exchange, Great Moor, for H.M. Office of Works, King Charles Street, London, S.W.

SWINTON AND PENDLEBURY.—Houses (102), for Urban District Council. Particulars from Surveyor.

THORNE.—New Cinema at Moorends. Particulars from Mr. T. H. Johnson, architect, Doncaster.

TISBURY.—Housing schemes, Fonthill, Gifford, and Tisbury, for Rural District Council. Particulars from the Surveyor.

TWICKENHAM.—Fire station extensions, for Town Council. Particulars from borough engineer, Mr. G. R. King

WAKEFIELD.—Additions to works of Messrs. A. Talbot and Son, manufacturing chemists. Particulars from architect, Mr. F. Simpson, Wakefield.

WEST PELTON.—Sunday schools for Wesleyan Trustees. Particulars from architects, Cowe and Lawson, Chester-le-Street.

WESTON-SUPER-MARE.—Secondary school, for Somerset Education Committee. Particulars from Director of Education, Weston.

WHITEHAVEN.—Additional housing scheme (82), for Town Council. Particulars from the Borough Surveyor.

WHITTLESEY.—Housing scheme (24), for Urban District Council. Particulars from surveyor, Mr. H. W. Hawkins, Old Fletton.

WINCHESTER.—Parish hall. Particulars, Messrs. Carter and Joyce.

WINCHESTER.—New offices for Hants C.C. County Architect, with Sir Herbert Baker collaborating.

WOOLWICH.—Municipal offices and extensions to Public Hall. Particulars from Borough Surveyor.

WOOLWICH.—Offices for Equitable Building Society, 35, George Street. Particulars from Secretary.

WORTHING.—Manual instruction and science rooms, Sussex Road schools. Particulars from Clerk.

WORTHING.—Reconstruction of baths. Particulars from Borough Surveyor.

YEOVIL.—Additional housing schemes (76), for Rural District Council. Particulars from surveyor.

YORK.—Flats, for City Council. Particulars from contractors, Messrs. Flowitt and Gilbert, Doncaster.

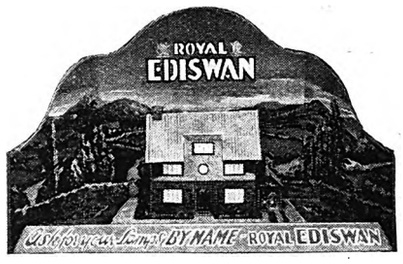
TRADE PUBLICATIONS.

THE "TYPERLITE" Co., 86, Cannon Street, London, E.C.4, has sent us a new supplementary price list of "Typerlite" fittings.

The current price list of the HENDERSON WIRELESS AND ELECTRICAL SERVICE, 54, Queen's Road, Brighton, has been received.

The 1929/30 pocket price list of the WANDSWORTH ELECTRICAL MANUFACTURING Co., LTD., Kenyon Street, Birmingham, is now available.

An illustrated envelope enclosure folder, No. 4150/7, giving details of the company's iron de luxe, has been issued by METRO-VICK SUPPLIES, Trafford Park, Manchester.



A CUT-OUT display model by the Edison Swan Electric Co., Ltd, which is now available for distribution. The design is approximately 38 in. wide and 24 in. high and is printed in colours. The house is lit throughout, and the light is reflected through the headlights of a motor car emerging from the garage. The words "Royal Ediswan" are illuminated and continually change colour. No "flashers" are employed. The display is extremely simple to erect and instructions are printed on the back.

The EDISON SWAN ELECTRIC Co., LTD., of 123, Queen Victoria Street, London, E.C.4, has published three new folders relative to "Tungar" 6 and 12 A battery chargers.

SUPERLAMP, LTD., 92/94, Paul Street, London, E.C.2, has published Edition XXXII of the illustrated list of electrical material, motors, telephones, and domestic appliances.

A number of well produced leaflets dealing with staff signalling systems have been received from the SLIPTON AUTOMATIC TELEPHONE SYSTEM (E. Slipton and Co., Ltd.) of Caxton House, Tothill Street, London, S.W.1.

The METROPOLITAN-VICKERS ELECTRICAL Co., LTD., Trafford Park, Manchester, has published two new descriptive leaflets, 40/1-1 and 40/2-1, dealing with large induction motors and high speed induction motors, respectively.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, point out that publication No. 214L, giving particulars of daylight-blue head lamps and "Duplo" anti-dazzle lamps, is now available to the trade upon request.

Publication No. H.118, dealing with multiple telephone cables, P.250, replacing P.206, and dealing with meters, and P.F. 59, relative to aerial cable unions, have been issued by BRITISH INSULATED CABLES LTD., Prescot, Lancs.

ERSKINE, HEAP AND Co., LTD., Lancashire Switchgear Works, Caroline Street, Broughton, Manchester, have issued two pamphlets, O.S. 24 and I. 23 relative to heavy duty oil circuit breakers, and long scale moving iron instruments.

Amongst the latest publications of J. G. STATTER AND Co., Queen Anne's Chambers, Westminster, London, S.W.1, is leaflet No. 203X, dealing with air circuit breakers; another leaflet entitled "Maintenance Instructions for Air Circuit Breakers" has also been published.

The MORSE CHAIN Co., LTD., Letchworth, Herts, has sent us a copy of the new handbook ML 929, dealing with standardised and individually suitable "Morse" chain drives in a range from 1 H.P. up to 60 H.P., as well as further useful information relating to installation, maintenance, chain cases, lubrication, etc.

Amongst the latest publications of J. M. DOUGHTY AND SONS, LTD., of 214, St. John Street, Clerkenwell, London, E.C.1, are two new catalogues dealing with lighting fittings. A somewhat personal touch is added to one of these catalogues by including pictures of the various workshops and a group of the works' staff.

The IGRANIC ELECTRIC Co., LTD., 149, Queen Victoria Street, London, E.C., has published list No. 6 610 dealing with "Springmore" wander-plugs, No. 6 616 concerning the company's l.t. supply unit, No. 6 618 describing the "Igranic" battery charger, No. 6 642 illustrating the type L.T. 92 input transformer for metal rectifiers, and No. 6 482 dealing with short wave h.f. chokes covering 10-80 metres.

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ELECTRICITY SUPPLY.

Birkenhead Contracts for Cables—Underground Mains in Maidstone Rural District—Colchester Loans for Wiring and Apparatus—New Plant at St. Pancras—Acquisition of Irish Undertakings—Electricity Supplied to Large Area from Shannon System.

SWANSEA Electricity Committee has decided to obtain an option of a site at Tir John for a generating station.

Burton-on-Trent Electricity Committee seeks sanction to borrow £85 000 for mains, services and transformers.

Spalding U.D.C. is introducing a scheme of assisted wiring for private houses where no extension of cable is necessary.

Driffield U.D.C. has decided to withdraw opposition to the scheme of the Holderness Trust, Ltd., to supply current to the district.

Lincoln Corporation has decided that electrical installations shall be put in 14 houses which are being erected on the St. Giles Estate.

Malling R.D.C. has given consent to the application of Maidstone T.C. for a Fringe Order to supply current to Leybourne Grange.

Birkenhead Electricity Committee has authorised the Electrical Engineer to invite tenders with a view to placing twelve months' contracts for mains and service cable.

Barnstaple R.D.C. has now given its consent to the application of the Bideford Electricity Supply Co. for a Special Order to supply current to certain parishes in the Council's area.

Maidstone Corporation has decided to accede to the R.D.C.'s request to transmit current to the villages of Teston and Wateringbury, by underground cables, instead of by overhead lines.

Colchester Corporation has received sanction to a loan of £7 500 for domestic electrical apparatus for hire, and a like sum for consumers' wiring installations with prepayment meters.

Gillingham T.C. has come to an arrangement with local contractors for electric wiring and fitting, the work to be carried out in rotation, and the borough electrical engineer to take his turn in the work.

St. Pancras (London) Finance Committee recommends the B.C. to seek sanction to borrow £17 340 for electric mains and services and also to apply for an advance by London County Council of £30 000, on account of £42 760, for a 15 000 kW turbo-alternator.

Plans have been drafted for the erection of a power station at Svinov, near Ostrava, in Moravia, which will be capable of supplying energy to the whole of North and Central Moravia as well as Northern Slovakia. The initial capacity of the station will be 42 000 kW and the ultimate capacity 140 000 kW.

The revenue of Wellington (N.Z.) electricity department during the year ended March 31st, 1929, was £326 344, against £340 018 in the preceding year, and, after providing for working expenses, capital and special charges, and placing £20 000 (against nil) to district fund, the net credit balance was £33 868, against £51 607.

The rapidity of hydro-electric development of Canada is shown in recently published statistics. Present developments under way will, when completed, amount to over 2 000 000 H.P., bringing the total Dominion development up to 7 349 232 H.P., representing a 650% increase in 20 years. The total capital investment is estimated at $1 172 600 000.

Stoke-on-Trent Electricity Committee has approved a proposal to lay a main, at a cost of £250, to give a supply to Messrs. Johnson Bros. (Hanley), Ltd., for an electric kiln with a maximum demand of 60 kW. New distribution mains are to be laid in Queen Street and Swan Square, to supersede old mains laid in wooden troughing. The cost will be £1 700.

The Irish Free State Electricity Supply Board and the Provincial Electricity Suppliers' Association have agreed to the formation of an arbitration board to deal with any cases in which the Electricity Board wishes to acquire a permitted undertaking and the permitted undertaker may be unable to agree with the Board as to the price to be paid by the latter for the acquisition of the undertaking.

The Auckland (N.Z.) Electric Power Board's accounts for the year ended March 31st, 1929, show revenue £605 788, against £574 179 in the previous year, and gross profit £300 553, against £303 729. After provision for interest, redemption and sinking funds, depreciation, superannuation, writing off expenditure on preliminary expenses, capitalised interest, etc., balance carried down was £49 458, against £60 999.

Wimbledon Electricity Committee appeared before the Assessment Committee and successfully sustained the Council's objection to the increased assessment of the electricity undertaking in Maldens and Coombe from £3 500 to £4 000.—Sanction is to be sought to borrow £30 000 for mains and services.

Stalybridge, Hyde, Mossley and Dukinfield Electricity Board is applying for power to borrow £54 091, including excess expenditure on building work, railway sidings and crane (Hartshead), £16 418; excess expenditure on plant and plant foundations (Hartshead), £2 673; prospective expenditure on mains, £25 000; and on transformers and switchgear on consumers' premises, £10 000.

A main is to be laid by Stoke-on-Trent electricity department to the proposed sub-station at Greengate Pottery, Tunstall, at a cost of £6 000.—It has also been decided to spend £1 000 upon a main to Stuart Avenue and Longton Road, Ash Green, Trentham.—Another extension of mains, from Etruria sub-station along Garner Street to a new sub-station, at a cost of £3 200, has also been approved.

On October 21st electricity generated under the Shannon scheme was supplied for the first time to virtually all centres of population in the Irish Free State south of a line drawn from Galway to Dublin. It is expected that the area north of Dublin will be linked with the Shannon system within the next five or six weeks. Dublin, which will be the largest consumer of Shannon current, will be the last centre to be supplied. The charges at which Dublin consumers will be supplied have not yet been announced.

Hastings Electricity Committee has obtained sanction to borrow £15 000 for mains and £10 000 for wiring installations.—The Committee recommends the carrying out of certain work, including an overhead line from Northiam via Ewhurst and Staplecross to Cripps Corner, £3 445; overhead lines in these districts and services, £2 990; and two 30 kVA and one 50 kVA transformer, three transformer switches and outdoor sub-station, £755.—The Committee has arranged terms for a supply of electricity for decorative lighting at the pier.

Glasgow Electricity Committee has received from the Glasgow and West of Scotland Retail Drapers' Association a copy of a resolution protesting against the new scale of charges for electricity adopted by the Corporation for commercial lighting, and asking that the rates applicable to shops be reconsidered with a view to a reduction being made. The Committee agreed that the representations be taken into consideration.—The Housing Committee has agreed to receive a deputation from the Hawthorn and Hillend Tenants' Association requesting that the houses at Hillend be supplied with electricity in lieu of the gas supply installed when the houses were built by the County Authorities.

Omagh U.D.C. recently received an offer by Mr. George Harvey in connection with the proposed electricity supply scheme for the town. Mr. Harvey stated that sufficient power for the scheme could be obtained from a waterfall, his property, about three miles from the town. He would let the water power and a mill at the place to the Council at a yearly rent of £300 for the first five years, and assuming that the supply of electricity increased, then an additional £50 per annum until a maximum of £500 was reached. A report was received from Mr. P. A. Spalding, stating that a water-power scheme would be more costly and not as satisfactory as the Council's original scheme to instal engines and generators. The matter was referred to the Electric Lighting Committee for consideration.

Hull Corporation has received sanction from the Electricity Commissioners to the borrowing of £100 000 for mains and services and £50 000 for sub-stations and equipment. The Commissioners have approved in principle the proposal for increasing the cooling tower capacity.—The Electricity Department is to instal, for experimental purposes, cookers and washboilers in 12 houses in each of the Corporation's two estates, Derringham Farm and Hall Road.—Sanction has been given to the supply of areas in the urban district of Corringham, the boroughs of Heverley and Hedon, and the rural districts of Beverley, Skirlaugh, Sculcoates and Partington. The Engineer reports that the total area covered by this section is 120 square miles, and that preliminaries are already in hand for the construction of the necessary trunk lines.

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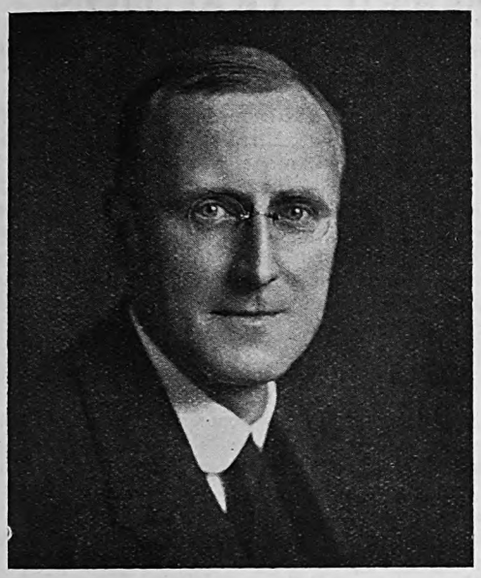
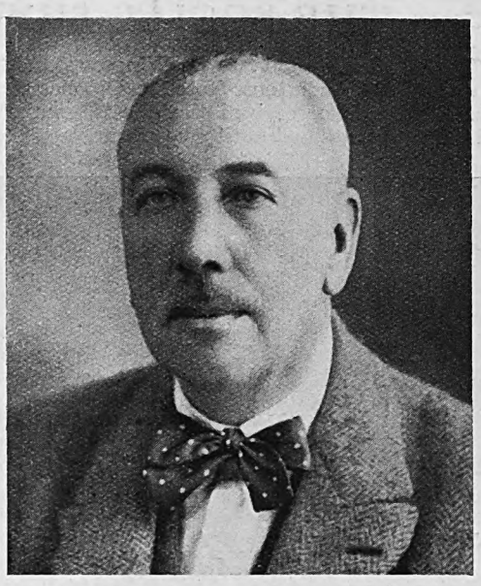
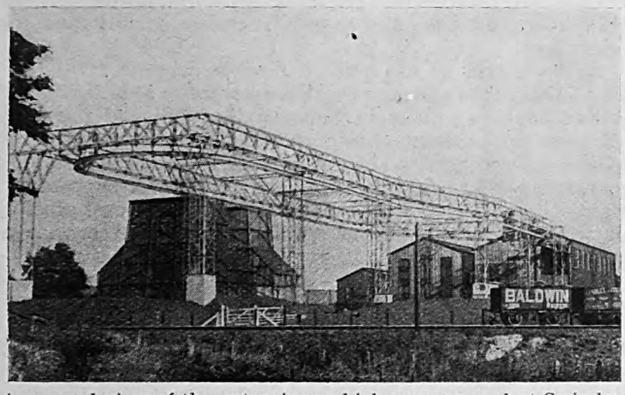
ELECTRICAL NEWS IN PICTURES.



Right. Mr. T. Herbert, the new chairman of the North Western Centre of the Institution of Electrical Engineers, and assistant superintending engineer of the South Lancs. district, P.O. Engineering Department.

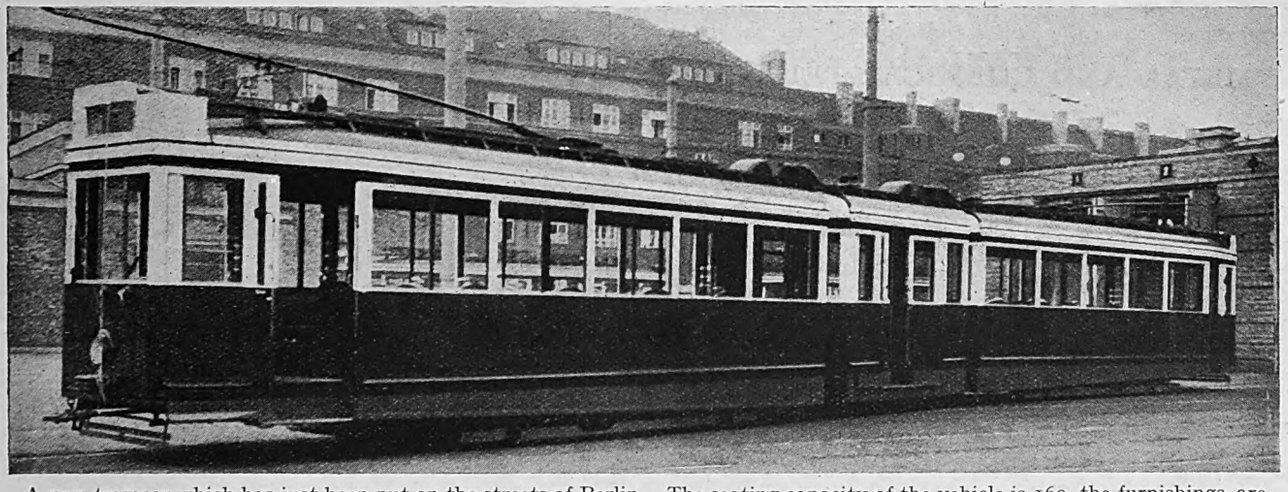
Left. Mr. E. H. E. Woodward, of the Newcastle-upon-Tyne Electric Supply Co., Ltd., who, as announced last week, has been appointed technical assistant to the general manager.





A general view of the extensions which were opened at Swindon on October 26th. The initial plant comprises two 3 750 kW Ljungström turbo-alternators and two of 1 875 kW, but preparations for additional plant are already being made.

Good progress has been made with the construction of the R 100 at Howden, and like the R 101, this vessel is fitted with an all-electric kitchen. One of the cookers is here seen being used in preparing meals for the stand-by crew.



A new tramcar which has just been put on the streets of Berlin. The seating capacity of the vehicle is 169, the furnishings are said to be luxurious, while the lighting arrangements are claimed to be better than those of any other tramcar in the country. Another tramcar which claims to be of unique design is that of the Liverpool Corporation, an illustration and description of which appear on page 548.

Bolton Electricity Committee has obtained sanction to borrow £75 000 for mains and £25 000 for sub-stations and equipment.

Fulham (London) Electricity Committee has acquired a site in Avonmore Road for a sub-station, which will be equipped with two 200 kW transformers, the total cost being £1 390.

Kensington (London) Works Committee has decided that a higher standard of illumination of the streets of the borough generally is desirable, and has authorised the Borough Engineer to submit proposals for improvements.

East Ham Electricity Committee has obtained sanction to loans of £7 290 for distributor mains and £1 748 for feeder mains.

Eastbourne Electricity Committee seeks sanction to borrow £16 000 for a 2 500 kW turbo-alternator, £16 000 for a new boiler and £6 000 for a switch house.

Leigh (Lancs.) Electricity Committee has adopted a scheme for laying conduit lines and cables and providing a sub-station and transformer equipment for electricity supplies in West Leigh and in Pennington. The estimated cost is £6 929.

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THE SOCIAL SIDE.

THE London staff dance of Wingrove and Rogers, Ltd., was held at Anderton's Hotel, on October 18th. Major and Mrs. G. D. Ozanne received the guests, numbering about 90, and dancing continued until a late hour.

A scene from the farce "The Whole Town's Talking" as performed by the M-V. Dramatic and Operatic Society.

Herbert Terry and Sons, Ltd., of Redditch, on October 22nd commemorated the 21st anniversary of the establishment of their London office by a dinner at the Holborn Restaurant. Mr. Albert Ball gave an account of the beginnings of the firm which has become recognised as the "Spring Specialists,"

The Royal Naval Divisional Engineers are holding their annual dinner at the London Tavern, Fenchurch Street, E.C., on November 15th, at 6.30 p.m. for 7 p.m., morning dress. Tickets, price 5s. 6d., from Mr. F. W. Davey, 14, Victoria Street, S.W.1; Mr. Eric Wettern, St. Stephens House, Westminster, S.W.1; or at the restaurant.

An amusing debate took place at Magnet House on October 17th under the auspices of the G.E.C. Debating Society, the subject being "Should Bachelors be Taxed?" The mover of the motion put forward the plea that most married men experienced untold hardships in paying income tax, school fees for children and other outgoings. He taunted the bachelors with shirking their national responsibilities and with evading their proper share of the national burden. The bachelors furiously repudiated the slur on their character and termed it an iniquitous and abominable interference with their liberties. One speaker said he rejoiced in the fact that his tobacco bill was twice that of any married man. He poured such scorn on the motion that it was irretrievably lost.

METAL AND CHEMICAL PRICES.

TUESDAY, October 29th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£76 10 0	—	—
Electro Wirebars	„	£84 10 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	„	11⅜d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2⅛d.	—	—
Brass 60/40—				
Rod, basis	per lb.	9d.	—	—
Sheet „	„	10⅛d.	—	—
Wire „	„	11⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig—				
English	per ton	£25 0 0	10s. 0d.	—
Foreign or Colonial	„	£23 7 6	5s. 0d.	—
Tin—				
Ingot	per ton	£183 15 0	£2 12 6	—
Wire, basis	per lb.	2s. 5⅛d.	⅛d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£22 2 6	—	—
Mercury	per bottle	£22 12 6	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £20 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2⅛d.
Sodium Bichromate—Per lb. 3⅛d.
Rubber—Para fine, 9⅛d.; plantation, 1st latex, 9d.

*** The metal prices are supplied by British Insulated Cables Ltd.,

THE LEAD MARKET.

The market opened last week with a weak tone in sympathy with other metals, and, according to James Forster and Co., prices fell 5s. per ton, later in the week dropping a further 5s. per ton lower, forward lead selling at £22 16s. 3d. The American market has an easier tone; price unchanged 6·90 cts.

Closing prices on Oct. 25th were £23 12s. 6d. for Oct. £23 8s. 9d. for Nov., Dec. and Jan. 5s. to 1s. 3d.up on the week.

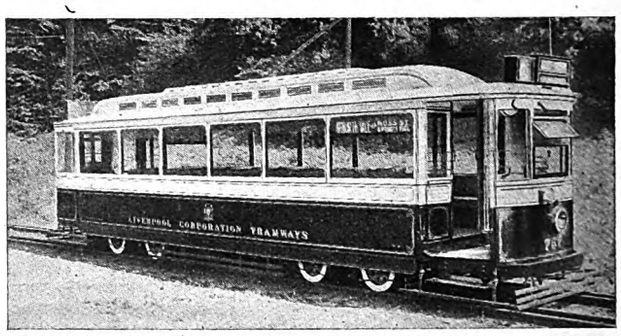
ELECTRIC TRACTION.

Special New Car for Liverpool Corporation Tramways.

A NEW type of tramcar has been designed and developed by Mr. P. Priestly, general manager of the Liverpool Corporation Tramways Department, in conjunction with the English Electric Co., Ltd., of Preston, and has been manufactured wholly by the latter company. A driving equipment consisting of two D.K. 120 motors, each of 60 H.P. at 500 V, is employed, thus giving an exceptionally high power. All four axles are driving axles, so that the whole of the car weight is available for adhesion and the maximum possible acceleration can be obtained. The actual arrangement of motor and truck is that they have been developed as one unit, so that in its completed state the motor forms an integral part of the truck. The motor, which is mounted longitudinally, has a pinion at each end, driving on to a spiral bevel gear wheel which is mounted on a quill surrounding each axle. The quill is mounted on large roller bearings secured in a cast steel casing to the main frame of the motor, so that the gears are always correctly in mesh. Similarly, in order to retain this correct meshing, the armature of the motor is also mounted on roller bearings, and, therefore, as no wear takes place in the bearings, the correct pitch line will be maintained between the pinion and gear, and generally ensure smooth and silent operation.

At each end of the quill, a flexible drive is arranged for transmitting the power to the driving wheels. This flexible drive allows relative movement between the quill and the axle in all directions without setting up additional strains in any part of the driving gear. The truck, which really consists of the motor, together with the two end casings, is supported on eight coil springs, and the whole is mounted on cast steel caps in which are enclosed the special anti-friction bronze axle bearings.

The arrangement for lubrication is also very simple, as each casing at the end of the motor forms an oil bath, from which all the axle and motor bearings, flexible drive and gears, are lubricated. The control equipment is arranged for operation with coupled cars. The controllers are of the English Electric drum type, and have been arranged so that it is possible to drive the two-car unit from either end of the unit, or, alternatively, to drive each car separately from either end. The only extra switchgear necessary is the change-over switch on



The new tramcar of the Liverpool Corporation Tramways Department, details of which are given above.

each car, together with a three-way coupler. The line contactors have been incorporated so that when shutting off from power the whole of the current braking is taken on these contactors. The feature of electric braking has been retained, though in order to keep the control as simple as possible, it has been arranged that the electric brake, which is used in Liverpool essentially as an emergency brake, is operative on the driving car only. For the same reason of simplification, the reverse position on each controller only operates the motors on the driving car. The other items in the electrical equipment are standard units as used in the more normal tramcar equipment, and consist of D from A circuit breakers, F.R. type resistances, all manufactured by the English Electric Co., and the trolley made to the special design of the Liverpool Tramways Department. The body which has been fitted to this car is of the super luxury type, having a seating capacity of 44. Special attention has been paid to the lighting, and inside the saloon 13 lights have been fitted, four down each side, and five down the centre under the Monitor roof. The fittings consist of large base holders with "Super-lux" white glass shades and "Silvalux" opal gasfilled lamps.

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COMPANY NEWS.

Effect of American Collapse on British Electrical Price—Chloride Electrical Storage Co.'s Increased Distribution—Amalgamated Wireless Improved Dividend.

THE speculative collapse in New York has naturally not been without its effect on this side, and prices of most of the leading electrical shares are lower than a week ago, and by the time these lines are read will probably have further receded. At the time of writing, General Electrics at 45s are 2s. 6d. down; Callenders at 75s. show a decline of 5s. and British Insulateds at 80s. of 2s. 6d. Henley's at 127s. 6d., are 1s. 3d. down and Brush stock at 126½ is 4 points down. Cables and Wireless A and B stocks at 80 and 45⅛ respectively, show a decline of about four points, and Marconi Marine shares have dropped 5s., to 42s. 6d.

Last Annl. Divd.	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
%	**Electricity Supply.**				
(*d*)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P...	22/6	22/6	24/3	21/6
10	County Lon. Elec. Sup. Ord. ..	51/6	52/6	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
(*e*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/6	27/6	37/6	23/-
1/9½	Metro. Elec. Sup. Ord.	47/6	46/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
7½	N'castle & Dis. Elec. Ltg. Ord. ..	28/9	28/9	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	26/3	26/3	30/3	19/3
6	N. Metro. Elec. 6% C.P. ..	21/6*	21/6	23/9	20/10
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
6	Shrops. Worcs. & Staffs. Power Pref.	21/6	21/6	—	—
1/9⅓	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/-	17/-	17/10½	16/7½
8	Yorks. Elec. Power Ord. ..	35/-	35/6	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	122½	152	117
7·67	" " " " 6% Pf. Stk.	124½	124½	133	103½
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4	" " " 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	76½*	77½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77	76	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	72	72	73½	62
5	" " " 5% Deb. ..	68½	68½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	61½	61	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dis. Rly. Ord. Stk. ..	73	73	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
7	Underground Electric Rlys. Ord.	22/-	22/-	28/2	11/-
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb...	57	57	78	60
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P...	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	80/-	82/6	86/3	56/-
6	" " " 6% C.P.	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref...	23/3	23/3	24/9	19/7
7	" " " 7% Deb. ..	102½*	104½	109½	102½
10	Brush Electrical Ord. Stk. ..	126½	130½	153½	120
15	Callender's Cable Ord.	75/-*	80/-	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
8	Crompton-Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/-	18/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/-
—	English Elec. Ord.	7/6	7/6	15/9	5/-
—	" " 6% C.P.	8/9	8/9	18/9	7/-
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord...	19/9	19/-	92/3	18/1
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	45/-	47/6	46/6	26/6
25	W. T. Henley's Ord.	127/6	128/9	120/-	69/3
10	Johnson & Phillips Ord... ..	40/-	40/-	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref.	23/9	23/9	25/-	22/3
7½	Siemens Bros. & Co. Ord. ..	27/6	27/6	36/6	24/9
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	63½	56½
—	Cables and Wireless—				
	7½% "A" Ord. Stk. ..	82	84	—	—
	"B" Ord. Stk.	50½	52½	—	—
	5½% Cum. Pref. Stk. ..	98	96	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Great Northern Telegraph (£10)	29½	30	43½	26
10	Indo-European (£25)	47½*	47½	48½	30
15	Marconi's Int. Mar.	42/6	47/6	90/-	16/6
4	Western Tel. 4% Deb. Stk. ..	75	74½	82	76

(*a*) 19·2d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. * Ex dividend.

SIMMS MOTOR UNITS, LTD.—Intm. div. on ord. shs. of 5% (actual), less tax (same as last year), is payable to-day (Nov. 1).

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Usual fin. div. on ord. shs. of 6% actual, again makg. 12%, tax free, will be payable on Dec. 2.

UNITED RIVER PLATE TELEPHONE CO., LTD.—Intm. ord. div. of 3%, tax free (same as last year) on acct. of year endg. Dec. 31 next, is recommended.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—Intm. div. of 10% actual, tax free (compared with 5% last year) has been declared for the "A" and "B" shs.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Transfer books relatg. to ord. shs. are closed from Nov. 1 to 14, inclusive. Intm. div. 3%, less tax, will be paid on Nov. 15.

FOUNDATION CO.—Net pft. for year ended June 30, 1929, after makg. reserves for depreciatn., £22 655, agst. £21 282. It is proposed to carry to contracts res. £5 000. Div. on pref. shs. at rate of 8% p.a., less tax; fwd. £26 168, agst. £18 112.

WESTERN UNION TELEGRAPH CO.—Gross revs. for nine months to Sept. 30, 1929, $111 120 485, agst. $102 582 646. Deductg. total exes. left blce. $14 226 724 ($13 937 224), and deductg. int. on bonded debt, $2 707 349, agst. $2 705 858, left net income $11 519 175, agst. $11 231 366.

AMALGAMATED WIRELESS (AUSTRALASIA), LTD.—Company has published blce. sheets for past two years. Pft. for past year was £80 000, increase £31 000, and div. 8%, increase 2%. The cost of the beam service is £304 000. Subscribed cap. is £744 000, of which Commonwealth subscribed £300 000.

EVER-READY CO. (GREAT BRITAIN), LTD.—Directors have declared intm. divs. for half year ended Sept. 30, 1929, at rate of 10% p.a. on pref. shs., and 10% actual on ord. shs. (same on increased cap.), both payable on Nov. 30, 1929.

OFFICIAL QUOTATIONS.—The Stock Exchange Council has granted official quotations to $3 155 000 cap. stk. of the American Telephone and Telegraph Co.; £103 082 income deb. stk. (6% participatg.) of Aron Electricity Meter, Ltd., and 12 482 £1, fully paid, ord. shs. of Underground Electric Railways Co. of London, Ltd.

AMERICAN WIRELESS MERGER.—It was announced on Oct. 26 that a merger had been effected between the Radio Corporation of America, the General Electric, Westinghouse Electric, and the Victor Talking Machine Co., for the production and sale of wireless equipmt. The combine will come into operation on Jan. 1 next.

Company Meeting.

DRAKE AND GORHAM, LTD.—Mr. B. M. Drake, presiding at the meeting on Tuesday, said it was satisfactory that they had been able to maintain the same rate of dividend as for the previous three years and to continue placing a substantial sum to general reserve, thereby increasing the book value of the proprietors' shareholdings. The spread of supply main's was opening up new fields for their activities. The chairman then mentioned a number of important contracts which had been entrusted to the company, including those at the Bank of England, Lloyd's Bank head offices, Harrods, Ltd., Concrete Aggregates, Ltd., Lord Lonsdale's estate and stud farm, Brookman's Park broadcasting station and the Ninth Church of Christ Scientist. The electric sign department, he said, continued to expand, and the value of an agency which they held for the north-western district appeared to be increasing.

New Companies.

BULL (W. J.), LTD.—Cap., £1 000. General merchants, electricians, etc. Reg. Office: 57, Farringdon Road, London, E.C.1.

CONVECTED HEAT CO., LTD.—Cap., £500. Electric light engineers, etc. Solicitor: R. Harradine, Moorgate Station Chambers, London, E.C.2.

ROBINSON AND REILY, LTD.—Cap., £4 000. Electrical engineers, manufacturers of machinery, etc. Reg. Office: The Garage, Trundle Street, Hull.

BRITISH CONTROLLED FINANCE CORPORATION, LTD.—Cap., £2 750. Capitalists, financiers and concessionaires, electrical engineers and contractors, etc. Reg. Office: 90, Fenchurch Street, London, E.C.3.

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DIRECT FURNISHERS, LTD.—Cap., £50. Electricians, etc. Reg. Office: 75, Portland Street, Leeds.

HUDSON RADIO, LTD.—Cap., £100. Engineers, advisers, experts and consultants in connection with wireless, etc. Secretary: M. Marks, 65/6, Basinghall Street, London, E.C.

BRIDGES-BOWER, LTD.—Cap., £500. Wireless, radio and electrical engineers, manufacturers of and dealers in electrical apparatus, etc. Reg. Office: 77, New Oxford Street, London, W.C.1.

BRITISH ALARMEX CORPORATION, LTD.—Cap., £3 000. Manufacturers of or agents for fire alarms, fire extinguishing appliances and equipment, etc. Reg. Office: Oswaldestre House, Norfolk Street, London, W.C.2.

WILLIAM EDWARDS (BIRMINGHAM), LTD.—Cap., £2 000. To acquire business of electrical turnery and general woodworker now carried on by J. M. Boydell as "William Edwards," at 248, Bell Barn Road, Birmingham.

RADIO REPAIRS, LTD.—Cap., £700 in £1 shares. Objects: To carry on the business of consulting wireless experts, designers and manufacturers of, agents for, and dealers in radio, wireless, electrical and telephone appliances, etc. Reg. Office: 5, Carshalton Grove, Sutton, Surrey.

ROE AND WILDERS, LTD.—Cap., £3 000. To acquire business of manufacturer of railway carriage, tramcar, and other metal fittings, including metal fittings for telephones, chandeliers, etc., now carried on by F. Clews as "Roe and Wilders" at 89, Leopold Street, Birmingham.

L. COLE AND SONS, LTD.—Cap., £500. Engineers, advisers, experts, consultants, contractors, etc., in connection with wireless telephony or telegraphy, etc. Subscribers: R. H. Currell, 79, Scott's Road, Leyton, London, E.10; C. H. Blazier, 11, Downhurst Avenue, Mill Hill, N.W.

HOME-TALKIE SETS, LTD.—Cap., £100. Manufacturers of, agents for and dealers in instruments for producing or reproducing sound, apparatus and installations for synchronisation of sound with motion picture photoplays, etc. Reg. Office: Kent House, 87, Regent Street, London, W.1.

MUNICIPAL FINANCE.

Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1928–9 of the 146 undertakings included in the following table and in the tables which appeared in our issues of August 9th and September 13th, was £24 156 796. The gross profit on the year's working of the undertakings was £11 650 468, and the aggregate sales of electricity amounted to 4 126 515 884 kWh, while 61 undertakings out of the total number have contributed out of the year's profits or from reserve an aggregate of £426 398 to the relief of rates. In many cases the costs include items of a capital nature, and net profits have been reduced as the result of reduction of charges for current. As it is desired to make these tables as complete as possible, the Editor will be pleased to receive similar particulars of other municipal electricity undertakings.

Authority.	Total Revenue. £	Gross Profit. £	Net Profit (+) or deficit (−) £	(a) Working Costs per kWh sold.	Total Cost per kWh (inc. capital charges).	Electricity sold (kWh).	Increase (+) or Decrease (−) in kWh sold.	Maximum Simultaneous Load in kW.	(h) Load Factor.	Radiators and Cookers Connected (total) in kW except where otherwise stated.	Other Domestic Appliances connected (total) kW.	Contributed in Aid of Rates.
Aberdeen C.C.	248 779	144 738	+ 31 266	0·653d.	1·335d.	35 484 692	+ 2 506 690	15 700	(c) 31·61	(b) 15 074	See footnote (b)	—
Ashford U.D.C.	18 861	8 348	+ 2 131	0·961d.	1·704d.	2 624 734	+ 993 386	1 270	23·59	(No.) 182	(No.) 320	—
Bacup T.C.	22 945	4 683	+ 1 314	1·035d.	1·212d.	4 236 967	− 63 574	2 074	24·30	(b) 811	See footnote (b)	—
Bangor T.C.	16 799	5 348	+ 1 051	2·770d.	3·810d.	992 000	+ 139 400	728	21·80	300	300	642
(d) Bo'ness T.C.	16 534	6 812	+ 1 049	1·473d.	2·346d.	1 583 734	+ 117 959	606	29·83	See footnote (e)	See footnote (e)	—
Bristol C.C.	572 439	292 910	+ 65 874	0·622d.	1·180d.	93 441 031	+ 9 317 053	34 310	31·09	See footnote (e)	See footnote (e)	—
(f) Bury St. Edmunds T.C.	23 211	10 564	+ 7 765	1·840d.	2·440d.	1 521 454	+ 585 770	790	17·60	(f) 80	—	1 000
Caerphilly U.D.C. ..	4 529	1 759	+ 706	3·170d.	5·400d.	170 176	+ 21 890	157	12·32	—	—	—
Cheltenham T.C. ..	69 842	24 536	+ 7 290	1·458d.	2·011d.	6 882 771	+ 812 250	4 247	18·50	—	—	1 370
Darwen T.C.	35 365	15 355	+ 6 687	1·033d.	1·499d.	4 647 691	− 191 747	2 290	23·16	(b) 1 818	See footnote (b)	2 000
Dearne Dist. Electy. Bd.	10 250	4 592	+ 625	0·540d.	2·270d.	552 394	+ 69 648	512	13·60	78	169	—
Eston U.D.C.	18 757	8 123	+ 444	2·432d.	4·420d.	927 532	+ 58 647	504	23·00	300	1 604	—
Formby U.D.C.	6 164	1 831	+ 800	3·012d.	3·600d.	420 682	+ 156 062	274	17·90	—	—	—
(d) Glasgow C.C.	1 515 933	942 775	+ 142 741	0·572d.	1·414d.	233 155 455	+ 12 907 857	106 900	29·99	107 557	31 293	—
(d) Greenock T.C. ..	178 011	86 268	+ 8 795	0·896d.	1·626d.	24 562 155	− 560 421	14 156	(h) 24·18	(b) 9 928	See footnote (b)	—
Guildford T.C.	43 522	21 625	+ 382	1·270d.	3·029d.	3 469 747	+ 1 174 485	2 600	15·15	(b) 2 687	See footnote (b)	—
Halifax T.C.	194 766	102 464	+ 32 584	0·713d.	1·252d.	31 081 590	+ 2 106 015	17 100	20·70	3 797	(i) 800	—
Haslingden T.C.	20 749	6 094	+ 1 152	1·065d.	1·445d.	3 277 903	+ 124 894	1 320	28·30	2 047	1 717	700
Hendley U.D.C.	4 732	2 542	+ 986	1·660d.	2·720d.	314 898	+ 22 913	251	14·28	235	—	182
Hornsey T.C.	86 516	49 895	+ 9 849	1·258d.	3·045d.	6 077 466	+ 955 400	5 070	18·43	See footnote (e)	See footnote (e)	2 000
Hove T.C.	76 340	33 712	+ 7 745	1·940d.	3·109d.	5 269 734	+ 1 064 667	3 300	18·23	(b) 6 050	See footnote (b)	4 300
(d) Kirkcaldy T.C. ..	52 776	25 184	+ 2 477	0·778d.	1·020d.	8 369 095	− 27 091	3 520	33·00	(b) 3 810	See footnote (b)	—
Lancs R.D.C. (Maghull and Lydiate)	2 656	556	+ 263	1·830d.	2·310d.	171 367	—	144	18·57	20	—	—
Long Eaton U.D.C. ..	28 816	10 060	+ 4 732	1·486d.	1·902d.	3 029 005	+ 359 698	1 449	23·80	1 358	466	—
Maidstone T.C.	99 650	46 909	+ 13 719	0·552d.	0·929d.	21 086 246	+ 3 513 063	7 710	32·30	4 600	2 000	4 000
(d) Motherwell and Wishaw T.C.	56 750	14 888	+ 710	1·296d.	1·738d.	7 676 476	+ 40 209	2 723	32·00	1 627	872	—
Mountain Ash U.D.C. ..	22 291	10 505	+ 6 827	2·100d.	2·530d.	1 184 229	+ 19 288	—	—	—	—	242
Newton-in-Makerfield U.D.C.	18 538	5 717	+ 977	1·004d.	—	3 119 800	+ 551 744	1 482	24·03	—	—	—
Normanton U.D.C. ..	5 792	3 244	+ 1 225	0·421d.	1·498d.	302 620	+ 82 388	205	18·67	(b) 189	See footnote (b)	—
(d) Paisley T.C.	101 183	51 166	+ 4 767	1·050d.	1·820d.	12 744 207	+ 1 032 416	5 800	25·08	4 703	1 668	—
Sheffield C.C.	857 076	471 964	+ 104 430	0·442d.	0·863d.	208 614 227	+ 1 614 227	80 529	29·60	—	—	—
South Shields T.C. ..	106 704	59 085	+ 10 230	0·530d.	1·070d.	11 053 150	+ 455 372	5 902	21·37	(k) 224	(l) 218	—
Southend T.C.	205 076	90 939	+ 59 605	1·653d.	2·684d.	17 426 436	+ 1 437 578	8 182	24·30	3 740	See footnote (e)	5 300
Spenborough U.D.C. ..	23 889	7 678	+ 681	1·180d.	1·690d.	3 296 379	− 47 508	1 280	29·50	(b) 642	See footnote (b)	282
(d) Stirling T.C.	17 330	5 320	+ 295	1·860d.	2·040d.	1 547 623	+ 207 083	970	18·21	See footnote (e)	See footnote (e)	—
Stockton-on-Tees T.C. ..	53 459	23 214	(m) + 6 947	1·112d.	1·645d.	6 831 291	+ 1 167 813	3 310	23·56	345	—	1 500
Stoke-on-Trent C.C. ..	208 054	118 951	(o) + 12 557	0·691d.	1·494d.	33 422 778	+ 8 347 201	13 056	29·22	See footnote (n)	See footnote (n)	—
Swansea T.C.	217 784	99 060	+ 20 577	0·720d.	1·220d.	37 830 318	+ 2 625 271	12 920	33·40	—	—	2 000
Tonbridge U.D.C. ..	20 871	10 258	+ 5 929	1·402d.	1·970d.	1 830 684	+ 636 857	1 108	18·80	(b) 725	See footnote (b)	—
West Bromwich T.C. ..	99 593	13 553	+ 3 106	1·272d.	1·435d.	15 369 430	+ 2 952 455	7 734	22·68	1 200	158	—
Winchester C.C.	38 870	19 039	+ 5 568	1·727d.	2·910d.	2 754 778	+ 342 784	1 560	20·16	—	—	—
Wrexham T.C.	24 014	7 221	+ 2 867	1·520d.	2·880d.	1 777 750	− 1 786 279	1 174	21·06	(k) 330	See footnote (e)	587

(a) Usually include management, repairs and maintenance, rates and taxes and special charges. (b) Including other domestic electrical appliances. (c) Calculated on kWh generated. (d) Year ended May, 1929. (e) Not available. (f) 15 months ended March, 1929. Approximate. (h) Calculated on kWh generated. (i) Washboilers only; particulars of other appliances not available. (k) Cookers. (l) Boiling rings. (m) After provision for expenditure on land, meters, cookers, etc., £2 254. (n) Cookers hired by department, 988 kW, washing machines, washboilers, etc., 162 kW. No accurate record of total radiators and small apparatus connected. (o) Out of £12 557 net profit, amounts of £3 424 and £1 245 have been appropriated to cover expenditure of capital nature and £7 888 has been transferred to special repairs and renewals account.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

APPLEBY'S RADIO ELECTRIC, 119, Nursery Road, Birmingham, wireless dealers. £11 2s. 1d. September 11th.

ARMSTRONG, Mr. F. N., 22, Park Street, Shirley, wireless dealer, £15 18s. 8d. September 4th.

EVANS, Edward, 6, Vine Street, and Sandy Road, Seaforth, electrical contractor. £32 1s. 8d. September 16th.

GARTER ELECTRICAL MANUFACTURING CO., LTD., Church Street, Staines. £15 5s. 11d. September 19th.

HAYES ENGINEERING CO., High Street, Hayes, wireless dealers. £22 8s. 6d. September 4th.

LANGHAM RADIO, 96, Regent Street, W., radio manufacturers. £19 0s. 4d. September 12th.

OATES, J. AND J., 53, Haymarket, S.W., electrical contractors. £19 0s. 1d. September 11th.

PARCELL, Mr. E., Eastcheap, Letchworth, wireless dealer, £31 15s. September 4th.

RADIO HOUSE, 510, Stockport Road, Longsight, wireless dealers. £13 11s. 2d. September 4th.

SHILVOCK (G.) AND SON, 197, Station Road, Rugby, electrical engineers. £12 19s. 1d. August 31st.

STOURBRIDGE BATTERY AND ELECTRIC CO., Court Street, Stourbridge, electrical engineers. £17 18s. September 11th.

TERRACE RADIO AND SPORTS SUPPLIES, 4, Terrace Road Upton Manor, radio engineers. £13 18s. 7d. September 4th.

WARDLEWORTH, L. AND V., 335, Bury Old Road, Heaton Park, wireless dealers. £13 5s. September 4th.

WOOD'S RADIO DEPOT, 142, High Road, Leyton, wireless dealers. £17 3s. 6d. September 4th.

Deed of Arrangement.

ABBOTT, James William, trading as ELECTRICAL ENGINEERING AND SUPPLY CO., 26, The Bank, Barnard Castle, electrical engineer. Dated October 26th, filed October 28th Trustee, H. Wood, Newgate, Barnard Castle, C.A. Secured creditors £217; liabilities unsecured, £556; assets, less secured claims, £328

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure: Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

HANSON, Harold, and JACKSON, Alfred Vincent, trading as THE AVON ELECTRIC CO., Chesnut Street, Liverpool. A meeting of creditors of the above was held recently at the offices of John Airey and Co., accountants, Liverpool, when a statement of affairs was submitted which showed liabilities of £454, of which £428 was due to unsecured creditors. In addition, there were fully secured creditors for £23, holding security valued at a similar amount, and partly secured creditors' claims amounted to £35, the security being valued at £9, leaving £26 to rank as unsecured. The assets comprised cash, £2; stock in trade, £22, valued at £15; trading fittings, etc., £1 15s.; work in progress, £10; balance due from purchasers of Aigburth Road business, £239; Marconi royalty, £5; and book debts, £12; making a total of £284, from which preferential claims of £64 had to be deducted, leaving net assets of £220, or a deficiency of £234. One creditor at the meeting, however, intimated a further account of about £20, which would increase the deficiency to £254.

It appeared that the debtors commenced business in 1920 with £30 capital. In December, 1927, they estimated that they had a surplus of assets over liabilities of about £100. They then opened a branch in Aigburth Road for the sale of wireless accessories, but they found that this involved them heavily, and as a consequence they became short of capital. Eventually they sold that branch for £350. A full set of books had not been kept, but it was stated that at one time the drawings were about £3 per week each, but they later dropped to about £2, and more recently 30s. each per week. About six months ago they opened a branch at Cherry Lane for the purpose of charging batteries, but this had not been successful and had only contributed to their present position. No definite offer was forthcoming, and it was suggested that the purchase money of the Aigburth Road branch might be paid to a trustee and the debtors allowed to carry on business. They proposed to increase the amount spread over a period of 18 months, and pay in all a composition of 15s. in the £. After some discussion, the creditors resolved to adjourn the meeting to enable the accountant acting in the matter to investigate the position further.

REPRODUCTION LTD., 5, 6 and 7, Dysart Street, Wilson Street, E.C.2, electrical wireless and gramophone dealers. In pursuance of the provisions of the Companies (Consolidation) Act, 1908, a meeting of the creditors in this matter was held on October 28th at the Institute of Chartered Accountants, Moorgate Place, E.C., when the chair was occupied by Mr. H. B. Keeping, 18, Ironmonger Lane, E.C., the liquidator of the company. A statement of affairs was submitted which disclosed liabilities of £6 173, all due to unsecured creditors. In addition, there were six per cent. debentures issued for cash amounting to £500 and interest at five per cent., totalled £5 18s. 4d. The assets consisted of cash in hand, £28; cash at the bank, £25; book debts, £460, estimated to realise £224; stock, loose tools, fixtures and fittings, £2 308, expected to realise £580, making total assets of £858, from which had to be deducted the debentures amounting to £506, and preferential creditors totalling £19, leaving net assets of £333. Dealing with the heavy depreciation of the stock the liquidator said that it had been written down by such a large amount because it would be difficult to dispose of having regard to the high price of the machines, which, for the "Rhapsody Twin" was £130 and the buyers and dealers required guarantees to be given. As the company was now in liquidation that would be impossible, and any parts of the machines would not be able to be replaced. The liquidator mentioned that he would endeavour to dispose of the stock to advantage if he were continued in his appointment, but it would not be advisable to prolong the liquidation indefinitely, with regard to the debenture, that was created in July of this year. After discussing the position, several of the creditors considered that the liquidation should not be confirmed but the liquidator declared that his appointment as liquidator was confirmed on the proxies received in his favour.

London Gazette, etc.

Bankruptcy Information.

COLES, Allan James, 424, Pinner Road, Harrow, electrical engineer and contractor. First meeting, November 5th, 2.30 p.m., 29, Russell Square, London, W.C.1 Public examination, November 27th, 10.30 a.m., Court House, St. Albans.

JAMES, John Price, lately 2A, Neath Road, Hafod, Swansea, wireless engineer. Receiving order, October 21st. Debtor's petition. First meeting, November 5th, 11 a.m., Official Receiver's Offices, Government Buildings, St. Mary's Street, Swansea. Public examination, November 22nd, 11 a.m., Town Hall, Swansea.

NEWMAN, Edmund Harold, and BAYNES, Maudslay, lately 96, Regent Street, London, W.1, trading as LANGHAM RADIO, wireless manufacturers. Receiving order, October 23rd. Creditor's petition.

Notice of Dividend.

BLOOD, Ralph, 44 and 46, Station Road, Padiham, Lancashire, wireless dealer and electrician. First and final dividend, 1s. 11½d. per £, payable, November 4th, Official Receiver's office, District Bank Chambers, Blackburn.

Notice of Intended Dividend.

PAGE, Edgar George Matthews, Bohemia Road, St. Leonards-on-Sea, dealer in wireless sets and accessories. Last day for receiving proofs, November 12th. Trustee, R. W. Cave, 12a, Marlborough Place, Brighton, official receiver.

Partnership Dissolved.

WEBB AND RODGERS (Albert Wallace RODGERS and Leonard Charles WEBB), electricial engineers and contractors, 34, King Street, Bristol, by mutual consent, as from October 22nd, 1929. Debts received and paid by A. W. Rodgers, who will continue the business.

Bankruptcy Proceedings.

MARSH, Basil, 17, Victoria Road, Brighton, lately 6, Victoria Road, Brighton, Sussex, electrician. The adjourned public examination herein was held recently at the Court House, Church Street, Brighton. It was stated by the debtor that between August and September, 1928, he had been pressed by creditors, and before Christmas had paid out an execution after the bailiffs had been in one day. Early in January he was pressed by creditors and he formed a company, he and another being the only shareholders, and each having a £1 share. In February the debtor purposed to assign to the company his assets in consideration of a sum of £100, but he had not received the money. His assets at that time were about the same as on December 31st, namely, £402. On March 4th he was informed that he was allotted six £100 debentures in the company, but he never had them. On July 4th he purported to mortgage the lease to his solicitor. The debtor was questioned regarding his assignment of the assets, and he replied that he considered the lease as part of the assets, but had kept it and debts amounting to £346 12s. 7d. owing to him. In May last he had received a letter from his solicitor relating to the transfer of one of the six debentures allotted to him and on June 21st he signed a transfer of the £100 debenture. On July 6th the debtor gave notice to his creditors that he could not pay any more. The examination was concluded, subject to the signing of the notes.

SANDS, Chaloner Wilkinson, High Street, King's Langley, Hertfordshire, electrical and wireless contractor. The receiving order herein was made on October 9th on the debtor's own petition. The first meeting of the creditors was held recently at 29, Russell Square, London, W.C.1, when according to the statement of affairs submitted there were liabilities amounting to £367 against assets of £103, thus leaving a deficiency of £264.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

317 201 General Electric Co., Ltd., and H. W. Cron. Electric coupling-devices. (16/7/28.)
317 202 G. Wall and Associated Electrical Industries, Ltd. Electricity meters combined with time-measuring devices. (16/7/28.)
317 203 S. H. Munro and D. E. C. Foster (trading as W. White and Co.). Electric switches. (18/7/28.)
317 209 General Electric Co., Ltd., and N. R. Campbell. Manufacture of photo-electric cells. (25/7/28.)
300 895 Forges et Ateliers de Constructions Electriques de Jeumont. Mechanism for producing step-by-step movements, particularly applicable to the switches of electrical control systems. (19/11/27.)
317 215 D. Montague and S. Montague. Aerials for wireless receivers. (31/7/28.)
317 217 C. Farrar. Screening wireless receiving-apparatus. (2/8/28.)
295 686 Electrical Research Products, Inc. Acoustic devices such as loud-speaking telephones. (17/8/27.)
317 221 A. F. Pollock and D. A. Pollock. Methods of reducing the intensity of unduly intense impulses in electrical amplifiers or loud-speaker circuits. (7/8/28.)
317 222 A. F. Pollock and D. A. Pollock. Loud speakers. (7/8/28.)
317 228 Siemens Bros. and Co., Ltd., and A. Rosen. Arrangements for measuring electrical quantities. (11/8/28.)
317 231 A. K. Croad (Hanovia Chemical and Manufacturing Co.). Therapeutical lamps. (17/8/28.)
297 818 Siemens-Schuckertwerke Akt.-Ges. Process for testing and starting the working of high-tension lines. (29/9/27.)
296 058 British Thomson-Houston Co., Ltd. Electric circuit-controller-. (24/8/27.)
317 237 W. T. Henley's Telegraph Works Co., Ltd., and P. Dunsheath. Insulation of electric cables. (24/8/28.)
317 239 Automatic Telephone Manufacturing Co., Ltd., and C. H. Archer. Electric heating-elements. (28/8/28.)
296 410 Loewe-Audion Ges. and Dr. E. Roemhild. Support for the electrode systems of electronic valves. (31/8/27.)
296 447 British Thomson-Houston Co., Ltd. Electric condensers. (2/9/27.)
296 677 Marconi's Wireless Telegraph Co., Ltd. Radio and the like high-frequency circuits. (3/9/27.)
312 031 British Thomson-Houston Co., Ltd. Sound-reproducing apparatus. (19/5/28.)
297 834 Associated Electrical Industries, Ltd. Thermally-responsive systems in or for electrical apparatus. (30/9/27.)
298 901 Siemens-Schuckertwerke Akt.-Ges. Means for driving machines by two mechanically-coupled asynchronous polyphase motors. (15/10/27.)
298 959 Telefunken Ges. fur Drahtlose Telegraphie. Thermionic valve transmitters for use in radio and other high-frequency systems. (17/10/27)
299 375 Soc Amon. le Nickel. Electrolytic extraction of metals. (13/4/27.)
300 640 Siemens and Halske Akt.-Ges. Depolarising-plate for galvanic cells. (17/11/27.)
313 512 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. Electro-medical apparatus. (13/6/28.)
301 030 Associated Electrical Industries. Ltd. Control systems for elevators, hoists, and the like. (23/11/27.)
301 043 British Thomson-Houston Co., Ltd. Mechanism for feeding wire in general, and in particular, for feeding a welding rod or wire in automatic or semi-automatic welding-machines. (23/11/27.)
301 908 Siemens and Halske Akt.-Ges. Telephone systems. (9/12/27.)
307 876 Scintilla Akt.-Ges. Electric startors for internal-combustion engines. (15/3/28.)
304 231 Furukawa Denki Kogyo Kabushiki Kaisha. Method of manufacturing storage battery plates and the product thereof. (17/1/28.)
304 592 British Thomson-Houston Co., Ltd. Continuous windings for electrical apparatus such as transformers. (21/1/28.)

Applications for Patents.

July 23rd.

22 603 H. W. Adey. Coils for radio signalling apparatus. (3/11/28.)
22 633 Adie and Co., Ltd., and B. W. Grimes. Electric circuits including smoothing elements.
22 631 Automatic Telephone Manufacturing Co., Ltd., G. A. Burns, A. E. Ereckson and T. R. Rayner. Supervision of apparatus at a distance.
22 673 Automatic Telephone Manufacturing Co., Ltd., and G. A. Burns. Fire alarm apparatus.
22 632 S. G. S. Dicker (N.V. Philips' Gloeilampenfabrieken). Thermionic valve detector circuits.
22 584 W. S. Drew. Colour changer for spot and floodlights.
22 657 J. J. Drumm. Storage batteries.
22 608 A. W. Harris. Regulating speed of electric motors.
22 609, 22 610 A. W. Harris. Loud speakers.
22 565 H. T. Harrison. Electric water heating and storage apparatus.
22 549 W. T. Henley's Telegraph Works Co., Ltd. Cast-iron pit frames for disconnecting boxes.
22 615 Kolster-Brandes, Ltd. Radio signalling. (8/8/28, U.S.)
22 536 H. A. P. Littledalf. Device to furnish test signal for picture receiving.
22 593 Nalder Bros. and Thompson, Ltd., and F. H. Nalder. Cock pieces for electric instruments, etc.
22 574 E. R. Ritter and Scherbius and Ritter. Electric switch. (7/9/28, Germany.)
22 545 E. Shulman. Electric junction box.
22 658 Siemens und Halske A.G. System for transmitting alarm signals. (20/12/28, Germany.)
22 659 Siemens und Halske A.G. Line protecting devices. (27/7/28, Germany.)
22 670 Siemens und Halske A.G. Remote impulse frequency measurement of output of different signs. (20/7/28, Germany.)
22 674 C. Scott-Snell. Apparatus for obtaining light and heat.
22 596 Ges. Dr. A. Wacker Ges. fur Elektrochemische Industrie. Manufacture of insulating material. (23/7/28, Germany.)
22 566 J. A. Whatnall. Radio sets.

July 24th.

22 732 Almeida Accumulators, Ltd., and L. A. Levy. Electric cells.
22 802 Automatic Telephone Manufacturing Co., Ltd., C. Gillings and W. H. Paulett. Telephone systems.
22 763, 22 764, 22 765, 22 766 W. E. Beatty (Bell Telephone Laboratories, Inc.). Combined motion picture and sound producing apparatus. (20/7/28.)
22 743 E. A. Bitton and H. Branton. Electric sound reproducers.
22 769 British Thomson-Houston Co., Ltd. Electric control systems. (24/7/28, U.S.)
22 730 J. N. Chaviara, J. F. Gill and F. J. Teago. Electrical propulsion of ships.
22 704 R. F. Christopher. Lighting device for automobiles.
22 678 J. A. Crabtree. Electric lamp holder switches. (16/5/28.)
22 679 J. A. Crabtree. Cord grips for lamp holders. (16/5/28.)
22 680 J. A. Crabtree and B. C. Harrison. Electrical pin and socket couplings.
22 696 G. Decombe. Reels for cables. (18/10/28, France.)
22 707 A. H. Diggle. Service of current to accumulators, etc.
22 753 E. V. Hayes-Gratze. Electroplating of motor vehicle radiators, etc.
22 754 E. V. Hayes-Gratze. Electrodeposition of metals.
22 755 E. V. Hayes-Gratze. Electrodeposition of chromium.
22 715 J. Grove. Brackets for electric globes.
22 796 W. Gusseff. Electrolytic treatment of metals.
22 770 International General Electric Co., Inc. Bonding layers of material together. (24/7/28, Germany.)
22 723 O. C. Jones. Magnetic separators.
22 697 A. E. M., E. G. O., and K. E. H. Pressler and O. Pressler Thuringer Vakuumsrohrenfabrik und Fabrik Wissenschaftlicher Apparate. Light electric cell. (6/8/28, Germany.)
22 805 Siemens-Schuckertwerke A.G. Connecting sleeves for lead cables. (22/11/28, Germany.)
22 804 Siemens und Halske A.G. Distant measurement apparatus. (25/7/28, Germany.)
22 741 J. Smyth. Transmitting sounds, messages, etc.
22 743 H. A. Storry, Ltd., and H. G. Bawtree-Williams. Electric sound reproducers.

July 25th.

22 832 H. R. and N. Allday. Electric igniters.
22 819 J. Anderson and St. Georges Engineers, Ltd. Cooling radiators for transformer tanks, etc.
22 866 N. R. Campbell and General Electric Co., Ltd.—Manufacture of photo-electric cells.
22 826 H. E. Dance. Apparatus for measurement of volt-amperes in a.c. circuits.
22 871 English Electric Co., Ltd. and T. Zweigbergk. Electric motor control.
22 872 English Electric Co., Ltd. and F. Morris. Electric motor control.
22 895 M. Hauser and H. Trinkl. Electric switches. (7/9/28, Germany.)
22 870 International General Electric Co., Inc. Electric furnaces. (25/7/28, Germany.)
22 902 N. Japolsky. Generation of electromagnetic waves.
22 856 Kabelfabrik-u. Drahtinustrie A.G. Manufacture of electric cables. (16/8/28, Austria.)
22 825 D. E. Lambert and A. Reyrolle and Co., Ltd. Electric frequency controlling apparatus.
22 928 J. N. Morris and M. D. Scott. Electrical reciprocating apparatus.
22 862 E. Roberts and B. Walton. Fitting for electric light shades.
22 931 W. B. Sayers. Apparatus for producing magnetic fields within the human body, etc.
22 850 A. Williamson. Induction motors.

COMING EVENTS.

Friday, November 1st. (to-day).

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. Thomas Hawksley Lecture, by Prof. H. L. Callendar, F.R.S., on "Critical Relations Between Water and Steam." 6 *p.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Institution, Savoy Place, Victoria Embankment, London. Chairman's inaugural address by Mr. E. W. Hill. 7 *p.m.*

Saturday, November 2nd.

Electrical Power Engineers' Association (West Yorkshire Section).—Great Northern Hotel, Leeds. Seventh annual dinner. 5.30 for 6 *p.m.*

Monday, November 4th.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Paris and the Pyrenees: Notes on some of the Technical Features of the I.E.E. 1929 Visit." (Opened by Mr. R. Borlase Matthews. With cinematograph and epidiascope illustrations.) 7 *p.m.*

Institution of Electrical Engineers. (Mersey and North Wales-Liverpool Centre).—University, Liverpool. Paper by Messrs. Johnstone Wright and C. W. Marshall on "The Construction of the 'Grid' Transmission System in Great, Britain." 7 *p.m.*

E.L.M.A. Lighting Service Bureau.—15, Savoy Street, Strand, London. Twentieth Illumination Design Course. Lecture (III) by Mr. T. Catten on "Selling, Electric Light to the Shopkeeper." 7.30 *p.m.*

Tuesday, November 5th.

Electrical Association for Women (South Wales and Monmouthshire Branch).—Visit to the City Lodge, Cardiff. Inspection of electrical apparatus for treating patients.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting. 5 *p.m.*

Institution of Civil Engineers.—Great George Street, Westminster. Opening meeting. Address by the President. 6 *p.m.*

Electrical Society of Glasgow.—30, Gordon Street. Lecture by Dr. Eliz. Mudie on "Light in Health and Disease." 7.30 *p.m.*

Television Society.—Engineers' Club, London. Lecture by Mr. F. Langford-Smith on "Amplification and Television." 8 *p.m.*

Tuesday, November 5th-Saturday, November 16th.

"Daily Despatch" Smoke Abatement Exhibition, City Hall, Deansgate, Manchester. 11 *a.m.*-9.30 *p.m.*

Wednesday, November 6th.

Electrical Contractors' Association (Bath Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting. 2.30 *p.m.*

Institution of Electrical Engineers (Wireless Section).—Institution, Savoy Place, Victoria Embankment, London. Inaugural address by the chairman, Captain C. E. Kennedy-Purvis. 6 *p.m.*

Institution of Heating and Ventilating Engineers.—Swedenborg Hall, 29, Hart Street, Bloomsbury. "Notes on Electric Warming, with Special Reference to Low Temperature Panel Systems," by Mr. R. Grierson. 7 *p.m.*

Royal Society of Arts.—John Street, Adelphi, London. Inaugural meeting. Address by the Chairman, Mr. Ll. B. Atkinson on "Fifty Years of Electrical Science and Industry." 8.30 *p.m.*

Thursday, November 7th.

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 3.15 *p.m.*

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Papers by Messrs. B. A. G. Churcher and A. J. King, on "The Analysis and Measurement of the Noise Emitted by Machinery." 6 *p.m.*

Electrical Association for Women.—Visit to Messrs. Shoolbred, Ltd., Tottenham Court Road, London. Lecture by Mr. W. J. Jones on "Electric Light and Eyesight Preservation," with special demonstrations. 3 *p.m.*

Batti-Wallahs' Society.—Hotel Cecil, Strand, London. Luncheon. 12.30 for 1 *p.m.*

Friday, November 8th.

Institution of Electrical Engineers (North-Eastern Centre, Students Section).—Armstrong College, Newcastle-on-Tyne. Lecture by Mr. B. H. Leeson on "Centrovisory Control of Power Stations." 7.15 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W. Annual general meeting and election of officers. 7.30 *p.m.*

Saturday, November 9th.

Association of Mining Electrical Engineers (Western Sub-Branch).—Paper by Mr. G. E. Hider on "The Problem of Peak Loads."

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THE ELECTRICIAN

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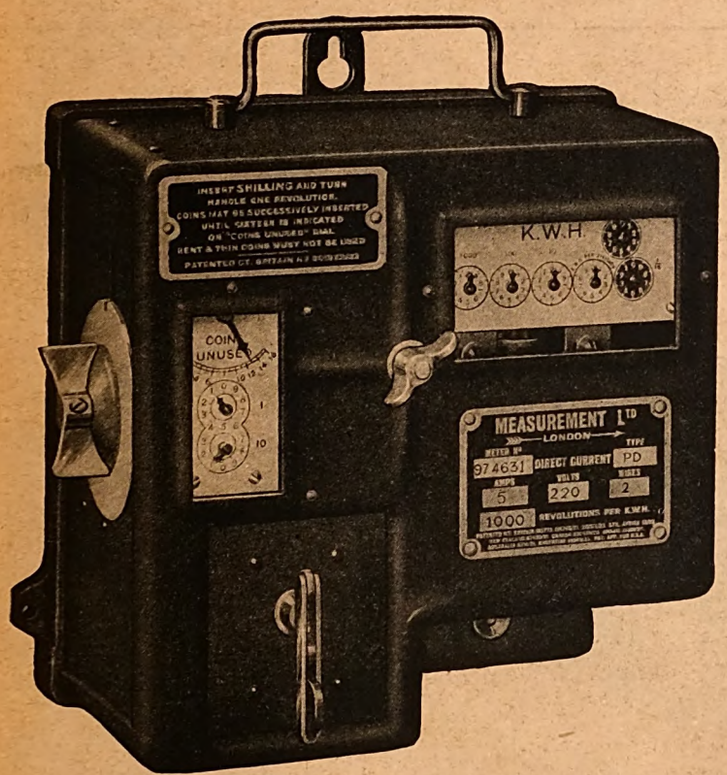

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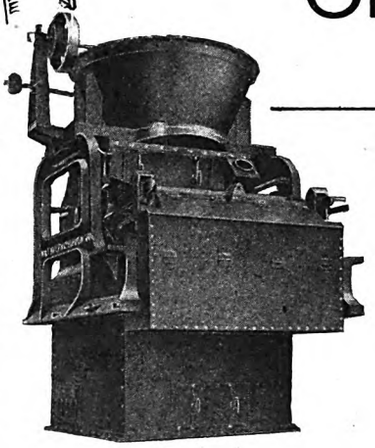

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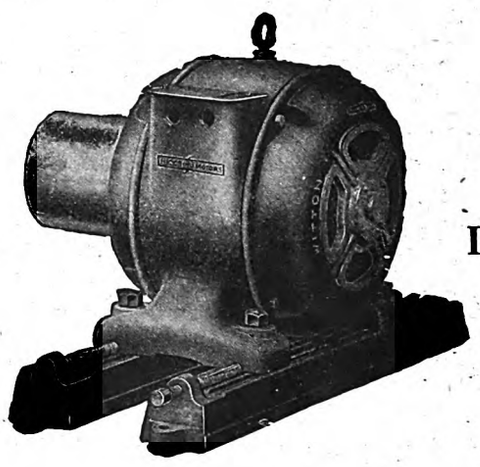

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THE ELECTRICIAN

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Current Topics.

Costly Canvassing.

A CONSIDERABLE amount of house-to-house canvassing for business is done in this country, and the bulk of it is devoted to the sale of household appliances. So thickly is some ground covered that most housewives look upon the canvassers as a nuisance. Moreover, it is a costly system of distribution, and, as a rule, fails utterly in provision of service after sales, for the simple reason that a commission salesman selling a speciality article has no interest in customer or user satisfaction once the sale is made and he has drawn his commission. A recent U.S.A. Department of Commerce report dealing with a certain market for vacuum cleaners, polishing and other machines, gives illuminating facts relating to the sale and distribution of a speciality sold on the instalment plan by salesmen dealing direct with the consumer. The retail price of the appliance in that particular market is nearly four times the landed cost! Sales representatives are divided into groups of eight to ten salesmen, each group under a sales chief who receives salary and commission. The individual salesman receives no salary, being entirely dependent upon the sales commission. The average period for which a salesman is employed is only three weeks. After the individual exhausts the possibilities of selling to his close friends and relatives, his lack of income from commissions makes it necessary for him to seek other employment. Losses are said to be considerable, but apparently the loss factor is discounted in determining final sale price. Cutting adrift from the recognised and well-established machinery of distribution through the retail trader does not appear, on this showing, to mean either more efficient or more economical distribution, but the reverse—which is, after all, scarcely surprising.

Marconi Royalties and Trade.

CONSIDERABLE dissatisfaction is evident in the electrical contracting industry with respect to the long delay in arriving at a satisfactory conclusion with regard to Marconi royalties, and, at the time of writing, agreement between the R.M.A and the Marconi interests appears to be as far off as ever. Since the terms of a proposed new licence were placed before the members of the R.M.A. nearly three months ago, certain of the patents covered by both the old and proposed licences have expired. On the other hand, other patents held by the Marconi Co. have increased in value from the point of view of royalties, and though by the expiration of such patents as that covering reaction the revenue producing qualities of the licence would appear to be less valuable, such is not the case. Both the R.M.A. and the Marconi Co. have everything to gain by an early settlement of the question, for a reduction in royalty charges would not only bring new enthusiasm to the trade, but would furthermore encourage the public to regard radio receivers more favourably as suitable gifts for Christmas. We do not suggest that either the R.M.A. or the Marconi Co. should enter into an agreement which is not the best compromise possible, but we nevertheless feel that it is time that the licence question was settled. Both the trade and the public are becoming impatient.

"The New Despotism."

THE business world will desire to add its quota to the thanks now being showered upon the LORD CHIEF JUSTICE for the service he has rendered in raising the fundamental issues dealt with in "The New Despotism." The story of the book is that having spent some eight or ten centuries in developing a system of democratic government, and in disposing of various despotisms from kings and barons downwards, we now find that a new and more subtle and tyrannous despotism, the despotism of the bureaucracy, has been unwittingly and silently created. It is only necessary to examine building regulations, details of taxation, or the com-

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plications of a new enactment like the de-rating law of the last Government, to recognise how difficult the new position has become. Questions are constantly arising in the experience of business people, the answer to which depends upon the unchallengeable word of some inaccessible official. LORD HEWART, in his graphic way, sums up the matter by saying that these cases are in fact tried by a court where "one of the parties is absent; there is no hearing; the decision is given by the opposite party, and there is no appeal." LORD HEWART objects to the assumption by a bureaucrat of powers which have never been discussed, which arise out of the bureaucrat's own and undebated theories of what is right and proper, and from which a free and independent citizen has no escape and no right of appeal. But he might have gone on to discuss what we will describe as the collateral despotism that constantly arises out of these powers. As an illustration, a department armed with general powers may make a regulation to cover, let us say, some detail in regard to the guarding of machinery. It will then become the duty of a local official to see that machinery is properly guarded in accordance with such a regulation. From there the next step is easy. The official may have his own views on the general question of factory management, and will proceed to impose upon the unfortunate manufacturer all sorts of onerous conditions as the price of his licence or consent in the simple matter of the guard on the machine.

An Historic Instance.

AN historic instance of the development and use of this collateral despotism is to be seen in the well-established practice of the London County Council over music and dancing licences. The illustration is the better for the purposes of our argument because of the large existing measure of agreement with the practice of the London County Council. The Council has parliamentary powers which give it the right to grant or refuse music and dancing licences. It used these powers from the very start to impose a temperance policy upon music and dance halls. The Council said in the simplest and most direct manner, "We will only give you a music licence if you will undertake not to apply to another authority for a drink licence." This, although the County Council as such has nothing whatever to do with the drink question. When we remember that the liberty thus given to the L.C.C. spreads automatically to every bureaucrat in every Council office having any discretion in the granting or withholding of a licence or a permit or a pass for any industrial or business transaction, LORD HEWART'S case begins to assume its right proportions from the commercial and industrial point of view. The fact is that in these days the local officials, to say nothing of the trade union officials, have more power inside a business establishment than the owners or the managers of the business itself. The whole matter is highly controversial and will require a very great deal of study and debate.

Commercial Motor Transport.

THE exhibition of commercial motor vehicles which opened at Olympia, London, yesterday, again contains many electrical exhibits of outstanding interest. The luxury of some of the trolley buses shown rivals that of many of the cars seen at the recent Motor Show, while the number of electrical firms occupying stands at the exhibition indicates that manufacturers are fully alive to the potentialities of the commercial vehicle market with respect to fittings and accessories. During the last show, two years ago, we pointed out in these columns that the electric vehicle was receiving attention in the field of light delivery vehicles, and though the present exhibition again includes these vehicles, the number shown is small. Six wheeled electric trolley buses are again prominent, while those vehicles coming under the heading of petrol-electrics still maintain their popularity. The exhibition is well worth a visit, including as it does items of interest to manufacturers, supply authorities and contractors.

Illumination Aids Navigation.

NEWS of an interesting experiment reaches us from Amsterdam, where one of the Batavier vessels is fitted with a large illuminated arrow device immediately below the bridge. The purpose of the device, which resembles somewhat the direction-arrows fitted to many motor cars, is to supplement the syren signals used when docking or navigating crowded waters. Attention is drawn to the vessel by a syren blast, and instruction as to her course is given by an arrow, which in the vertical position, signifies "Straight ahead." On those occasions when visibility is poor the ordinary sound signals are used in conjunction with the device, and, so long as the arrow is sufficiently bright, is something of a "safety first" measure not hitherto enjoyed by seafarers. A demonstration of the system in London last week showed even in bright daylight the illuminated arrows are plainly visible. The idea has much to commend it for navigating rivers, and with suitable development would, no doubt, prove applicable to small craft as well as large.

Rural Electrification in Japan.

ACCORDING to latest information from Japan considerable progress is being made in the electrification of farming operations, and a new stimulus to greater activity in this direction is to be provided by Government-facilitated loans at low interest. Electric farm heating applications in Japan are not altogether parallel with British farm requirements, and electricity is already employed by Japanese farmers for such purposes as "silkworm nursing," the drying of cocoons, and tea roasting. Lighting also finds unorthodox employment with a connected load of 1 661 kW for exterminating bugs in the rice fields and fruit gardens.

A Salutary Lesson.

Now that the great N.E.L.A. celebration of the American invention of the incandescent electric lamp has been triumphantly concluded, with glowing notices in most of the public newspapers in this country, British electrical engineers generally are wondering why, with all the associations which exist to promote this and to develop that and the other, none was ready to enter the lists in defence of the memory of the late Sir JOSEPH SWAN. We have shared this wonder ourselves, and though the time has now passed for the launching of an effective counter-attack on the lamp invention, we hope that the lesson of "Light's Golden Jubilee" will not be forgotten when the time arrives for the celebration of further inventions such as the thermionic valve. Recent events have certainly shown the electrical industry's need of some organisation which can authoritatively and fearlessly put its views and claims on matters of general concern before the general public.

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ELECTRICAL COMMUNICATIONS.

Special Alloys for Inductive Loading of Submarine Cables—Characteristics of New Insulating Material—A Record in Long-distance Telephony.

(*Concluded from page* 529).

DEALING with radio telephony, the President said that since the establishment of the London–New York system more than 25 000 successful conversations had been effected. The present traffic from all sources at each side averaged about 45 calls per day, and the average duration of calls was about six minutes. The division of the traffic averaged at this side: 95% from the United States; 4% from Canada; and 1% from Cuba and Mexico. At the other side they got 53% from Great Britain; 34% from France; 7½% from Germany; and 5½% from other European countries.

Although the general quality of the service might be regarded as satisfactory at the present early stage of transatlantic telephony, the possibilities of further developments in the art of linking radio circuits with telephone lines were such that the commercial data so far provided by the Anglo-American service was very far from representing the ultimate grade of service which would be obtained from such circuits.

Since radio was necessarily to some extent a broadcast method of transmission, the transatlantic telephone had been subject to the disadvantage that the conversations passing over its radio link might be picked up and understood by other parties. It was not at all an easy matter for an unauthorised listener to "tap" its communications. Methods of imparting a high degree of privacy had been devised and close attention was being given to their development.

Many of the special features of the transatlantic radio system, on which it depended for its commercial success, were devices intimately connected with, and in some cases borrowed from, the developments of line telephony. Thus the single side-band system of transmission, used on the original long-wave circuit, was developed originally in connection with the high-frequency multiplex system of telephony over land wires.

Additional Submarine Facilities.

Notwithstanding the high degree of stability which had been attained on the existing transatlantic radio-telephone channels, the system would gain greatly by the addition of a submarine cable channel to the facilities available. It had been felt that while such a cable would be so costly that, taken by itself, its provision would be financially impracticable, the expense could be justified in the case of a cable which formed part of a larger system, to which it would impart assured continuity of service and unchallengeable secrecy, as well as adding to the traffic-carrying capacity of the system.

The research laboratories of the American Telephone and Telegraph Co. had succeeded in producing remarkable improvements in the construction of ocean *telegraph* cables by the development of new metallic alloys for inductive loading, known as "permalloys." Its engineers were thereby encouraged to tackle the problem of the ocean telephone cable, with the result that last year the company announced that the Bell Telephone Laboratories had evolved a method of deep-sea telephone-cable construction which would be suitable for transatlantic operation. Work was now going forward actively on the development of a cable of this type for connection between London and New York, and it was possible that this circuit would be available for service as early as 1932. The new cable would yield only one additional telephone channel, but it would be a circuit of maximum reliability, free from the the variations characteristic of radio circuits. It was probable that a superposed telegraph channel would also be obtainable.

The route of the cable was not yet settled in detail, but it was probable that the main transatlantic link would extend directly from Newfoundland to Ireland, a cable length of approximately 1 800 nautical miles. From Ireland the circuit would probably be carried through submarine cable to Scotland, and thence by land cable to London, where it would terminate. It was expected that from Newfoundland the circuit would be carried through several sections of submarine cable to Nova Scotia, and thence by land circuits through Nova Scotia, New Brunswick and the New England States to New York City, which would be the other terminal.

The new cable would be of the continuously loaded type. For the loading material it was intended to use one of a new series of alloys designated as "perminvars." The conductor would be insulated with a new dielectric material known as "para-gutta." The attenuation represented by the main cable link between Newfoundland and Ireland would be immensely greater than that of any other telephone circuit yet planned. It would be such that the ratio of input to output power between the repeaters at its two ends would be about 10^{16}, or the equivalent of 150 decibels for the high frequencies of the voice range; i.e., received power would be one thousand-million-millionth of transmitted power. This decrement was, of course, far greater than that at which ocean telegraph cables were operated, and was of about the same order as that experienced on the transatlantic radio circuits themselves.

Special Features of the Cable.

The possibility of operating successfully through a line attentuation of this phenomenal magnitude depended upon two special features of the cable: first, the characteristics of perminvar, which permitted the use of a level of transmitted power much in excess of that which could be used in an ordinary telephone cable; and second, the careful shielding of the cable ends, for many miles from each shore, against the possibility of even the slightest interference from other electrical circuits. The received power would be so extremely low that even the minute currents caused by thermal agitation of the atoms of the conductor became an appreciable source of disturbance.

The end repeaters would be single-way amplifiers and, in order to make two-way conversation possible, voice-operated switching mechanisms would be employed to control the direction of transmission. Thus two persons would, by the mere act of speaking, alternately switch the transmitting amplifiers into action at each end as required, and conversation would proceed in a perfectly natural manner.

As showing that the dimensions of the earth's surface now set no bounds to the range of telephony, Col. Purves mentioned a long-distance test conversation carried out in association with the United States by two of his officers who visited Sweden last year in connection with the opening of communication between that country and America by the Anglo-American radio-telephone channels of the Post Office.

The chain of lines set up and spoken over on that occasion ran from Stockholm, via Berlin and Amsterdam, to London, and thence to New York by radio. From New York it was extended stage by stage via Chicago and San Francisco to Los Angeles, and back by another channel to New York, then once more to Chicago and back again to New York, with a final extension to the home of an American Telephone and Telegraph Co.'s official in New Jersey, from which a fair grade of conversation was exchanged with Stockholm.

The total length of the route traversed was about 14 000 miles, including approximately—270 miles of open-wire line in Sweden; 200 miles in submarine cables across the Baltic and North Seas; 1 050 miles in underground cables in Germany, Holland, and England, to London; 3 900 miles, London to New York, including the radio link of 3 200 miles and 700 miles in underground cables; 3 860 miles of open-wire line, worked by the high-frequency carrier system, and 4 850 miles in underground cables in the United States.

The aggregate length of copper conductor used on both sides of the Atlantic to carry this record long-line conversation was about 40 000 miles. The land-line equipment comprised 117 four-wire repeaters, 19 two-wire repeaters, 24 carrier-channel repeaters, and 6 cord-circuit repeaters, in addition to 8 echo suppressors and numerous other special devices.

Attempts to estimate the power which would be required to deliver currents of telephonic magnitude at the far end of such a circuit in the absence of repeaters suggested that the whole radiant energy of nature would fall immensely short of meeting the requirements, we should need to multiply nature by 10^{177}. The phenomenon known as the "photo-electric effect" had provided a new and useful tool for the communications engineer. Within the past few years it had been utilised in the development of apparatus for the telegraphic transmission of pictures, and of facsimiles of written messages and printed matter, both by wire and by radio. It had brought practical television well on the horizon, and had also enabled the communications engineers of the Bell Co. to solve the problem of combining the cinematograph with perfectly synchronised sound reproduction.

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IRON-SILICON-CARBON ALLOYS.*

Constitutional Diagrams and Magnetic Properties—The Effects of Various Heat Treatments.

By T. D. YENSEN (Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.).

THE discovery of the advantages of silicon steel for magnetic purposes by Hadfield in 1900, and the subsequent pointing out by Gumlich in 1901 and Campbell in 1902 of the importance of its high electrical resistance in reducing eddy

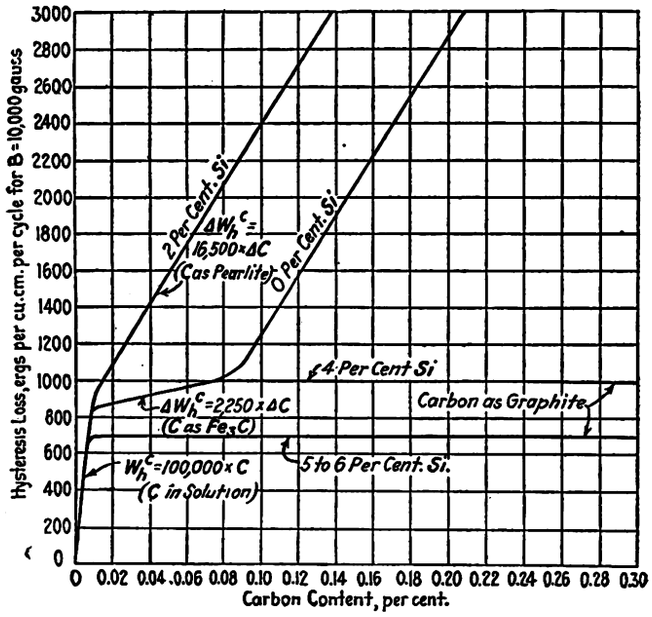

Fig. 1.—Effect of carbon on the hysteresis loss of iron-silicon alloys. All other impurities and effect of grain size eliminated.

currents, marked the beginning of a new era in the development of electrical machinery that has not yet been closed. During the intervening quarter of a century investigators in all parts of the world have studied the various phases of iron-silicon alloys, with the result that their magnetic properties have been greatly improved.

The author's paper on Fe–Si–C alloys published in 1924 was an attempt to correlate the magnetic properties of iron

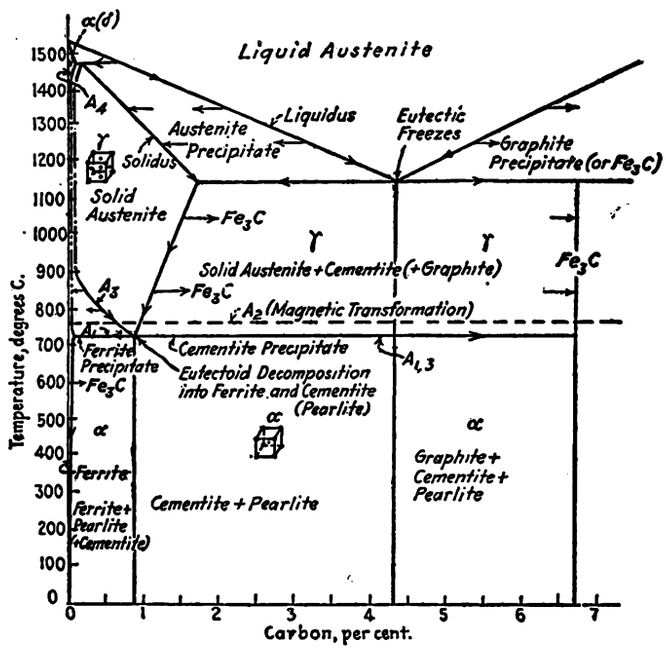

Fig. 2A.—Constitutional diagram for Fe-C.

and iron-silicon alloys with their chemical and structural characteristics. This was made possible, in the first place, by an improved method of carbon analysis whereby an accuracy greater than ±0·001% could readily be obtained, revealing for the first time that at room temperature the solubility of carbon in iron and iron-silicon alloys is not nil, but of the order of 0.008%. Another contributing factor was the type of test-pieces used, which were in the form of comparatively thick rings. These facilitated accurate testing, and minimised surface effects, particularly due to oxidation during annealing. With the regular 14-mil (0·36 mm.) sheet material this effect becomes very serious.

The enormous effect on the magnetic properties of carbon in solution (see Fig. 1), agreeing with that previously obtained by Gumlich for quenched high-carbon alloys, accounts for the previous confusion in regard to the magnetic properties of low-carbon alloys, and particularly the large variation in these properties with apparently the same chemical composition. This is now readily understood when we know that a variation of ±0·001% of dissolved carbon has approximately the same effect on the hysteresis loss and on other magnetic and electrical characteristics as ±0·1% of sulphur or ±0·03% of manganese.

Investigators attempting to determine the effect of impurities or grain structure on the magnetic properties of very

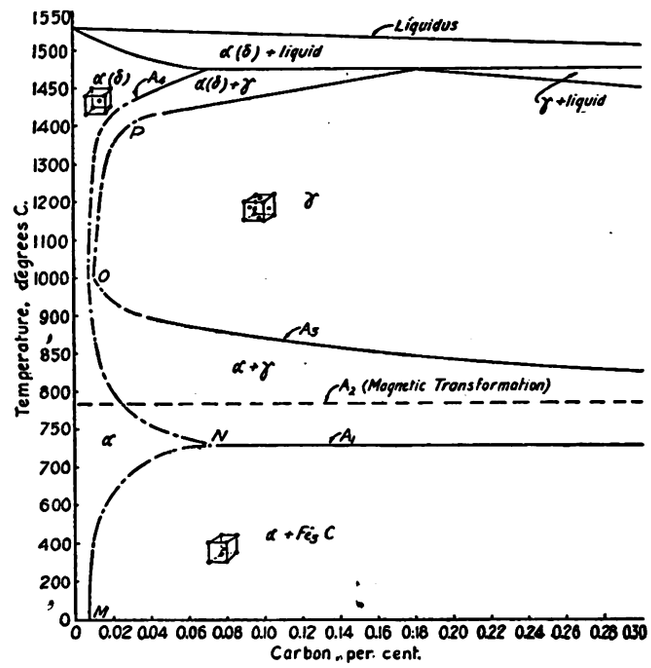

Fig. 2B.—Constitutional diagram for Fe-C.

low-carbon alloys without determining the amount of dissolved carbon and making proper allowance for it are thus leaving out of consideration one of the most, if not the most, important factor, and the results obtained can obviously not be expected to be consistent. Daeves fully realised the above difficulties, and confined his investigation to alloys in sheet form with a relatively high carbon content (more than 0·04%), in which the amount of dissolved carbon may be considered constant (0·008%), the remainder being in the form of free cementite (Fe_3C), with only a slight effect on the magnetic properties ($\frac{1}{40}$ to $\frac{1}{50}$ that of dissolved carbon). Daeves consequently confirmed qualitatively the author's results in regard to the effect of carbon, manganese, phosphorus, and particularly grain-size. Ruder's early results have thus received further support.

Von Auwers, on the other hand, experimenting with 2·6% silicon steel sheet annealed at 200 to 1 000 deg. C. in hydrogen, nitrogen, and *in vacuo*, and containing before annealing carbon 0·01, manganese 0·03, phosphorus 0·05, and sulphur 0·06%, could find no relation between the grain-size and the magnetic properties. This is very probably due to the fact that the annealed samples were not analysed for impurities, and the variation in final carbon content alone was undoubtedly great enough to mask the effect of variations in grain-size without considering the oxygen content.

* From a paper read before the Iron and Steel Institute.

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As a matter of fact, no method of accurate carbon determination was available, so that the data in regard to this important impurity were unreliable even for the unannealed samples. An accuracy of ±0·01% is sufficient for carbon contents in excess of 0·02%, but not when it drops below 0·01%. This matter was also pointed out by Daeves in the discussion of a subsequent paper. More recently a large amount of data has been collected in Germany in regard to the effect of mechanical working and heat treatment on the properties of silicon steel.

Considerable work has also been done in recent years in regard to the purely metallographic phase of the Fe–Si–C alloys, so that we are beginning to get a fair amount of knowledge of their behaviour, although agreement as to details is still lacking, due to technical difficulties.

It has been known for some time that the A_3 (α–γ) transformation point is raised, and becomes increasingly faint, with increase of silicon, and that it disappears altogether for more than a certain silicon content, investigators differing as to the exact amount (1 to 2·5%).

The lowering of the A_4 (δ–γ) transformation point with increase in silicon (to 1·2%) was first observed in 1914 by Ruer, and this observation has since been amply confirmed. The fact that with increasing silicon the A_3 transformation point occurs at increasing temperatures and gradually disappears, while the A_4 point occurs at decreasing temperatures

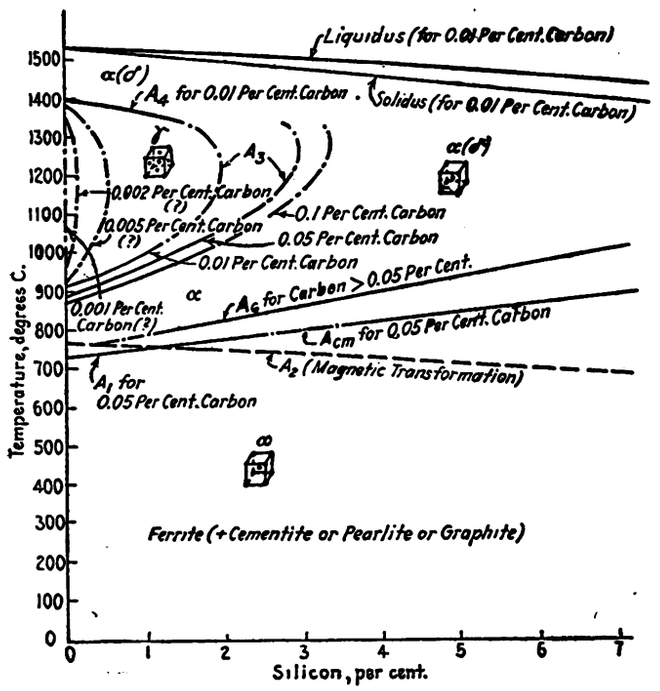

Fig. 3.—Constitutional diagram for Fe-Si.

and gradually disappears, coupled with the fact, established by Westgren and Phragmén, that the α and δ modifications are identical, naturally led to speculation as to the complete form of the Fe–Si diagram, particularly in regard to the A_3 and A_4 lines. When Hanson, in discussing the Westgren-Phragmén paper, spoke about "imagining an element added to iron which would at once lower the δ point and raise the γ point, under which condition a position would be reached where γ-iron disappeared from the system and δ- and α-iron became identical," it is difficult to believe that he did not have silicon definitely in mind. The present author, in June, 1923, made this notation in the margin of Hanson's remarks: "This may be the case with Fe–Si alloys," and on March 1st, 1924: "This *is* the case with Fe–Si alloys." In his paper in 1924, the author in discussing the effect of silicon on iron, consequently stated: ". . . while *with* silicon (4%) the normal grain-size is large, due to the *absence* of the A_3 transformation point. . . ."

When, therefore, Oberhoffer in 1924 presented his theory on the joining of the A_3 and A_4 lines with silicon above 1·3% it seems but fair to recognise that he had been anticipated by others. Daeves in 1926, Phragmén in 1926, and Oberhoffer, Von Moos, and Oertel in 1928, give Oberhoffer credit for being the first proponent of this theory.

The author has been engaged in the study of iron-silicon alloys since 1914, and has fully realised the necessity for a careful metallographic investigation of these alloys as a means towards an intelligent development of their magnetic properties; he was fortunate in being associated at the time with Norman B. Pilling. The investigation has recently

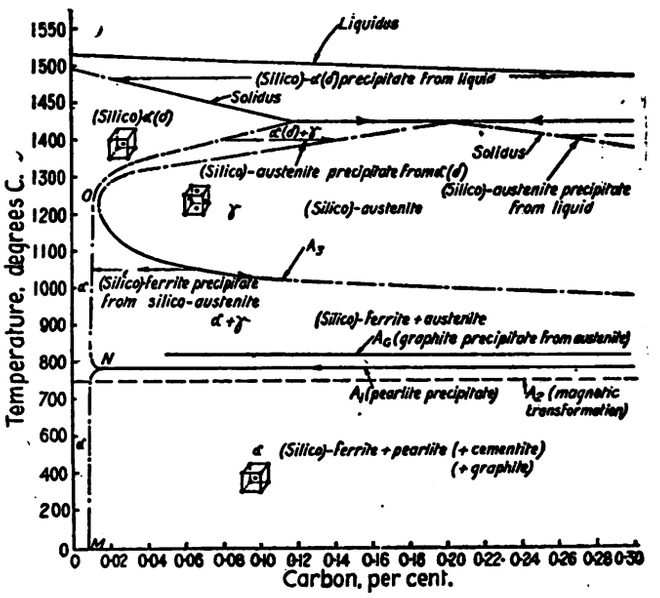

Fig. 4.—Approximate constitutional diagram for Fe-C with 2% of silicon.

been resumed through co-operation with O. W. Ellis and N. A. Ziegler, to whom the author is greatly indebted for information and suggestions in connection therewith.

The data obtained by Pilling and Halliwell have been collected and extensively used in drawing the constitutional diagrams shown in this paper. Pilling and Halliwell, however, did not investigate the δ–γ range, and the parts of the diagrams dealing with the solubility of carbon in α-iron are based partly on data obtained from other sources, and partly on hypothesis.

Constitutional Diagrams.

In Figs. 2A and 2B are shown the constitutional diagram of iron-carbon alloys, based on the most recent information available. The only part that is not strictly orthodox is that

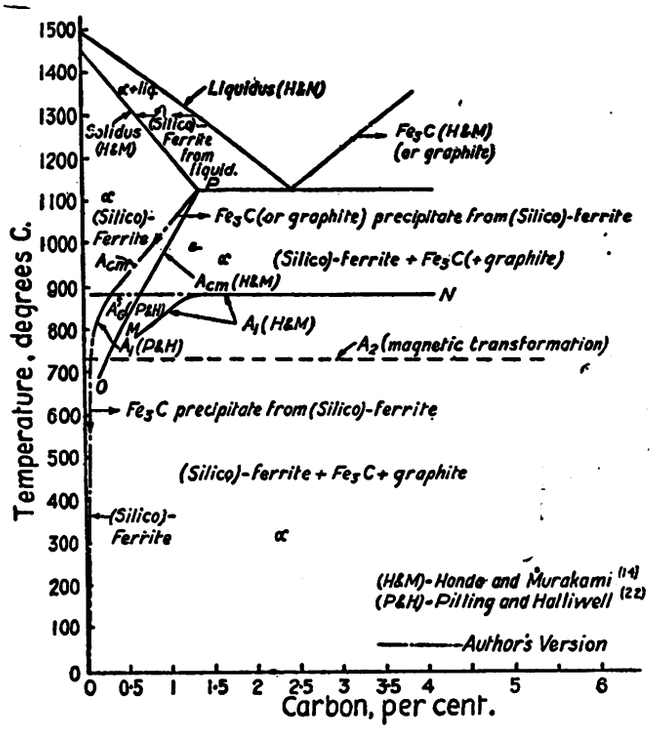

Fig. 5A.—Approximate constitutional diagram for Fe-C with 4% of silicon.

pertaining to very low carbon contents, shown in dash-and-dot lines to indicate uncertainty. The justification for these lines is as follows:

(1) From the author's data on the magnetic properties of Fe–C alloys (Fig. 1), corroborated by metallographic data,

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the solubility of carbon in iron at room temperature is about 0·008%. That the solubility should be 0·05 to 0·06%, as held by Sauveur and Krivobok and by Hatfield, does not seem probable in view of this and later data, and must rest on a misinterpretation.

(2) Scott is probably the discoverer of the fact that the solubility of carbon at the A_1 temperature is at least 0·03%.

(3) Again, from the author's data, it appears that between 0·01 and 0·1% of carbon is precipitated as free Fe_3C, which can be explained by the curve *MN*. This is confirmed by

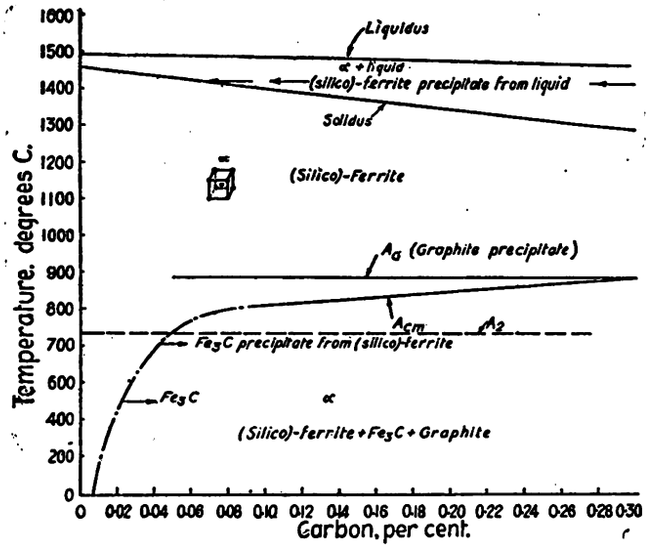

Fig. 5B.—Approximate constitutional diagram for Fe-C with 4% of silicon.

Whiteley's recent work on the solubility of cementite in α-iron, in which he finds that α-iron above 630 deg. C. dissolves appreciable amounts of Fe_3C (0·03% of carbon at 720 deg. C., in complete agreement with Scott), and that Fe_3C is precipitated as minute particles in the ferrite grains when samples quenched from about 700 deg. C. are reheated to 250 deg. C. or over. As to the exact solubility at the A_1 point, this may be even less than 0·03% for complete equilibrium, but it is quite possible that even slow cooling from a high temperature may retain at first as much as 0·1% of carbon in solution at 720 deg. C., this amount gradually decreasing by the precipitation of the excess carbon as Fe_3C at or below 720 deg. Work is in progress at the Westinghouse Laboratories for the determination of the actual solubility of carbon in α-iron at various temperatures.

Customary Assumptions.

(4) It is customary to assume the solubility of carbon in α-iron at 905 deg. C., and in δ-iron at 1 400 deg. C. to be zero, and that even pure iron (Fe) passes through allotropic transformations during cooling at these temperatures (from δ to γ at 1 400 deg., and from γ to α at 905 deg. C.).

There is apparently good reason for these assumptions; in the first place, the A_3 and A_4 transformations are always found for iron no matter how low the carbon content, and, in the second place, the lower the carbon content the more pronounced is the A_3 transformation. The author, however, has come to the conclusion that if iron free from all interstitial impurities, such as oxygen and carbon, could be obtained, no allotropic transformations would be found—that is, iron would crystallise from the liquid as body-centred cubes (α), and would retain this structure as it cooled to room temperature. He is of the opinion that iron changes its structure from the body-centred (α) to the face-centred (γ) cube at 1 400 deg. C., because the latter (γ) has a higher solubility for the interstitial impurities than the former. The reverse action, taking place at the A_3 point, is attributed to the decrease in the rate of diffusion of the carbon atoms as the temperature decreases, and to the tendency of the iron to return to the α structure whenever the visits of the "stranger" atoms become sufficiently infrequent to permit the change to take place.

The experimental evidence in support of the above hypothesis was given and discussed in the author's previous paper, and will only be briefly summarised here:

1. So-called pure iron contains a large amount of oxygen (up to 0·4%).
2. Some of this oxygen (0·02 to 0·05% at 20 deg., 0·2% at 1 530 deg.) forms a solid solution with the iron (interstitial element).
3. Oxygen in solution has a large effect on the physical properties of iron.
4. Oxygen can be most effectively removed by means of carbon and vacuum-fusion and vacuum-annealing, but it is difficult to strike a balance so as not to leave traces of either.
5. Oxygen can be removed by means of 2 to 3% of silicon. Silicon is a substitution element in the iron lattice, and has but slight direct effect on the magnetic properties.
6. The addition of 2 to 3% of silicon also eliminates the A_3–A_4 transformation.
7. Silicon eliminates the A_3–A_4 transformation largely because it removes oxygen from the iron lattice.
8. If iron can be obtained free from carbon, oxygen, and other interstitial impurities, it seems reasonable to assume that it will have no transformation points, even in the absence of silicon.

When the above hypothesis was announced at the meeting of the American Institute of Mining and Metallurgical Engineers, an interesting discussion by Sauveur, Krivobok, and Hayes followed. These speakers disagreed with the author's conclusions either from a theoretical or from an experimental standpoint. Gillette, of the Bureau of Standards, however, presented the first direct confirmative evidence in the form of heating and cooling curves for electrolytic iron treated in such a way as to remove carbon and oxygen as far as possible.

Electrolytic Iron.

In the first set of samples the iron was thoroughly oxidised, then crushed and compressed into cubes, and reduced with hydrogen at 1 000 deg. C. These samples gave no trace of any A_3 transformation point, whereas electrolytic iron crushed and compressed gave a distinct A_3 point. This evidence, however, was discredited, because it was doubtful whether all the oxide had been reduced, and the absence of the A_3 point may have been due to isolation of the Fe particles by oxide films.

In another set of samples the carbon and oxygen was largely eliminated by treatment of the electrolytic iron with an NH_3–N_2–H_2 mixture, and in these samples the intensity of the A_3 point was very much reduced. The definite proof of the hypothesis is a very difficult problem, on account of the great affinity of iron for impurities, and the efforts so far made in the Westinghouse Laboratories have been fruitless. Whenever thermal curves have been obtained the A_3 point has appeared, but magnetic and micro-analysis have indicated that contamination has taken place. The work is being continued, however, and others interested in the problem are invited to co-operate.

There is no need to consider the pure iron-silicon diagram separately in this connection, as all iron-silicon alloys contain more or less carbon, and without carbon (or with carbon $<0{\cdot}001\%$) the diagram would probably consist of the liquidus and solidus lines only. In drawing the diagram for Fe–Si the carbon content must therefore be definitely indicated, as is done in Fig. 3, which really is a superposition of several Fe–Si diagrams with carbon contents varying from 0·01%. The data for these curves are largely obtained from Pilling and Halliwell for the A_1, A_2, and A_3 lines, while the A_4 lines have been drawn on the basis of the results of other investigators. The uncertain parts are shown in dash-dot lines as before.

Fig. 4 is a diagram for 2% Fe–Si alloys with carbon as abscissa, constructed on the basis of the scant data available (shown in full) and on the author's hypothesis.

In Fig. 5A have been collected, the data available for 4% Fe–Si alloys (drawn in full), on the basis of which the author has constructed the diagram shown in Fig. 5B. It will be seen from Fig. 5A that the points that Honda and Murakami interpret as A_1 (pearlite points) for carbon greater than 1·5% coincide with Pilling and Halliwell's graphite (A_G) points for carbon less than 0·5%. It is further noticed that for carbon greater than 1·5% Honda and Murakami found both A_{cm} and A_1 points. Their A_1 points (*MN*) were obtained from cooling curves, while their A_{cm} points (*OP*) were obtained from quenching tests, and it is not improbable that the lower part of *MN* might actually coincide with *OP*, the discrepancy being due to loss of carbon not having been taken into account. Pilling and Halliwell took particular precautions against loss of carbon by oxidation by using a high vacuum, and careful analysis before and after taking the cooling curves showed no loss. The author is, therefore, of the opinion that Honda and Murakami's curves should be shifted to the left to coincide with Pilling and Halliwell's, and that the resultant single curve is a cementite (A_{cm}) curve, as indicated by dot-dashed lines in Fig. 5A. The horizontal part of *MN* is probably a graphite line (A_G).

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These conclusions are partly based on the fact that, in the author's investigations, 4% Fe–Si alloys have never shown pearlite after very slow cooling, but only free cementite (Fe_3C) and graphite.

In the case of 6% Fe–Si alloys free Fe_3C does not appear, as graphitisation takes place readily during slow as well as during moderately fast cooling from 1 000 deg. C. For high silicon contents the equilibrium diagram consequently becomes simple. Even for high carbon contents, δ-iron does not appear, and α-iron prevails from solidification to room temperature.

By comparing the diagram of the magnetic properties (as represented by the hysteresis loss shown in Fig. 1) with corresponding constitutional diagrams (Figs. 2B, 4, and 5B for 0, 2, and 4% of silicon respectively) the variation of the magnetic properties can now be explained on the basis of the constitutional diagrams.

Considering first 0% of silicon, Fig. 2B shows carbon in solution up to about 0·008%, corresponding to the initial steep part of Fig. 1. With carbon increasing from 0·008 to 0·1%, it precipitates on slow cooling as free cementite, corresponding to the flat part of the diagram, and, for higher carbon, pearlite appears corresponding to the second steep part of Fig. 1.

For 2% of silicon, on the other hand, carbon above 0·008% appears as pearlite, without the intermediate step of free Fe_3C. The curve *MNO* in Fig. 4 would account for this. Confirmation in the form of cooling curves is lacking so far, the only evidence consisting of a few micrographs. According to the diagram it is possible to obtain carbon as graphite for carbon greater than 0·05% by long annealing at about 820 deg. C., in which case only a small amount of pearlite should be present, and the curve in Fig. 1 should become horizontal above 0·05% of carbon. Confirmation on this point is still lacking. The raising of the A_3 point makes it easy to obtain large grains by high-temperature annealing.

For 4% of silicon, carbon between 0·008 and 0·05, or perhaps 0·1%, is again precipitated as free Fe_3C. By annealing at 890 deg. C., graphitisation takes place more readily when the carbon exceeds 0·05% than with 2% of silicon, which accounts for the fact that the curve in Fig. 1 for 4% of silicon becomes horizontal for carbon greater than 0·1%. The absence of γ-iron makes it possible to get enormous grains for all carbon contents by high-temperature annealing.

With 6% of silicon graphitisation takes place so readily that it is difficult to obtain carbon in any other form than graphite above about 0·07% of carbon.

These diagrams also help to explain the various annealing and cooling phenomena that heretofore have had no satisfactory theoretical basis.

Why Magnetic Properties Improve.

For 0% of silicon, Fig. 2B shows why the magnetic properties improve as the annealing temperature is increased, as shown, for example, by the author's results in 1915. The permeability increases slowly as the annealing temperature is raised to 700 deg. C., then very rapidly as it is further raised to 800 deg. C., and again slowly for higher temperatures. Based on Fig. 2B, the unannealed forgings would be expected to contain more than 0·008% of carbon in solution (perhaps as high as 0·1% if the total carbon content were that high), because of the rapid cooling. Subsequent annealing and slow cooling tends to precipitate the dissolved carbon as free cementite, the more so the higher the annealing temperature, until the maximum precipitation occurs for slow cooling from 720 deg. C. Raising the temperature above 720 deg. should not affect the relative amounts of dissolved and precipitated carbon, and consequently should affect the magnetic properties only through grain-growth.

With 2% of silicon, the cooling rate from 780 deg. C. for low carbon contents (less than 0·02%) is of slight consequence, as carbon above 0·008% is precipitated as pearlite. For higher carbon contents there is a possibility of precipitating carbon as graphite by prolonged annealing at 820 deg. C., and this should result in a decided improvement of the magnetic properties, as already mentioned.

For 4% of silicon the cooling rate again becomes of prime importance, as seen from Fig. 5B. Carbon above 0·10% can here readily be precipitated as graphite by annealing at 890 deg. C., and the remainder (except the 0·008% that remains in solution) can be precipitated as free cementite by slow cooling.

Finally, it should be pointed out that it may be possible to reduce the amount of dissolved carbon in the finished material to a value below 0·008%, by extremely slow cooling, obtaining it in the form of cementite, pearlite, or graphite, with a corresponding improvement in the magnetic properties.

Conclusion.

In drawing the above constitutional diagrams the author has paid strict attention to the metallographic evidence available. As far as he is aware, there is no fundamental contradiction between the diagrams and the experimental data, although he admits having taken the liberty of making his own interpretation in some cases in which the experimental data do not agree. There are also a great many gaps that had to be filled in and that need direct confirmation, and it is hoped that this paper will serve as an incentive in this respect. The gaps are shown by dot-dashed lines, and should be regarded only as the author's idea as to the probable shape of the curves. By means of the above diagrams it is possible to explain the various magnetic phenomena exhibited by iron and iron-silicon alloys, both after slow and after rapid cooling.

It is interesting to note that predictions as to many of the constitutional features were first made on the basis of the magnetic properties, and that these predictions have subsequently been confirmed by careful metallographic investigation.

Magnetic testing is evidently much more sensitive in detecting small quantities of certain impurities, like carbon, and the form in which they exist, than is either metallographic or ordinary chemical analysis, and once the correct relationship has been established by ultra-careful means, magnetic analysis should be a powerful aid also in this branch of metallurgy.

INDUSTRIAL RESEARCH.

Its Bearing on British Electrical Development.

ON October 28th the first of the I.E.E. informal meetings of the new session was opened by the President, Colonel Sir T. F. Purves, who, in the course of his remarks, said that though the formation of the Department of Scientific and Industrial Research was an event which would continue to keep British industry anchored upon science, it was not enough. Those admirable supplementary bodies, the British Electrical and Allied Industries Research Association and its counterparts in other main branches of industry were also not enough. There would always remain a mass of practical problems that any industrial undertaking aspiring to regain and hold the markets of the world for this country must solve in detail for itself.

The very fact that scientific research had now, by universal consent, been made the business of the nation, might bring with it a new danger. The individual producing concern might become too trustful, and might be tempted to rely too much upon centralised sources of scientific information.

The report of the Committee on Industry and Trade indicated that the capital invested in the general electrical industry of this country was about 121 millions sterling and that the industry had only contributed about £50 000 to the Research Association in the five years ended 1926. It would be difficult to reconcile this fact with what was known of the excellence of British electrical equipment in the absence of a considerable amount of research by individual companies.

It was a difficult matter to assess the value of research to an industry in the form of a profit and loss account, because the result took on many different forms of value, for example, timely information thus obtained frequently prevented costly mistakes in the investment of capital. A celebrated leader of industry once expressed this view by saying that research enabled us to make our mistakes on a small scale. In his discussions, from time to time, with leaders of industrial undertakings carrying on research on a large scale, Col. Purves said he had always found the conviction that systematic research produced advantages far ahead of its cost.

Talking recently with Dr. F. B. Jewett, of New York, about the modern universality of scientific research in the industry of the United States, and the way in which it was rising to cater for the enormous *internal* demands of the country, he remarked that up to the present practically the whole effort was being made to provide for the needs of the home markets. " Our industry is facing *inwards*," he said, " and I sometimes wonder what will happen to the rest of the industrial world when it finds that, for continued life, it has to turn about, as it will some day, and face *outwards*."

Messrs. J. R. Bedford, H. Craske, W. Day, P. Dunsheath, W. A. Erlebach, A. F. Harmer, C. G. Garton, W. A. Gillott, J. G. Hines, A. N. D. Kerr, W. E. Lang, F. Ockenden, T. N. Riley, E. S. Ritter, J. F. Shipley, T. Wadsworth, and W. E. Warrilow, also spoke.

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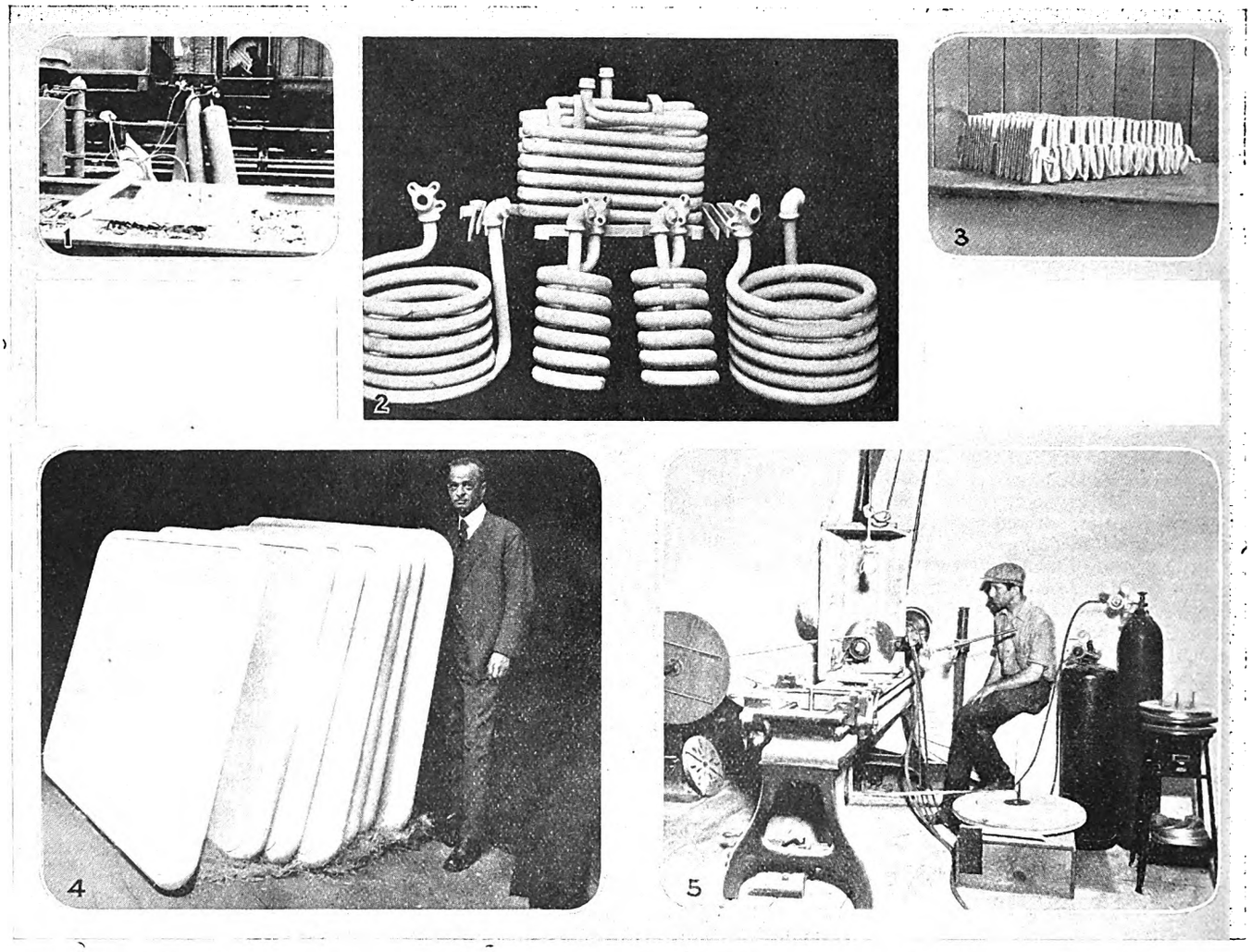

THE coating of metallic and non-metallic articles with a variety of metals by spraying is finding increasing application in the electrical industry. The pictures show (1) *Ends of railway rails sprayed with zinc.* (2) *Refrigerator coils coated with zinc. Some of these pieces were first covered with aluminium to which was applied a further coating of zinc.* (3) *Resistance units zinc sprayed.* (4) *Wood condensers coated with sprayed molten tin.* (5) *A* 500 000 *ft. length of* $\frac{3}{4}$ *in. paper tape coated with zinc* 0·003 *in. thick. Some details of the process are given in the accompanying notes.*

METAL COATINGS.

Process for Depositing Molten Metals by Spray Pistol—Some Electrical Applications.

THE possibility of applying metallic coatings of thicknesses from 0·001 in. upward to articles and parts of metallic or non-metallic construction, was recently made practicable by the pistol spraying process sponsored by the Metals Coating Co., Ltd.

The metal to be deposited is normally used in the form of ordinary commercial wire, but for special purposes metal dust or powder may be employed with a modified form of apparatus. A special type of spraying pistol is used and the wire is fed automatically from a reel into contact with an oxy-acetylene flame which melts the wire, and, in combination with compressed air, blows the atomised metal against the surface being coated at a velocity of about 3 000 ft. per sec. The metal, as it impinges against the surface, solidifies and practically becomes integral with the surface, from which it cannot be separated either by severe hammering or bending tests.

The pistol, which is known as the "Metalayer," is connected by means of a rubber hose to standard acetylene and oxygen cylinders, and also to a suitable supply of compressed air. The tool contains a wire feeding device which is rotated by a small air turbine through suitable reduction gearing. The feed mechanism pulls the wire from the reel and feeds it through the nozzle at a rate varying from 12 to 24 feet per min., according to the metal used.

The wire remains unaltered and nearly cold until it reaches a point about $\frac{3}{32}$in. from the nozzle. At this point the wire enters a reducing flame, and the minute particles of the molten spray are protected against oxidation, so that layer after layer may be deposited, if desired, the entire coating forming a coherent and adherent mass.

This metal-spraying tool weighs only $3\frac{1}{2}$ lb., and is manipulated by hand for most work, although for some purposes it is guided mechanically. The parts to be sprayed are first sand-blasted to obtain a clean open-grained surface. Then the surface is coated by merely holding the nozzle three or four inches from it and moving the tool about sufficiently to cover the entire area. In starting a new piece of work, the wire feed is adjusted by turning a small needle valve, which controls the flow of air to the turbine wheel.

For enlarging cylindrical parts, the work may be placed between lathe centres and revolved while a "Metalayer" is traversed lengthwise by the lathe carriage, in the same way that a turning tool is used.

Another important application in the case of cylindrical parts consists in applying a coating of some metal, such as copper, to withstand chemical action or corrosion, the coating in this instance being primarily for protection rather than as a means of enlargement.

The interior surfaces of tubes, even though small and of considerable length, may be coated readily by using a special internal attachment in conjunction with the "Metalayer" tool.

When comparatively small pieces are to be coated in bulk, a mass coating machine is used in conjunction with the coating tool.

The spraying process may be utilised for filling blowholes or other defective places in either grey iron, steel, or non-ferrous castings. Another application of considerable interest is the coating with aluminium of parts subjected to high temperatures to prevent oxidation and scaling.

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PRECISE MEASUREMENTS WITH AN A.C. POTENTIOMETER OF THE LARSEN TYPE.

Some Interesting Applications—Accurate Measurement of the Ratio of Two Potentials and their Phase Difference—Other Uses.

By E. R. WIGAN.

AN alternating-current potentiometer which can be used at speech frequencies is an extremely useful piece of apparatus. Prof. Larsen described his delightfully simple device in 1911.* No doubt the lack of suitable oscillators at that time caused its value to be unrecognised. The Cambridge Instrument Co. now make a potentiometer containing Larsen's elements. This instrument by various ingenious additions has been made into a precision instrument. The "impurity" of the mutual inductance, for example, is reduced almost to zero.† It is surprising, however, that the original device had not been widely used before this. Larsen himself suggests its use for measuring the efficiency of transformers and the attenuation of telephone lines.

The Arrangement Explained.

It is possible that experimenters were deterred by the difficulties, which are described by Larsen, due to leakage currents. By a simple arrangement these difficulties can be overcome and a high degree of accuracy can be obtained from the potentiometer.

The modified arrangement is described in detail in Appendix (1). The apparatus required is as follows:—Audio-frequency oscillator and accessories. Standard Campbell mutual inductance. Subdivided calibrated 10 ohm slide wire resistance. Calibrated decade resistance box. Two small 1/1 current transformers. An a.c. milliammeter. "Listening point"—consisting of a high impedance telephone receiver movement coupled to a microphone button (forming an amplifying system) and a pair of low resistance head-telephones with a suitable battery. In addition various uncalibrated resistance boxes will be required. Means of measuring the frequency of the oscillator current will be necessary.

With this apparatus it is possible to build up a potentiometer which will measure the ratio of two potentials and their phase-difference with very great accuracy. The absolute value of the potentials depends upon the reading of a current meter and is therefore dependent upon the accuracy of that instrument. The "impurity" of the current from the oscillator will also cause errors in estimating the true value of the potentials. But the accuracy with which the ratio of two potentials can be measured depends only upon (1) the accuracy with which the balance point can be found, and (2) the changes of potential caused by leakage currents. As will be shown the knowledge of the ratio of two potentials is in many cases sufficient and of great value.

In this potentiometer owing to the amplification at the listening point the accuracy of balance is usually within the limits of accuracy of the calibration of the apparatus used, and on account of the special arrangement of the windings of the isolating transformers and the reduction of earth-capacity at the listening point the errors caused by leakage currents are extremely small. This has been demonstrated by a large number of tests (all made at 800 cycles per second). See Appendix (2).

Telephone Cables and Networks.

The most valuable application of a potentiometer which will measure ratios accurately is to the measurement of the input and output voltages of telephone cables and networks. At the present time a common method of measuring the attenuation factor of a short length of cable is to measure the "open" and "closed" impedances from either end. This method is inaccurate if the cable is long or of high attenuation. In this case the attenuation can be accurately measured at one frequency only—that at which the phase change becomes 180°. With the potentiometer, however, no limitations are set provided both ends of the cable are available.

There is, however, a possible source of error. At the output end of an attenuating network the voltages are very small. When the potentiometer "potential leads" are applied to this end of the network small leakage currents may flow through that lead in which there is no listening circuit. Owing to the high series resistance of these networks such currents may cause considerable potential differences in the series members and thus will disturb the already minute p.ds. at the output end.

Experiments have shown, however, that errors from this source are extremely small. Cases have been chosen where the input to output ratio was known accurately. The ratio

* English Trans. ELECTRICIAN, Vol. 166, 1911, p. 738.

† See Campbell. Phy. Soc., November 23rd, 1928.

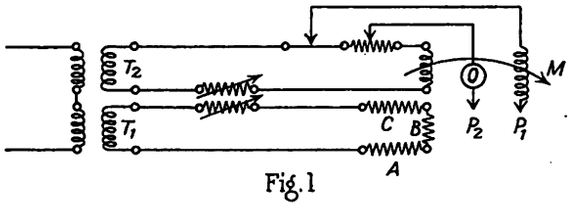

Fig. 1

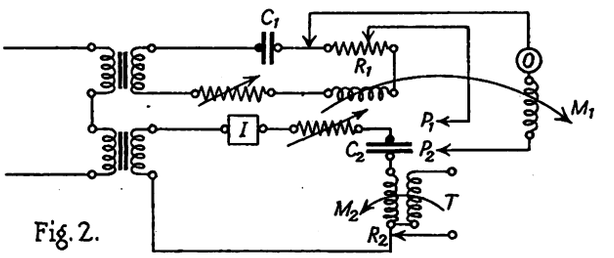

Fig. 2.

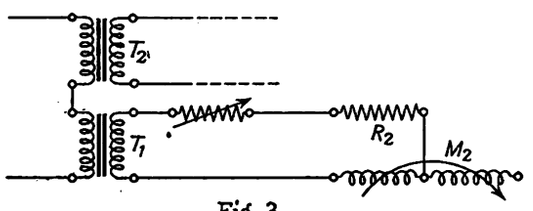

Fig. 3.

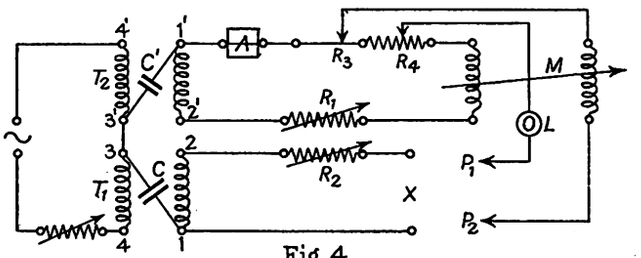

Fig. 4.

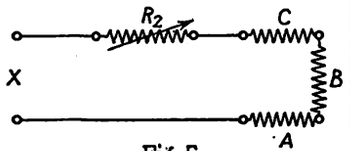

Fig. 5.

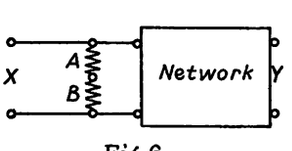

Fig. 6.

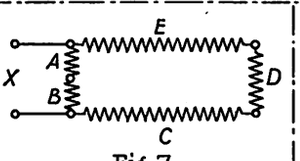

Fig. 7.

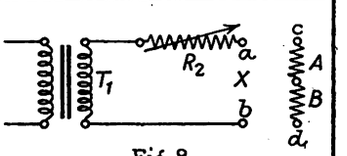

Fig. 8.

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as measured by the potentiometer was within the limits set by (*a*) errors of the potentiometer scales, (*b*) error of uncertainty in the known ratio. This refers to very large ratios of the order of 20. See Appendix (3).

A potentiometer is of assistance in the design of telephone apparatus and networks. The relative magnitude and phase-relation of the potentials in all parts of a complicated circuit can be determined without introducing any measuring instruments into the circuit. In such cases considerable differences of potential may exist between two parts of the network. For example in Fig. 1 there is scarcely any difference of potential between $P1$ and $P2$ and A. But there is considerable difference of potential between $P1$ and $P2$ and C if B is large. These differences of potential tend to circulate current through the inter-winding capacities of $T1$ and $T2$, thus affecting the potentials in the network and also slightly altering the current in the potentiometer circuit. Tests in Appendix (4) indicate how small are errors from this source.

Testing Condensers.

There are various special applications of a potentiometer which are of interest. The effective series resistance of condensers can be measured very simply. This will recommend itself to those who have attempted this test on a large number of condensers by the Carey Foster Bridge with a Wagner Earth. The arrangement is seen in Fig. 2, where $C2$ is the unknown carrying a current indicated by I and set by $R3$. The system $M2R2$ constitutes a dummy condenser, where $M2$ (which is negative) represents the true capacity and $R2$ the effective series resistance at the testing frequency. It is essential to know the frequency, so a standard condenser $C1$ is introduced into the potentiometer circuit. $M1$ and $C1$ can then be made the elements of a Campbell frequency-bridge by applying the lead $P2$ to a terminal of $C1$. In testing the condenser the leads $P1$ $P2$ are applied to the terminals of $C2$. The potentiometer is adjusted to obtain silence in the telephones. The leads $P1$ $P2$ are then transferred without reversal to the terminals T. $M2$ and $R2$ are then adjusted until silence is again obtained. $R2$ then equals the effective series resistance of the condenser. It should be noticed (1) that the resistances and inductance used for the potentiometer need not be " pure " or of a known value, (2) that the inductance $M2$ must be " pure." If the value of $M2$ is also known the capacity of $C2$ is at once calculable.

A second application of this potentiometer is of some interest. Frequency can be measured in terms of a resistance and a mutual inductance. The arrangement (Fig. 3) is :—

$R2$ and $M2$ are in series in the testing circuit. The potentials across $R2$ and the secondary of $M2$ are measured by the potentiometer. If $R2$ and $M2$ are " pure " these two potentials are at right angles to each other. Then if A and B are the readings of the resistance and inductance scales of the potentiometer when measuring the potential across $R2$ and C and D are the corresponding readings when measuring the potential across $M2$, it can easily be shown that :—

$$\frac{D}{A}=\frac{M2}{R2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

$$\sqrt{\frac{C}{B}\times\frac{R2}{M2}}=w=(2\pi f) \quad . \quad . \quad . \quad . \quad . \quad (2)$$

For this test the resistances and mutual inductances must be " pure." For an example of this test see Appendix (5).

It should be noted that in all the above tests the two transformers used in the potentiometer circuits were of perfectly simple design, and in fact had in the case of $T2$ an inter-winding capacity at least seven times greater than was necessary. By introducing five layers of 5 mil. Empire cloth between the windings the inter-winding capacity of these transformers becomes about 100 M.M.F.

It should be noticed also that all tests have been made with a small oscillator giving in no case more than 5 m.a. in the potentiometer circuit. The power available in the neighbourhood of the balance point is therefore small, but by means of the listening-point arrangements accurate balances have been obtained.

The work on this potentiometer has been carried out in order to show that Larsen's potentiometer is, with the modifications suggested, capable of working to the limit of accuracy set by the apparatus used in constructing it, and that this apparatus can be found in any laboratory where accurate high-frequency testing is carried out.

Permission to publish this work has been granted by Mr. W. H. Grinsted, of the Telephone Department of Messrs. Siemens Bros. and Co., Ltd., Woolwich, to whom the author is indebted for criticism and advice.

APPENDIX.

(1) The potentiometer circuit is shown in Fig. 4 where

A=Ammeter.
M=Standard mutual inductance.
L=Listening point.
X=Load terminals.
P=Potential leads.

The two transformers $T1$ and $T2$ are ordinary open iron circuit telephone induction-coils. $T2$ is the normal transformer 1 400/1 700 turns. $T1$ has the same turns ratio, but the secondary is wound on in the opposite sense to the primary.

The connections of $T1$, $T2$ are :—

Inner ends of inner windings	4 and 4′
Outer „ „ „	3 and 3′
Inner ends of outer windings	1 and 1′
Outer „ „ „	2 and 2′

The condensers C and $C1$ represent the interwinding capacities as being concentrated at the two adjacent faces of the windings.

C=110 M.M.F. and $C1$=700 M.M.F.

Any adjusting resistances such as $R1$ and $R2$ must always be added in the position indicated. The position in the circuit of L and the secondary of M is important.

No resistance must be added between 3 and 3′.

The oscillator should not be closer than 6 ft. from the inductance.

No earthing of the apparatus is necessary.

The capacity to earth of the windings of L should be reduced as far as possible. The mechanical connection between L and the microphone button should be of insulating material and of some length (say 2 to 3 in.). The slide $R3$ could be read to 0·01ω and was accurate to ·001ω. The resistance $R4$ was accurate to 1 part in 10 000.

The mutual inductance was also accurate to 1 part in 10 000.

(2) Consider a circuit as shown joined to the load terminals X in Fig. 5.

Let us suppose that in measuring the potential across B an error is introduced by leakage. This error will be of the same order when measuring the potential across A provided $R2$ is large. If then E_{A+B} is measured it will be different from the sum E_A+E_B.

Four Tests.

Four such tests are set out below :—

Readings of Potentiometer Scales.		E_A	E_B	E_{A+B}	E_A+E_B	Resistance of B.
1	R Ohms	30·805	30·850	61·670	61·655	100 nominal.
	M m.henrys	8·520	8·540	17·060	17·060	
2	R	29·160	58·440	87·600	87·600	200 nominal.
	M	8·245	16·495	24·735	24·740	
3	R	21·350	42·730	64·080	64·080	200 nominal.
	M	8·650	17·320	25·975	25·970	
4	R	20·130	60·450	80·530	80·580	300 nominal.
	M	8·355	25·100	33·450	33·455	

In all cases $R2$=800ω ; C=1 000ω ; A=Standard 100ω. And f=796 ~. Potentiometer current=4·3 mA.

The decade box in the potentiometer circuit could be relied upon to 1 part in 1 000. The mutual inductance could be set to 0·01 m.henry, and was accurate to 1 in 10 000.

The difference between (E_A+E_B) and E_{A+B} is equal to the sum of the errors made in measuring E_A or E_B.

It will be seen that the errors are very small and less than the probable errors in the apparatus.

(3) In the case of a ratio of the order 20 to 1 it is not possible to measure both voltages equally accurately. The arrangement is made as in Fig. 6.

A and B are standard resistances accurate to 1 part in 10 000. A is made 10 (or 20) times B. Then the potential at Y is compared with the potential at B. And $\frac{A+B}{B}=11$ (or 21) ± 2 parts in 10 000.

To compare the voltage ratio as indicated by the potentiometer with the ratio as indicated by the known resistances, a skeleton network of high resistance was set up (Fig. 7).

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E and C	D	Ratio $\frac{A+B}{B}$	Ratio $\frac{E+D+C}{D}$	Volts ratio measured $\frac{E_{(A+B)}}{E_D}=\frac{E_B}{E_D}\times 10$.
1 000	50	10	41·0	41·08
10 000	1 010	10	20·80	20·83
10 000	2 010	10	10·91	10·92
1 000	70	10	29·57	29·59
1 000	80	10	26·00	26·02

D was accurate to 1 in 1 000; E and C to 1 in 10 000.

(4) In Fig. 8 A and B are two resistances which can be connected to the terminals X by a reversing switch.

A was 100ω; B was 1 000ω.

A test was made at 796 cycles and with 2·0 mA flowing in the test circuit, that is the p.d. across B was 2·0 V.

The terminals a and c, and b and d were joined. The potential leads were applied to the terminals of A and the silent point was found. The connections were then reversed and so also were the potential leads. The silent point was found scarcely to have altered.

In the first part of the test there were 2·0 V available to produce leakage current, in the second part only a very small voltage. The leakage current produced by 2·0 V acting across the interwinding capacities of the transformers has therefore only a very small effect upon the balance conditions.

Taking two examples with slightly different values of current in the potentiometer circuit:—

	Readings of Potentiometer Scales R ohms	M milli h.
Test No. 1	58·73	8·800
	58·72	8·800
Test No. 2	48·98	4·853
	48·97	4·853

(5) A tuning fork of 791·2 (nominal) frequency was tested by this method.

A standard Campbell mutual inductance was used for the potentiometer circuit, with a standard non-inductive decade resistance.

$R2$ consisted of a 100ω standard resistance. $M2$ was a non-standard mutual inductance which was tested against the standard and was found to give a nearly silent balance point, and to have a mutual inductance of 30·20 m.h.

Using these fixed values for $R2$ and $M2$ four sets of readings were obtained by slightly altering the current in the potentiometer circuit:—

Test No.	Potl. across $R2$ R ohms	M m.h.	Potl. across $M2$ R ohms	M m.h.	f (calc.)
6 ..	.. 21·06	13·46	44·56	0·2825	790·7
7 ..	.. 25·61	14·23	47·13	3·440	790·2
8 ..	.. 29·45	14·775	48·93	3·955	790·2
9 ..	.. 32·97	15·21	50·37	4·425	790·3
					790·3 average

Error possible in each test 0·8 cycle.

During these tests the frequency of the oscillator output was kept at 1·8 cycles per sec. higher than the fork (9 beats in 5 seconds). The true frequency would appear to be 790·3 − 1·8 = 788·5. This was later confirmed by checking against a standard fork of 796 (±1 in 10 000) when 7·5 beats per second were obtained.

The true fork frequency was therefore 788·5.

BOOKS RECEIVED.

"Labrador's Fight for Economic Freedom." By Sir Wilfrid Grenfell. Self and Society Booklets, No. 19. (London: Ernest Benn, Ltd.) Pp. 36. 6d. net.

"Art and Everyman." By Ivor Brown. Self and Society Booklets, No. 20. (London: Ernest Benn, Ltd.) Pp. 28. 6d. net.

"The Consumer in History." By Prof. E. Levett. Self and Society Booklets, No. 21. (London: Ernest Benn, Ltd.) Pp. 40. 6d. net.

"Agriculture—Industry's Poor Relation." By G. Walworth. Self and Society Booklets, No. 22. (London: Ernest Benn, Ltd.) Pp. 32. 6d. net.

"Old and New Japan." By Dr. Ogata. Self and Society Booklets, No. 23. (London: Ernest Benn, Ltd.) Pp. 30. 6d. net.

"Capital, Labour and the Consumer." By Prof. Daniels. Self and Society Booklets, No. 24. (London: Ernest Benn, Ltd.) Pp. 36. 6d. net.

"Questions and Solutions in Magnetism and Electricity." Solutions by W. J. White. 3rd Edition. (London: Sir Isaac Pitman and Sons.) Pp. vii+178. 5s. net.

"Telegraphy and Telephony, including Wireless Communication." By E. Mallett. (London: Chapman and Hall.) Pp. ix+413. 21s. net.

INLAND TELEGRAPHS.*

A Forecast of Some Possible Developments.

By T. E. HERBERT, M.I.E.E.

IT is generally unsafe to attempt prophecy, nevertheless "where there is no vision the people perish." And so, I will venture to make an attempt to describe what I imagine will be the function of telegraphs some twenty or thirty years hence.

In the first place, the business community will have made the discovery that speeding up their methods will enable more business to be done with much less effort.

Every business office will be equipped with a teleprinter, and by means of a dial form of automatic switching, communications will be sent direct to the recipient. All the businesses where the office staff runs to even one typist will have the machine installed. In the case of very small firms, possibly the telephone connection may be used for the dual purpose, or perhaps several small firms may share a single telegraph wire.

The messages will be received on a form of receiving perforator in the main telegraph office of the town to which the recipient is connected, and in this way the message will be stored and sent in automatically to the recipient as soon as his circuit is free. It may be that several machines may be "lined up" on a rotary line switch with messages for a single subscriber, and will discharge their messages in sequence. This plan will enable the messages to be dealt with in a strictly routine manner in the same way as the morning mail, without fuss or flurry.

The telephone will, on the other hand, be used where discussion is essential, and all trivial inquiries made personally to important executives will be eliminated; surely I need hardly point out how much time can be, and is in fact, wasted by inquiries to particular people known personally to the caller for detail information which the executive has to obtain in a hurry while the telephone call is proceeding.

Sub-Audio Frequencies.

A service of the type I have sketched will need a large number of circuits, but these are already available, since it has been demonstrated that telegraphs can be worked at sub-audio frequency on telephone trunks without appreciable deterioration of the latter. When this source fails, voice frequency systems, or even multiplex systems, controlled by precision vibrators as regards the division of line, time will certainly meet the requirement.

There remains the problem of the delivery of messages. For the purely private messages where the recipient is not on the telephone—and the percentage of such messages to the total messages would tend to fall—there seems no alternative to delivery by messenger. If, however, the system as a whole can be made remunerative this does not seem a very serious matter.

The advantages of the plan I have outlined consist in transferring the human labour to the subscriber, but this does not represent any serious addition to his necessities, since the message can be telegraphed with just the same labour with which it would have in any case to be typed.

It only remains to add that salesmanship and adequate publicity are clearly essential to the early realisation of such a scheme. The engineering details would present no insuperable difficulties, but it may be interesting to point to a few other possibilities. In the first place, any telegraph message sent by telephone either from a telephone subscriber, a telephone kiosk or from a village Post Office or railway station would be typed as it is received at the main telegraph office, and would thus be transmitted to its destination; or perhaps the typewriter might have a perforating attachment to enable the message to be stored in the form of a perforated tape and so transmitted mechanically when a circuit is available.

The loss on telegraphs must ultimately be obviated, but, unfortunately, the problem cannot be said to have been solved by the Hardman Lever Report, by the recent Commission to America, nor yet by Lord Wolmer. On the other hand, the I.E.E. paper by Donald Murray† certainly did break new ground.

* Extracts from the Chairman's Address to the North Western Centre of the I.E.E., read at Manchester on October 22nd.

† "Speeding up the Telegraphs: A Forecast of the New Telegraphy," by Donald Murray. "Journal I.E.E." Vol. 63, p. 245, December 18th, 192

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HAMS HALL.

Opening of Birmingham's New Power Station by the Duke of York—A Brief Description of the Plant Installed for Initial Development.

THE first section of the Birmingham Corporation Electricity Supply Department's great new power station at Hams Hall was officially opened by the Duke and Duchess of York on Wednesday. On the arrival of the Royal party at the power station, the Lord Mayor presented Mr. R. A. Chattock, the City electrical engineer, and Councillor H. K. Beale, chairman of the Electricity Supply Committee. The party then proceeded to the engine room, where Miss Esther Chattock offered a bouquet to the Duchess of York, and Councillor Beale presented members of his Committee, officials of the Department, and representatives of the contractors. The Duke of York inaugurated the supply by starting up one of the sets, after which Councillor Beale presented the Duke with a silver-gilt model of the concrete cooling towers as a souvenir of the occasion.

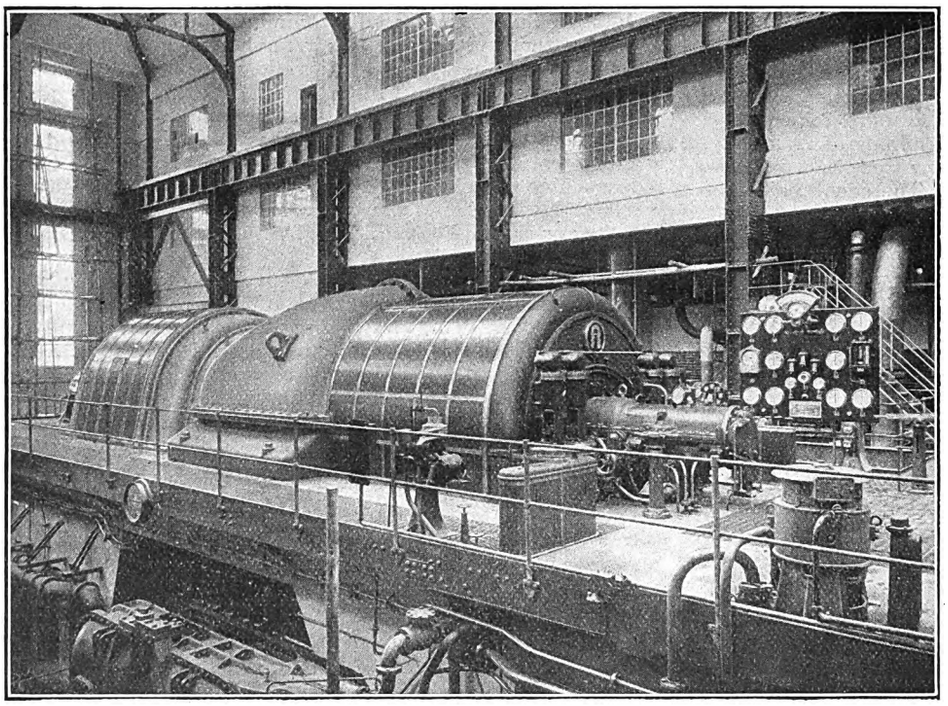

Fig. 1.—One of two 37 500 kVA turbo-alternators at Hams Hall: 11 000 V three-phase 25 cycles, 1500 r.p.m. (from turbine end).

The principal plant at present installed includes two main turbines and two house turbines constructed at the Fraser and Chalmers Engineering Works of the General Electric Co., Ltd. The main turbines have a maximum continuous rating of 30 000 kW and run at 1 500 r.p.m., while the house turbines have a maximum continuous rating of 1 875 kW at 3 000 r.p.m., and drive their respective generators through speed reduction gears. In all cases steam is supplied at 350 lb. and 700 deg., and the turbines are designed for 1 lb. per sq. in. absolute pressure at the exhaust.

The main turbines are of the single casing type, fitted with impulse blading throughout. The steam first expands in a velocity stage with two rows of moving blades, which are followed by three drums, of small to medium diameters, carrying 30 rows of blading, and the final expansion takes place in six single impulse stages of large diameter. All the blading, both moving and stationary, in the high pressure and intermediate pressure portions is completely machined, whereas in the low pressure portion the moving blades are machined all over, and the stationary blades are cast into the diaphragms. In the high pressure end the blading is made of nickel steel as far as the ninth stage of the first drum. Beyond this point all blading consists of stainless steel for the machined blades and rustless iron for the stationary low pressure blading.

The main shaft packing consists of a stationary bush made in halves, and a sleeve mounted on the shaft. The bush is centred in the casing by means of flexible fins, and strong flanges at either end render the necessary stiffening against distortion. In addition, circular keys are inserted between the packing flanges and the casing, with an expansion clearance for radial outward movement, but with a definite stop to prevent closing inwards. The flexible centring fins are so proportioned that no undue force is transmitted on the horizontal joint bolting of the casing. The sealing fins have less than 0·1 in. pitch.

The front end of the turbine casing is made of cast steel, the exhaust end of cast iron. The joint between the two parts lies in the region of pressure below atmospheric, and, in consequence, is subject to only moderate temperatures. The high pressure end of the casing forms the live steam belt, which is closed at the horizontal joint, the steam being admitted to the top half through external pipes. The casing is provided with three bleeder branches for feed

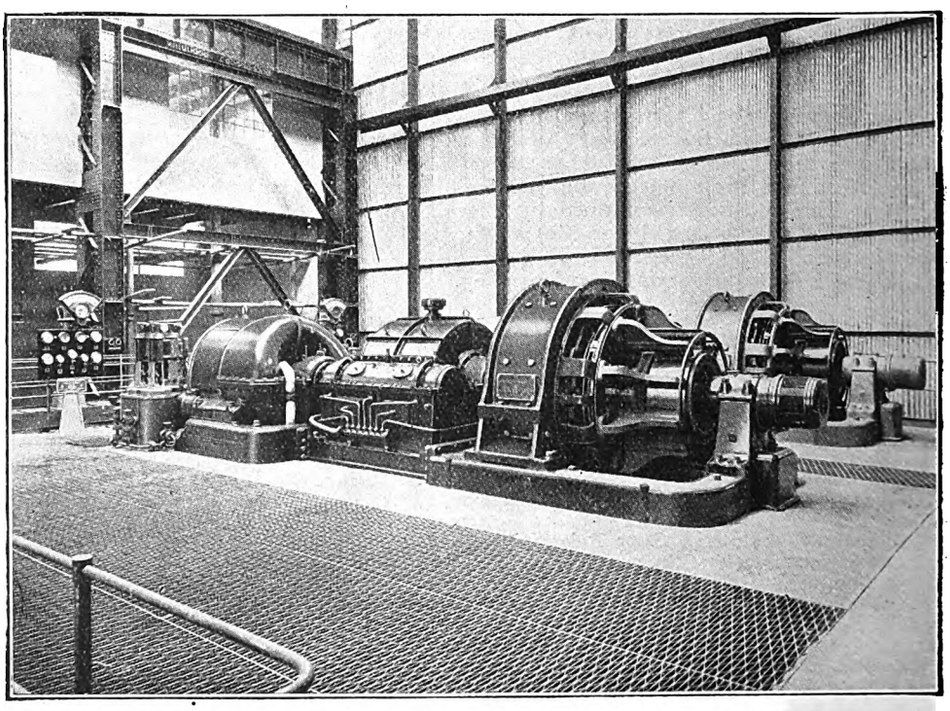

Fig. 2.—Two 1[875 kW geared turbo-generator sets at Hams Hall: 440/480 V, 500 r.p.m.; turbine speed, 3 000 r.p.m.

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heating purposes. These are arranged after each of the three drums.

As the leaving energy of a stage preceding a bleeder branch is practically lost, advantage has been taken of a larger blading diameter in the next following drum in order to obtain the most favourable relation of blade length and mean diameter.

The residual longitudinal thrust of the rotor is taken up by two Michell thrust bearings. One of these carries the load, whereas the other is adjusted with a small running clearance to act as standby.

The main coupling is of the flexible claw type, which locates the longitudinal position of the alternator rotor. The coupling sleeve has two projections turned in the bore, by means of which projections and two steel discs the coupling sleeve is definitely fixed to the shaft ends.

On either side of the front bearing pedestal are arranged the steam chests, and there are four throttle valves for 0·4, 0·6, 0·8, and 1·0 load. Two live steam pipes, each with their own stop and emergency valve, lead to the left and right-hand side steam chests respectively.

The oil for the relay service and lubrication is obtained from two main oil pumps driven through worm gearing from the main shaft. A stand-by oil pump of the turbo type is provided, and is motor driven and automatically controlled. It is mounted on the oil tank, which has a capacity of 1 300 gals. The oil coolers, which are of the Serck type, are duplicated and provided with interlocked change-over valves.

Nine impulse stages, of which the first is of the velocity compound type, are provided in the house turbines.

Each of the first three stages is fitted with completely machined stationary blading of nickel steel, while the centre portions of the first two diaphragms are steel castings. No cast iron has been used for any part in the high temperature region. The remaining diaphragms are made of cast iron fitted with rustless iron blading. All moving blades are of stainless steel.

Live steam is admitted to the bottom half of the casing only so that the horizontal joint is not subject to live steam pressure. Three throttle valves control the steam. The oil pump on the turbine supplies oil for relay service and for lubrication of turbine gears and generator outboard bearing. An automatically-controlled motor-driven pump acts as standby.

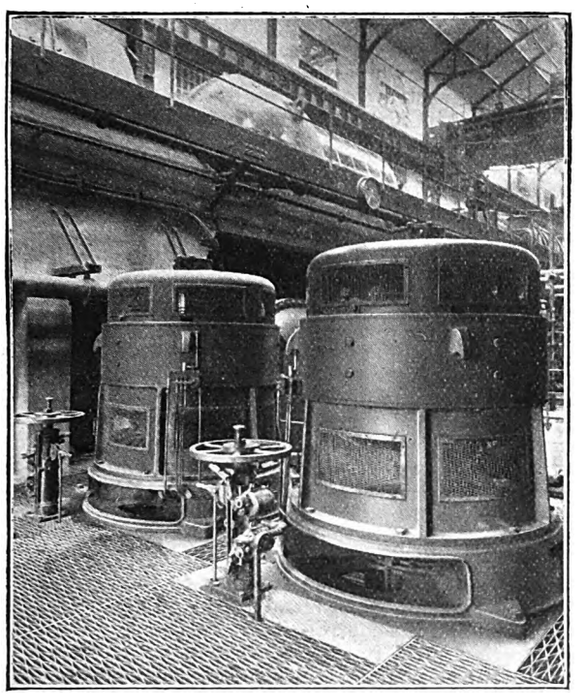

Fig. 3.—Two 400 h.p. vertical spindle d.c. motors driving circulating water pumps ; 440 V, 550/600 r.p.m.

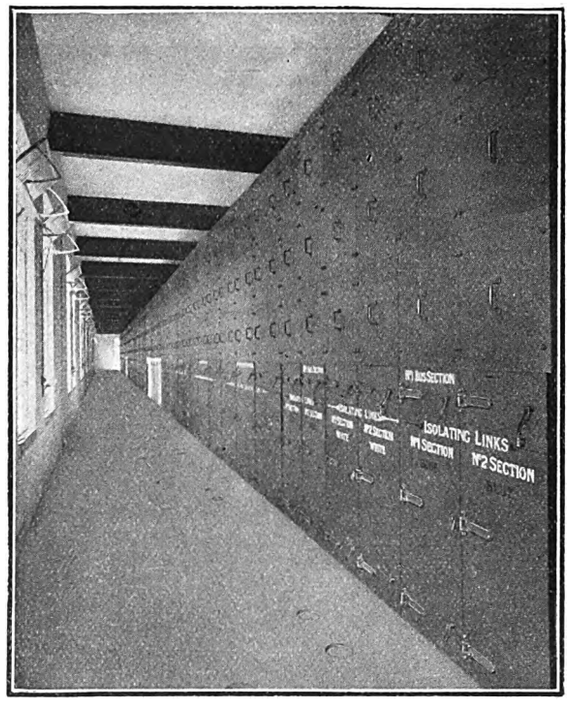

Fig. 4.—The 11 000 V high tension stonework cubicle switchboard in the Hams Hall station.

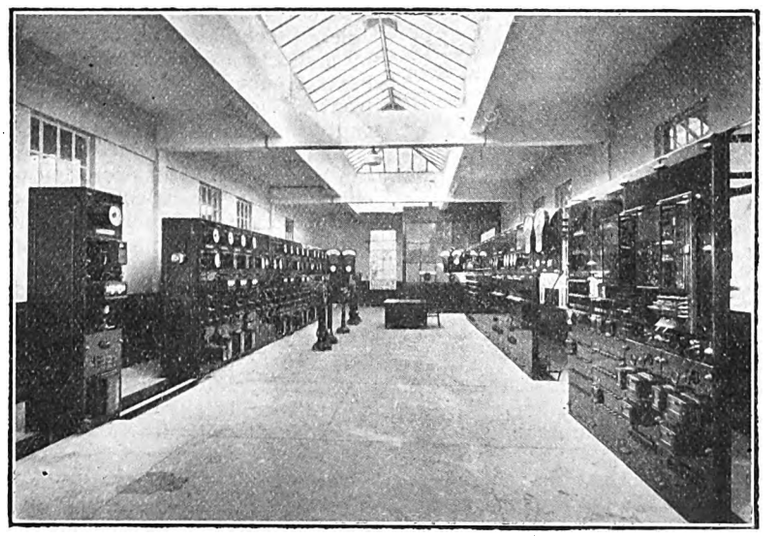

Fig. 5.—Control room with electrical remote control switchboards at Hams Hall ; a.c. control board on left and d.c. control board on right.

Generating Plant.

The two main alternators, coupled to Fraser and Chalmers turbines, are of the General Electric Co.'s standard type, and are capable of a continuous output of 37 500 kVA at 0·8 p.f. (30 000 kW). The machines generate at 11 000 V three-phase 25 cycles, and run at 1 500 r.p.m. Cooling of the ventilating air (which is on a closed circuit) is effected by means of twin tubular type air coolers mounted in the foundation block beneath the alternator, and across its axis. The hot air from the machine is discharged downwards between the two sections of the cooler, divides and passes horizontally through the two sections and re-enters the alternator at both ends. Automatically-operated doors and louvres provide for the admission of air from the engine room and the isolation of the cooler sections in the event of failure of the water supply to the cooler, but the doors are so interlocked with the protective system of the alternator that they can be kept shut in case of emergency.

Due to transport difficulties it was necessary to build and wind the alternator stators on site under the main engine room crane. The reason for this will be better appreciated when it

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is realised that the completed stator weighs 125 tons, whereas the heaviest single part of the stator to be brought to site weighed only 27 tons. The alternator rotor, which is built from a solid forging, weighs 45 tons, and was brought to site complete.

Driven direct from the end of the alternator rotor are the exciter and the auxiliary generator. These machines are

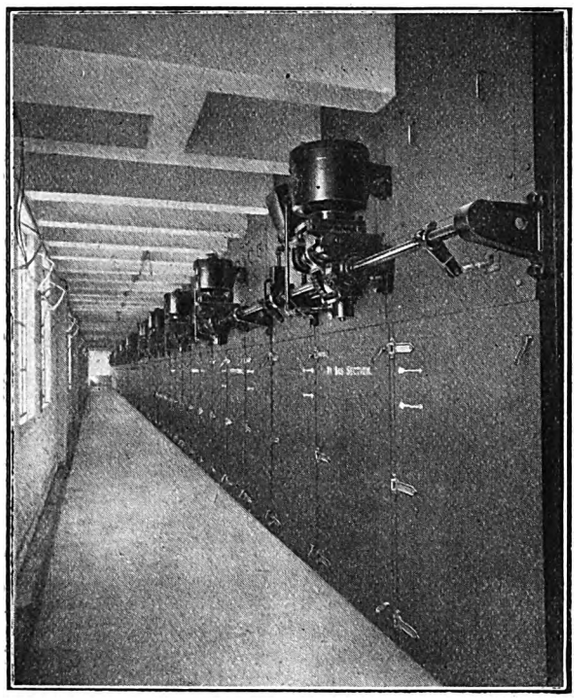

Fig. 6.—The 11 000 V high tension stonework cubicle switchboard (showing oil circuit breaker cubicles, solenoid operated).

electrically separate, but they are mounted in a common shell. Excitation is at 220 V, while the auxiliary generator is of sufficient capacity to supply one main circulating water pump and one main extraction pump with energy at 440 V.

There are two circulating pumps and two extraction pumps per set, one of which is normally supplied from the auxiliary generator and the other from the d.c. board, so that two separate and distinct electrical systems have to fail simultaneously before the set is shut down due to absence of power from the condenser auxiliaries. The d.c. switchboard can, moreover, be supplied from three separate sources.

The house service d.c. generators are one of the sources mentioned above. These two machines are also made by the G.E.C., and each gives 1 875 kW at 460 V. They run at 500 r.p.m., and are entirely standard.

Another d.c. supply for the station auxiliaries is given by the two G.E.C. motor-generator sets erected at ground floor level. They consist of 500 kW generators direct coupled to 750 H.P. motors supplied from the 11 000 V busbars through reactances. The sets run at 500 r.p.m.

The third source is the 440 V 2 000 Ah battery supplied by the Tudor Accumulator Co.

Auxiliary Drives.

Over 150 motors for auxiliary services, with a total capacity of over 10 000 H.P., have been supplied, ranging from fractional horse power machines driving remote controlled regulators, oil purifiers, etc., to the 750 H.P. motors of the motor generator sets. Special mention may be made of the circulating pump motors (two for each main set) which are d.c. vertical spindle machines, having an output of 400 B.H.P., with a speed range of 550/600 r.p.m., so that at light loads the quantity of circulating water may be reduced, with corresponding decrease in the power absorbed by the pumps. The extraction pumps in the pits on the boiler house side of the sets are also driven by vertical spindle d.c. motors, rated at 57½ H.P.

The boiler pumps are driven by two-pole 440 H.P. slip-ring induction motors. The special point of interest in these lies in the control gear. There is an ordinary hand-operated liquid starter connected in series with a slip regulator. When the liquid resistance is all out, the speed of the motor is 1 250 r.p.m. Between this speed and the maximum determined by the slip of the motor at the particular load the speed is automatically controlled by means of a Ruggles Kluijemann regulator, in such a way that the feed water pressure at the boiler is kept constant.

The twenty-five pulverisers are all driven by G.E.C. motors. Four pulverisers per boiler are connected to 120 H.P. two-pole induction motors at 1 475 r.p.m. and one per boiler to a 144 H.P. shunt-wound machine. The a.c. motors have totally enclosed slip-rings, while the d.c. are totally enclosed with a special cooling system for the air inside the casing. Each pulveriser has the coal feeder table driven by a small compound wound motor having a speed range of 400 to 2 000 r.p.m. obtained by series and shunt regulation. This gives complete control of the coal feed from the firing platform on which all the startors and regulators are mounted.

Switchgear.

The switchgear section includes numerous features worthy of comment. The equipment, all of which was supplied by the G.E.C., and manufactured at their Witton Works, includes a large 11 000 V stonework cubicle switchboard, electrically remote controlled, a d.c. flat back switchboard which is also electrically controlled, together with the control boards.

In addition there are several electrically-operated auxiliary switchboards, a low-tension a.c. board of the metal clad type controlling the house supply from two 1 750 kVA transformers, and a 33 000 V isolating link cubicle board on the e.h.t. side of the main transformers.

The whole of this switchgear is contained in the Switch House, a four-storey building adjacent to the main building. On the top two floors are installed the 11 000 V stonework cubicle board and the control board, the former occupying the greater portion of the two floors, while on the two lower floors are situated the d.c. and a.c. boards, auxiliary panels, and the 33 000 V isolating link cubicles.

The 11 000 V cubicle board is divided into 21 main panels, control being provided for the two 37 500 kVA turbo-alternators, six trunk feeders supplying power direct to various sub-stations, two 500 kW motor generator sets and two 1 750 kVA works supply transformers. There are also several cubicles containing busbar couplers, section switches and such necessary gear.

Main and transfer busbars are each provided with their own sets of isolating links, etc.

The equipment of the cubicles—which is practically the same for all the circuits controlled, with the exception that each alternator is supplied with a potential transformer and two oil circuit breakers, one for connecting to the main busbars and the other for the transfer bars—consists of an oil circuit breaker, isolating links and instrument transformers of Chamberlain and Hookham manufacture. The stonework cubicles are built up of slabs of moulded stone into a cellular construction forming compartments in which apparatus of different phase and polarity may be isolated so far as practicable. Steel plate doors fitted at back and front and fastened by padlocks are provided, while, in the case of the oil circuit breaker cubicles, the operating solenoids are mounted on the front. For all the circuits controlled the breakers have a rupturing capacity of 750 000 kVA.

The control room contains the necessary control boards for the remote electrical operation of the switchgear previously enumerated. These control boards extend down both sides of the room, facing each other, that controlling all a.c. circuits being on one side, while that controlling all d.c. circuits is lined up on the opposite side.

Dealing first with the a.c. board, this controls the alternator cubicles, six trunk feeder cubicles, bus section switch, bus coupler, works supply cubicles, and the two motor generator cubicles.

Each alternator control panel is equipped with two two-way control switches for operating the oil circuit breakers, red and green signal lamps indicating the position of the breakers. A further control switch operates a single-phase oil circuit breaker installed in the neutral earthing circuit of each alternator. The instruments on the panel include ammeters, power factor meter and indicating wattmeter, two synchroscopes (one for each set of bars), integrating watthour meter, regulator and governor motor controllers, air door relay and field suppression switch.

Each feeder control panel possesses an oil switch controller, ammeter, single pole leakage relay and a triple pole inverse time overload relay.

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All the alternator, feeder, works supply and motor generator panels are equipped with the G.E.C. protective system (McColl patents).

Two large voltmeters mounted on a bracket at the end of the board indicate the main and transfer busbar volts respectively.

The d.c. control board is equipped with panels controlling the two auxiliary generators, the d.c. sides of the two 500 kW motor generator sets, battery and booster, trip circuit master control, works lighting and power, and the two house turbo-generators. Several blank panels are left unequipped for future extensions.

Engine room telegraphs and telephones are also installed in the control room, and are mounted on pedestals in front of the appropriate panels.

The d.c. switchboard is on the same floor level as the turbo-alternators, and is housed in one room. The positive and negative boards controlling the same circuit are separated from each other so that the board is split into positive and negative sections. The panels control the two 1 875 kW house turbo-generators, the two 500 kW motor generators, the boiler house works supply, auxiliary generators and condenser auxiliary, 220 V lighting circuits and battery. Thus three sources of supply are available for the d.c. board, namely, the house service generators, the motor generators, and the battery.

Most of these panels are equipped with a new type of d.c. circuit breaker which has recently been developed by the G.E.C. It is known as the line contact circuit breaker, which is said to give a greatly improved form of laminated contact. The laminations are in the form of standard vee-edged blades, bedding into corresponding grooves formed in the contact block. By using any number of these blades any capacity of circuit breaker may be constructed up to 20 000 A with ease, and without overheating. Those on the various d.c. switchboard panels vary between 1 000 and 4 000 A capacity.

By an ingenious feature of design, not only are the contacts self-aligning, but they are self-cleaning as, during the process of closing, a vertical sliding action is transmitted to the blade so that each surface is effectively cleaned at every operation of the breaker. The auxiliary metal contacts are designed to maintain their pressure even under short circuit conditions until the blade contacts are well clear of the top block. Sure and rapid breaking under the heaviest short circuit conditions is accomplished by means of the auxiliary carbon blocks and arc-breaking devices.

In the basement of the switch house are located the main 12 000 kVA feeder transformers, of Ferranti manufacture, together with the three G.E.C. 1 750 kVA works supply transformers, one of which functions as a spare. Each of these latter transformers is supplied with three-phase 25 cycle current at 11 000 V, stepping down to 440 V. The cables from the secondaries of the two transformers in use are taken to two incoming units of the low tension metal-clad switchboard situated on the same floor. This switchboard, which supplies power to the various boiler house drives, comprises 12 units, two incoming and ten outgoing, each unit being equipped with an oil circuit breaker of 150 000 kVA rupturing capacity.

The 33 000 V isolating link cubicles are also housed in the basement, together with the liquid earthing resistances for earthing the neutral points of the two main turbo sets, and the six main feeder transformers. Each of the latter is situated in a separate room, the six rooms running the length of the switchhouse. With each transformer is associated one of the 33 000 V isolating link cubicle switchboards previously mentioned, and the appropriate earthing switch.

(*To be continued.*)

OVERHEAD LINES OR UNDERGROUND CABLES?

Circumstances in which the 33 kV Feeder System might be Laid Underground—New Excavating and Laying Machinery—Comparative Costs with Two Systems.

By COL. R. E. CROMPTON and DR. ALFRED EKSTROEM.

THE part of the grid which we believe to be the most important, and on which most of the Central Board's capital will be spent, is the development of the 33 kV feeders radiating from the selected power stations to distribute in bulk to undertakings supplying the surrounding urban and rural districts.

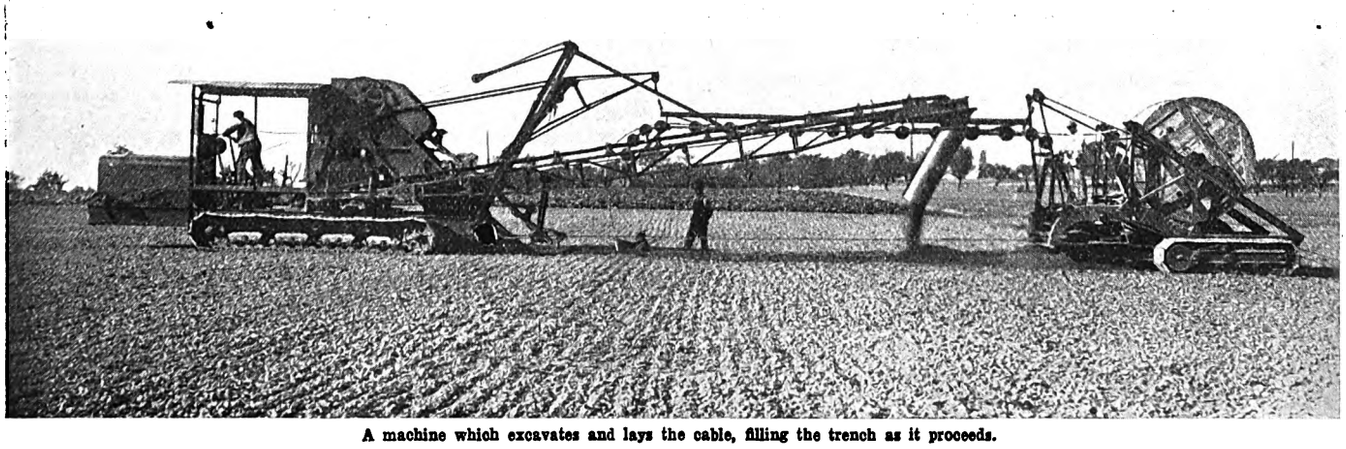
Only a few years ago nobody would have thought of building these systems other than with overhead line constructions, but modern engineering technique develops quickly and the cable manufacturing industry is in this respect no exception. Underground cables for 33 kV are now in extensive use and it is only a matter for economical consideration whether these lines should be built overhead or underground..

After considering the problem we maintain that by means of cable-laying machinery, such as that illustrated, the cost of laying the feeder cables underground can be reduced to a very low figure.

If the cable is laid at a depth of 4 ft. from the surface of the ground it will be sufficiently protected from damage by farming operations, so that for cables up to 20 kV the cost of steel-armouring can be saved, if necessary, for economic reasons. Again, the careful handling of the cable by this laying machinery will make it possible to reduce the strengthened construction necessary when the cable is to be laid by hand.

Again, the cost of wayleaves will be considerably lower when underground cables are used instead of overhead line construction, and there will be a certain saving in the actual length of the copper conductors due to the absence of catenary and avoidance of curves when an underground cable-line is used.

But even if, with the allowances mentioned above, the first cost of underground cables proves to be higher than that of overhead lines, this difference may be reduced by the following factors :—



A machine which excavates and lays the cable, filling the trench as it proceeds.

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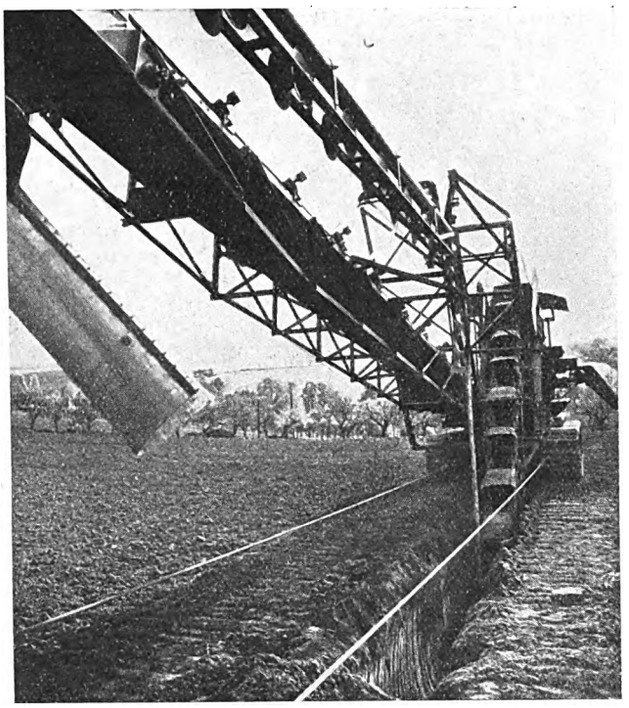
(1) Underground cables have a considerably longer life than overhead lines, and, therefore, the annual depreciation cost will be reduced.

(2) There will be fewer disturbances and interruptions due to weather conditions in a supply with underground cables, and this of itself reduces the cost of inspection and maintenance, and the losses from interrupted supply.

(3) The more reliable service obtained by an underground cable supply is important to the consumers, especially for industrial undertakings.



View of cable-laying machine showing the excavating arrangements and the earth return chute.

(4) The supply by cable will improve the power factor in comparison with that for overhead lines.

An Example.

Let us now assume that two places have to be connected for supply by a 33 kV transmission line of either overhead three steel-aluminium wires, each equivalent to 64·5 sq. m/m. = 0·1 sq. in. copper, or, in consequence of suitable soil conditions, by an underground cable of 3 × 50 sq. m/m. = 0·0 775 sq. in. copper.

We assume that when using overhead lines the actual length of copper will be 22 miles = 35 km., but with underground cables it will be only 19 miles = 30 km.

First Cost:—1. Overhead Line.—(Equivalent to 3 × 0·1 sq. in. copper wires.)

We assume that the cost of an overhead construction as above, according to the specifications of the Central Board, will be about £1 000 per mile, to which we must add £4 4s. for capitalised cost of wayleaves per leg of the pylons. Thus:—

22 miles at £1 000	=	£22 000
Capitalised cost of wayleaves	=	880
Total		£22 880

2. Underground Cable.—(Compounded, steel-armoured, paper-insulated, 3 × 0·0 775 sq. in. copper wires, each core lead-covered.)

We assume that such an underground steel-armoured underground cable will cost £1 300 per mile delivered at the place where it is to be laid.* Thus:—

19 miles of cable at £1 300..	=	£24 700
Cable boxes, joints, cable laying, etc. ..	=	3 500
Capitalised cost of wayleaves	=	200
Total		£28 400

The first cost of an underground cable would thus be about 24% greater than that of an overhead line.

* Prices received from a plant on the Continent.

Annual Working Cost.

Overhead Line.	£	*Underground Cable.*	£
(1) 7% interest on £22 880 .. .. =	1 601	(1) 7% interest on £28 400 .. .. =	1 988
(2) 1·6% depreciation (corresponding to 25 years life of overhead line) .. =	366	(2) 0·35% depreciation (corresponding to 45 years life of cable) .. .. =	99
(3) 4% management and upkeep .. =	915	(3) 1¼% management and upkeep .. =	426
(4) Dielectric losses (not estimated).. =	0	(4) Dielectric losses (1·7 kW per mile), 32·5 kW × 8 760 hrs. = 285 000 kWh at 0·3d. per unit .. .. =	356
(5) Copper losses, 650 kW × 2 000 hrs. = 1 300 000 kWh at 0·6d. per unit .. =	3 250	(5) Copper losses, 716 kW × 2 000 hrs. = 1 432 000 kWh at 0·6d. per unit.. =	3 580
(6) Losses due to interrupted service =	250	(6) Losses due to interrupted service =	50
Total	£6 382	Total	£6 499

These figures show that the cost of energy supplied by the Central Board to distributing undertakings may not be appreciably greater when using underground feeder cables in place of the proposed overhead lines.

This example is obviously not applicable to all parts of Great Britain. In parts where the soil is not suitable for cable laying the costs may increase to such an extent that overhead line construction is necessary. It shows, however, that the question of laying the 33 kV feeder system underground ought to be taken seriously into consideration wherever the soil conditions are favourable.

Drop in Voltage on 33 kV Line for Transmission of a Load of 8 600 kVA.

(1) Overhead Line.—22 miles 3 × steel-aluminium wires equivalent to 3 × 0·1 sq. in. copper wires:—

Ohmic drop in voltage	$R = I \times r \times l$	= 1 430V
Inductive drop in voltage	$X = I \times m \times l$	= 1 320V
Total drop in voltage	$Z = \sqrt{R^2 \times X^2}$	= 1 950V

(2) Cable.—19 miles 3 × 0·0 775 sq. in. copper wire:—

Ohmic drop in voltage	$R = I \times r \times l$	= 1 590V
Inductive drop in voltage	$X = I \times m \times l$	= 365V
Total drop in voltage	$Z = \sqrt{R^2 \times X^2}$	= 1 970V

From the above it can be seen that an overhead line of 3 × 0·1 sq. in. regarding total drop in voltage is equivalent to a cable of 3 × 0·0 775 sq. in.

It should also be noted that in consequence of the large electric capacity of the cable, a better power factor (cos φ) is attained than when an overhead line is used.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Our House in Order."

[To the Editor.]

Sir,—I feel I must write and thank Mr. Donald Smeaton Munro for his amusing contribution to our controversy, and although I was greatly entertained thereby, I am sorry that I was not greatly helped.

Surely Mr. Munro is not serious when he says that we have got beyond the "What shall I do" stage; the quotations I gave in my summary of the position definitely indicate the opposite. And I can give other instances of the widely divergent opinions of those to whom we look for a lead.

For instance, concurrently with Mr. Munro's very definite statement in the last issue of The Electrician—"when we work to rules, it logically follows that inspection is necessary"—we find no less a person than Mr. Willoughby Ellis in "The Electrical Review" stating the exact opposite, as follows: "There is not the slightest need for an army of inspectors, or other officials, to administer such compulsory rules. Half a dozen prosecutions and convictions would do more to "cook the goose" of the shoddy worker than all the inspectors or 'compulsory registration' in the world." (Domestic Service, October 18th.)

Well, to continue Mr. Munro's theological similies, are we to believe in the gospel according to Donald, or in that according to Willoughby, to bring us to our Paradise? Even then,

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I certainly do not expect to make a watertight compartment of the installation industry as Mr. Munro suggests. I am optimistic enough to think that there will always be sufficient contractors left to work out at more than one per town, and, in any case, I cannot think that our industry can be anything but better for the elimination of the incompetent. *Is* there no such thing as competition between, for instance, registered chemists?

There is undoubtedly, as Mr. Munro emphasises, a vast amount of apathy amongst contractors generally, but we must look for the cause of this. Many of these apathetic contractors *have* been registered, and *have* been members of the E.C.A., in some cases I know of have held office, and they must be reawakened to a sense of their responsibilities. How better can this be done than by letting them see the organised contractors going ahead with one voice and one policy, instead of twenty.

Mr. Munro must not think that I am in any way attempting to belittle the great progress made by the Register, or the valuable work done by the E.C.A. My own firm has been registered since the inception of the Register, and we have for years provided *two* members to the district branch of the E.C.A., one of us being its chairman. We therefore know what has been done, and can appreciate to the full the great amount of time and energy spent by our officers, mostly gratuitously, but we must not rest on our laurels. We want to get further and we *can* get further, but not until we know our own minds.

I am not particularly biased one way or the other; I may have leanings in one direction, but I believe I represent the view of the rank and file when I say we await a lead, something a little more definite than Mr. Munro's "work for the industry." We are all doing this, I hope, but our work will be the more effective if it is all in the same direction. As Mr. Willoughby Ellis himself says, earlier in the article I have already quoted, "it is most clearly apparent that the industry itself must entertain no two opinions on this vitally important matter."

To make a tangible start, will Mr. Munro bring his opinion into line with that of the President of the E.C.A., and thus "work for the industry?"—I am, etc.,

T. C. GILBERT.

Folkestone.

P.S.—I do not "claim" to be a Bolshevist, I have been *called* that, however.—T.C.G.

"Where *Is* That Battery?"

[TO THE EDITOR.]

SIR,—Since reading Mr. Raymond J. Mitchell's letter, which appears in your issue of November 1st, I have had the opportunity of also reading his letter of August 30th, in which he made the suggestion that a large sum of money should be put up to enable further research to be carried out with a view to possible improvement in storage batteries. Whilst in every way thoroughly appreciating what Mr. Mitchell means, I also think that now we have such a great improvement as the steel constructed, nickel-iron battery, we should at least be thankful for the really great work that has been carried on now for over twenty years with that particular object in view, namely the marketing of a real good engineering job in the form of storage batteries.

As regards battery performance, I think I can claim to be quite unprejudiced, for I have used many makes and types of accumulators during my experience, and I am very much surprised to learn that Mr. Mitchell claims that the nickel-iron battery has a commercial energy efficiency lower than the lead-acid cell, as I have found, in the course of many experiments, that there is not much to choose between them from the overall efficiency aspect, when subject to the strenuous duty and exacting demands of locomotive and road traction work. Even lead-acid battery medicine men have, at various times, admitted that the nickel battery is technically a superior piece of storage equipment, but, of course they point out that the cost is higher, that is to say the "first cost, is more for given output, etc. The truth of their views can be seen at the present time, when certain well-known, and experienced lead-acid battery manufacturers are to-day offering the "nickel-iron" cell as an approved alternative.

For a given commercial output, I am sure that Mr. Mitchell is well aware that the "nickel-iron" cell is lighter, and is much the better and cheaper of the two types, when capitalised out over the normal life of the locomotive or road vehicle. I am sure that the extensive research work which is going on in both camps at the present time will still further improve and, possibly, reduce the cost of storage equipment.

As I pointed out in my letter of October 18th in connection with the "Paragon" system, we have the very material advantage of still further reducing the weight of either type of battery, for given amount of ton-mileage duty done, and over given routes and weather conditions, by reason of the fact that we have improved the physical operating efficiency of battery traction generally, in the form of completely cutting out the tremendous resistance losses during "acceleration," and recuperating the "kinetic" energy so produced when stopping or running down grades, to a far greater extent than has been previously carried out. This results in a reduction of battery capacity of at least 30%, and it is for that reason that the cost of a complete "Paragon" locomotive, although fitted with a nickel-iron battery, is very little if any above the cost of an ordinary series-parallel locomotive fitted with a lead-acid accumulator.

The traction motor which is installed on the 100 H.P. "Paragon" battery locomotive has an electro-dynamic efficiency of 90%, so if Mr. Murphy has been able to produce a much smaller motor, such as would be required on a gross load of 12 tons, with an efficiency of 88%, it is very fine work, and should receive every possible encouragement. Now, in regard to regeneration, I have to thank Mr. Mitchell for his estimate that I get 10% return energy. I have to say that he is not quite right, though not far out for level road starting and stopping operations, but, when running down grades these locomotives are every day returning as much as 40 and sometimes 50% of the energy which they drew from the accumulator, when climbing the same grades at practically the same speeds. However, be that as it may, the great thing is that, if desired, we may have the material advantage of the long life of the nickel-iron battery at practically the same overall cost, besides all the even greater advantages of infinitely variable speed, both in acceleration and deceleration, apart from being in a position to run at any speed, without the electrical losses (all of which must be first put in, and then taken out of the battery) which are unavoidable in the normal type of series-parallel type of vehicle.

With regard to Mr. Mitchell's remarks about progress, I fail to see any improvement from the old single and two motor equipments which we had in use over 30 years ago, and can assure Mr. Mitchell that we had small motors, even in those days, having efficiencies as high as 85 and 87, but, owing to the absence of any other type of storage battery, and the high electrical losses which are unavoidable in such systems, that although many thousands of pounds sterling had been spent in the attempt, no improvement of a very highly technical nature has really taken place during the intevening period.

It is indeed interesting, however, to read Mr. Mitchell's statement that he has witnessed a recuperation of as much as 70% of the "retardation" energy, at all useful speeds; if he means 70% of the kinetic energy of the moving vehicle, I am sure that it is most excellent work.

I am still of the opinion that the time for a change has arrived, and it behoves accumulator traction engineers to do their best to forward the day when London, and many other large crowded cities, shall reap the great hygienic advantages of smokeless, noiseless, and poisonless operation of passenger and goods carriage, which can only be got from super-efficient electrically propelled vehicles.—I am, etc.,

WILLIAM P. DURTNALL.

London, S.W.1.
November 2nd.

"Sound Recording."

[TO THE EDITOR.]

SIR,—Further to Mr. Campbell Swinton's letter on the Electro-magnetic Method of Audio-frequency Recording, I, too, recall Dr. Poulsen's "Telegrafon" being demonstrated to me many years ago in Copenhagen.

To the best of my recollection Mr. Campbell Swinton was in Copenhagen at the same time. It was interesting to observe how different the recorded voice reproduced to the recorder, due, no doubt, to skull resonance.

On the other hand, when I listened to a reproduction of the demonstrating engineer's voice, it was *absolutely* recognisable, and, as Mr. Campbell Swinton remarks, only needed the addition of a modern valve for pure amplification.—I am, etc.,

H. ANTONY HANKEY.

London, W.6.
October 29th.

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NEWS IN BRIEF.

New Zealand and the Pacific Cable—The World Power Conference—Liverpool Electro-Harmonics—The Adventures of a 45-ton Stator—Pulverised Fuel Lectures.

FOR working wireless sets without licences, 130 persons were summoned at Birmingham last week.

A bill confirming the sale of the Pacific cable to the Communications Co. passed the New Zealand House of Representatives on October 21st.

A meeting of the Women's Engineering Society will be held at the Lyceum Club, London, on November 19th, when Miss Winifred Pink will give an address.

Before a well-attended meeting of the Diesel Engine Users' Association on November 1st, Mr. J. G. Pearce (director, British Cast Iron Research Association), read a paper on "Modern Engineering Cast Irons and their Properties."

An electrical device for detecting dirt is reported to have been developed in New York.

Barking U.D.C. recommends a tender, amounting to £500, for the erection of a sub-station at Gale Street.

Guildford Corporation has placed a contract amounting to £47 647, for extensions at the generating station.

Eastbourne Electricity Committee has accepted a tender for the erection of a switch house at a cost of £4 600.

A woodpecker having made a transmission pole unsafe at Newark, Notts, the supply was recently suspended in order that repairs could be effected.

Glasgow Watch Committee has asked the General Manager of the Electricity Department to prepare an estimate of the cost of wiring the various fire stations.

At a meeting of the South Midland Centre of the I.E.E. on November 11th, Mr. H. W. T. Taylor will read a paper entitled "Voltage Control of Large Alternators."

Prince Chichibu formally opened the Engineering Congress and World Power Conference at Tokio on October 29th. The number of British delegates attending was 35.

A meeting of the Overhead Lines Association will be held at the I.E.E. on November 20th, when Mr. Borlase Matthews will deliver a paper, illustrated by cinematograph, entitled "Standard Intermediate Voltages for Rural Electrification."

There was a good attendance of members of the electrical trade at the first dinner and concert of the season under the auspices of the Liverpool and District Electro-Harmonic Society. Mr. P. J. Robinson, city electrical engineer, Liverpool, presided.

At the meeting of the Institution of Electrical Engineers, North Midland Centre, at the Hotel Metropole, Leeds, on November 12th, Mr. E. J. Evans will read his paper on "Feed Heating by Extracting Steam in Generating Stations," for which he was awarded a premium last session.

A meeting of the Institute of Fuel will be held jointly with the Institution of Electrical Engineers in the Lecture Theatre of the Institution on November 21st, when three papers will be presented, in abstract only, all dealing with the subject of low temperature carbonisation in connection with the production of electricity. Sir Thomas Purves will preside.

The Board of Education announces the award of two Whitworth Senior Scholarships of the annual value of £250 and tenable for two years, six Whitworth Scholarships of the annual value of £125 and tenable for three years, a Whitworth Prize of £10 to a candidate who qualified for a scholarship but was unable to accept it, and 24 Whitworth Prizes of £10 each to unsuccessful candidates for scholarships.

The Commissioners of H.M. Works, etc., invite tenders for alterations and extension of the Wick wireless station.

The annual general meeting of the Junior Institution of Engineers will be held at 39, Victoria Street, London, S.W.1, to-night (November 8th), at 7.30.

The value of wireless in educational development has been extensively recognised, but Sheffield is probably the first of the Universities to bring broadcasting into its curriculum.

The first ordinary meeting of the thirtieth session of the Scottish Centre of the I.E.E. will be held at the Royal Technical College, Glasgow, on November 12th, when the chairman, Mr. George Morgan, will deliver his inaugural address.

Shipley U.D.C. has had under consideration the question of the re-arrangement of the lighting of the Victoria Hall, made necessary by the recent alterations, and has decided to instruct the Electrical Engineer to obtain schemes and estimates.

Ripon Corporation has received an application from Messrs. Freeman, Hardy and Willis for one of their shop lights to be used as a night light at no cost to them. A scheme is to be prepared for various shop lights to be used for public lighting in the city.

The London office of Kalgoorlie Electric Power and Lighting Corporation has received a cable from Kalgoorlie stating that a heavy storm and lightning have damaged the terminal house and that repairs will take several days to complete.

At a meeting of the Institution of Mechanical Engineers, on November 29th, Mr. R. H. Parsons will open a debate on "The Registration of Reliable Tests for Power Plant Machinery." A meeting of the Graduates' Section will be held on November 18th, when Mr. A. G. Brown will give an address entitled "Artificial Lighting of Factories and Public Buildings."

A recommendation that automatic road traffic signals be installed at 21 additional points, making 38 in all, was discussed by Edinburgh T.C. on October 31st. It was decided that 11 of the selected sites be remitted for further consideration.

A 45-ton stator was removed by the English Electric Co., Preston, by road to the Ribble power station last week. A specially adapted vehicle, drawn by a traction engine, was used. The generator, to which the stator belonged had been taken to the company's works for reconstruction, and its capacity was increased from 12 500 kW to 15 000 kW.

One hundred and thirty members and guests were present at a supper given at the Duke of Cornwall Hotel, Plymouth, on October 26th, by the Devonport Dockyard electrical department, Mr. H. F. Hunt, superintending electrical engineer, was in the chair, and the guests included the director of electrical engineering at the Admiralty, Mr. W. McClelland.

A special course of five lectures dealing with pulverised coal, at the London County Council School of Engineering and Navigation, Poplar, on Wednesday evenings, commenced on November 6th, and a special course of six lectures on the principles of electric welding will take place on Friday evenings commencing on November 8th. The latter course of lectures, which will be delivered by Mr. J. T. Bush, commence at 7 p.m., and the former, which will be given by different specialists, at 7.15 p.m. The fees for each course, for residents in the County of London, if over 21 years of age, are 3s. 4d., and if under 21, 1s. 8d.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated November 8th, 1879:—*

The death was announced of Prof. James Clerk Maxwell.

A leading article emphasised the need for widening the scope of the Society of Telegraph Engineers to enable it to cater for the increasing applications of electricity in other directions.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *recorded that:—*

Mr. J. Wilson Swan received a Knighthood, and Mr. C. A. Parsons, the C.B., in the Birthday Honours List. Swan was also awarded the Royal Society's Hughes Medal "for his invention of the incandescent electric lamp and various improvements in the practical applications of electricity."

* * *

FIFTEEN years ago it was stated in THE ELECTRICIAN *dated November 6th, 1914, that:—*

Mr. Llewellyn Preece presented to the I.E.E. a marble bust of Lord Kelvin.

* * *

TEN years ago THE ELECTRICIAN *of November 7th, 1919, stated that:—*

Mr. W. R. Cooper resigned the editorship of THE ELECTRICIAN.

Negotiations were proceeding for the absorption of the business of Brown, Boveri and Co., by Vickers, Ltd.

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PERSONAL.

MR. A. Dallow, electrician, had been re-elected unopposed a member of the Wolverhampton T.C.

Mr. T. Smith, electrical engineer, Haslingden, has been re-elected a member of the T.C.

Mr. T. R. McCandish, constructional engineer at Torquay electricity works for the past seven years, has secured a position with the Croydon Electricity Department.

Sir Hugo Hirst will give an address to the students of Faraday House Electrical Engineering College on November 18th at 11.30 a.m.

Mr. C. R. Westlake, assistant electrical superintendent to the Bedford T.C., has been appointed engineer and manager of Dumfries Electricity Department.

Mr. C. E. Hart has been appointed representative for handling the transformer products of the British Electric Transformer Co., Ltd., in Scotland and Northern Ireland.

Ald. G. B. Brooks, chairman of Marylebone (London) Electricity Committee, has been nominated to represent the Council as associate member of the Electrical and Allied Industries Research Association.

Mr. Harold W. Millatt, showroom superintendent of Chester Electricity Department, has been appointed sales engineer to the Bedford Electricity Department, at a commencing salary of £400 per annum.

There was an interesting ceremony at Newark last week, when Mr. A. J. Waring, the borough electrical engineer, was presented with a canteen of cutlery and set of carvers on leaving to take up his appointment at Felixstowe.

The marriage was solemnised at Biggleswade on October 31st of Mr. Charles Redvers Westlake, chief electrical engineer of the Dumfries County Council for the Gretna and Durnock district, and Miss Winifred Lucy Luxton Western.

Mr. W. Griegson Pickvance, managing director of Pickvance, Ltd., who was borough electrical engineer for Wrexham Corporation from 1907 until 1920, was elected a member of the Wrexham Town Council for the Maesydre ward last week. Mr. Pickvance has also had a consulting practice since 1920.

Estate of the gross value of £23 481, with net personalty £23 199, was left by the late Mr. Herbert Louis Leach, consulting engineer, who died on August 16th, aged 64 years. He left, among other bequests, £100 to the Institution of Electrical Engineers' Benevolent Fund, and a like sum to the I.E.E. Research Fund.

Hammersmith (London) Borough Council has appointed Mr. George Cheyne Law, deputy electrical engineer and manager to Barnes U.D.C., to a similar position in connection with the Hammersmith electricity undertaking, at a salary of £800 per annum, rising by increments of £25 to £900 per annum.

Practically the whole of the employees of the Plymouth municipal tramways and transport undertaking assembled on October 27th, when Mr. E. E. Ackland, chief assistant, made presentations to the departing engineer and general manager, Mr. H. P. Stokes, and his wife. Mr. Stokes, it will be remembered has accepted the position of general manager of the United Automobile Services Co., Ltd.

Power Lines, Ltd., are desirous of transferring Mr. Piercy from Ripon to Uttoxeter, where his services are required for the supervision of certain overhead construction. Ripon Electricity Committee desires Mr. Piercy to remain until the Littlethorpe and Bishop-Monkton distribution system and the connections at Ripon are completed, when a further application for his transfer will be considered.

Mr. E. S. Evans, who has been district engineer of the E.L.M.A. Lighting Service Bureau for the North-East Coast since its inception in 1925, and during this year has been manager of the E.L.M.A. stand at the North-East Coast Exhibition, sailed last week for South Africa, to take charge of lighting development work in that country. Mr. Evans's resignation represents a considerable loss to the lighting development in this country and South Africa will be richer by his efforts.

Obituary.

MR. GEORGE ARMSTRONG PEARSON.—On October 20th, aged 56 years. Mr. Pearson was lecturer in electrical engineering at Halifax Technical College.

MR. WILLIAM F. KING.—In 1869 he joined the staff of the French Transatlantic Cable Co., and in 1873 was appointed chief engineer to the Western and Brazilian Telegraph Co. In 1894 he started in business for himself at the Leith Electric Works, Leith.

BUSINESS ITEMS.

MR. ALEXANDER AULD has commenced business as an electrical engineer at Wellington House, Alloway Place, Ayr.

The telephone number of HOPKINSONS, LTD., Centrifuge Works, Huddersfield, has been changed to Huddersfield 3 469.

A DEPARTMENT of the factory of Messrs. Wm. Hollins and Co., Ltd., at Nottingham, illuminated by Geco reflectors and Osram gasfilled lamps.

MR. C. H. B. STANSFIELD, radio engineer, of Beckenham, has transferred his business to 5, Kelsey Park Road.

MR. W. A. GOODHEW, electrical and radio engineer, of Canterbury, has removed his business from 19, Sturry Road, to 22, Sun Street.

The Radcliffe offices of the LANCASHIRE ELECTRIC POWER Co. have now been transferred to the Kearsley power station, the postal address of which is Stoneclough, Nr. Manchester.

The Southampton branch of the GENERAL ELECTRIC Co., LTD., has been removed from 24, High Street, to 149, High Street. The telephone number has also been changed from Southampton 4463 to Southampton 5631-2-3.

The EDISON SWAN ELECTRIC Co., LTD., has opened new offices and stores at 9, Whimple Street, Plymouth, under the supervision of the Southampton depot manager, Mr. W. A. Maddick.

RD. JOHNSON, CLAPHAM AND MORRIS, LTD., advise us that they have been appointed wholesale distributors of E.L.M.A. lamps, and the showrooms at Lever Street, Manchester, have been reconstructed.

In connection with the electric cooking equipment on board the R101 airship, the AUTOMATIC TELEPHONE MANUFACTURING Co., LTD., point out that this equipment was supplied by them as sub-contractors to the Air Ministry, through the main contractors for the whole of the electrical equipment of the airship, HASLAM AND NEWTON, LTD., Derby, who also designed and manufactured the control switch gear.

A few years ago the Admiralty decided to adopt Yarrow land boilers for the boiler house extensions at H.M. Dockyard, Devonport North, and four units were supplied by YARROW AND CO., LTD. As a result of the performance given by these boilers, the company has just secured the order for a fifth repeat unit, comprising, as before, a "Yarrow" patent boiler, integral superheater, mechanical forced draught stoker, and cast iron economiser superposed in series. It will be recollected that this firm also supplied the latest boiler installation for Portsmouth Dockyard, comprising six water-tube land boilers.

BRITISH BROWN-BOVERI, LTD., inform us that they have secured the contract for the equipment of the two rectifier sub-stations required in connection with the electrification of the Madras suburban section of the South Indian Railway. The sub-stations will be located at Egmore and Minambakkam, and will each contain two 750 kW rectifier plants with h.t. and l.t. switchgear and feeder switchgear, the whole to be designed for automatic control. One sub-station will be fed with three-phase current at 5 000 V, and the other at 33 000 V, 50 cycles, the d.c. pressure being 1 500 V. The plants have to be capable of handling very heavy overloads.

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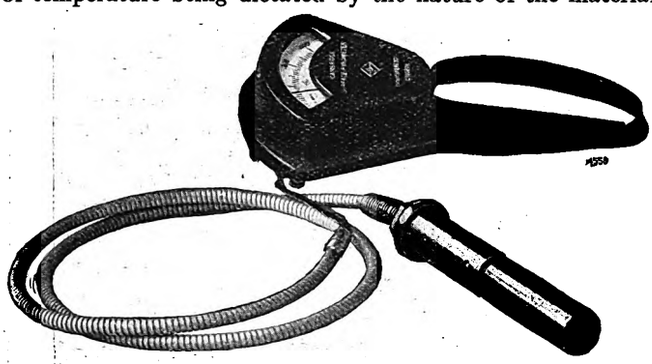
PLASTIC MOULDING.

Use of Surface Pyrometers for Temperature Maintenance.

IN the manufacture of plastic articles in heated moulds, satisfactory results can only be secured if the temperature is maintained within definite limits, the permissible variation of temperature being dictated by the nature of the material being moulded. Two new surface pyrometers (Models 33 and 34), just introduced by the Cambridge Instrument Co., Ltd., provide accurate and convenient means for quickly determining the inside surface temperatures of bakelite and other moulds, and of the heated surfaces of mould presses.



The Model 33 surface pyrometer of the Cambridge Instrument Co., Ltd.

Each instrument comprises a sensitive thermo-element connected by a short length of flexible steel armoured lead to a portable indicator calibrated to read directly in degrees of temperature. The thermo-element is protected by a cylindrical metal sheath which, when the thermo-couple is applied to the hot surface, is forced back against a spring so as to bring the end of the loop into contact with the surface.

When in use the thermo-couple is held in one hand and applied to the heated surface, while the indicator is held in the other. The instrument gives a steady reading almost instantaneously. In Model 33 (illustrated above), the thermo-couple is a thin flat strip formed into a small loop, and the sheath is directly attached to the end of the flexible leads. In Model 34, the thermo-couple is of wire form, flattened at the thermo-junction to form a small thin plate, and the thermo-couple sheath is pivoted to the end of a hollow metal rod which facilitates the application of the thermo-couple to surfaces which are not easily accessible.

In addition to their usefulness in determining surface temperatures of moulds, the instruments have also a wide field of utility in other manufacturing operations where it is necessary to ascertain surface temperatures with rapidity and accuracy. They may be used, for example, as insertion pyrometers for testing the temperature of field coils, etc., or as surface pyrometers for flat or curved surfaces as well as bearings, motor and generator parts, low tension bus bars, high tension cables, and other parts susceptible to a critical rise in temperature.

SCOTTISH CENTRE, I.E.E.

The Twenty-Ninth Annual Report of the Committee.

IN its report on the 1928–29 session the committee of the Scottish Centre expresses gratification at the continued prosperity of the Institution as a whole. During the session thirteen papers were read and discussed and the syllabus included a greater number of informal papers, dealing with matters of local interest, than has been hitherto customary. The average attendance at the ordinary meetings was 73. The session closed with a total membership of 738, being an increase of 41 on the previous year.

The Dundee Sub-Centre has recorded its ninth session of good work, the membership now reaching 57. The Students' Section has been specially active during the session and two of the student members gained Institution Premiums for their papers. The average attendance at the meetings held in Glasgow was 37, and at those in Edinburgh 26, giving the Section average as 31. The membership of the Section is now 157, and it is hoped that a better average will be forthcoming.

The committee regrets that greater support has not been forthcoming for the Golf Championship in connection with the Scottish "Centre Benevolent Cup."

IN PARLIAMENT.

Unemployment Relief and Electrical Development—Questions on Supply Failures.

IN the House of Commons on Monday, Mr. J. H. Thomas, Lord Privy Seal, gave an outline of his proposals for providing work to increase national efficiency, to stimulate exports and to improve industry's productive capacity. He mentioned that a further work programme amounting to £13 000 000 by the Underground Railways was under consideration, that the Central Electricity Board had placed contracts totalling £1 250 000 since July, and schemes were in existence covering nearly half the country. The Post Office, he said, was to spend £750 000 this year and £750 000 next year on telephone extensions.

Mr. Snowden (Chancellor of the Exchequer) stated, in reply to a question on Monday, that the terms of reference of the Committee of Inquiry into Finance and Industry would be "To inquire into banking, finance and credit, paying regard to the factors, both internal and international, which govern their operations, and to make recommendations primarily for the relief of industries, and calculated to enable these agencies to promote the development of trade and commerce and the employment of labour." He also made a statement as to the personnel of the Committee, which includes Mr. L. B. Lee, president of the Federation of British Industries, 1929–30, the Hon. R. H. Brand, a director of the Newcastle-upon-Tyne Electric Supply Co., and other companies, and Mr. J. F. Taylor, chairman of William Beardmore and Co.

Mr. Herbert Morrison, Minister of Transport, is informed that the Committee appointed under Part I of the Development (Loan Guarantees and Grants) Act has received an application for assistance in connection with various schemes which include a proposed railway running northwards from Finsbury Park.

In reply to questions as to whether he intends to introduce legislation requiring the certification and stamping of all electric meters, the Minister of Transport says representations in regard to this matter have been made to him by certain public authorities, and the matter is under consideration.

The Minister of Transport understands from reports in the Press that there have been certain temporary local failures of electric light supplies in the County of London during the last six months. He thinks that undertakers are fully alive to their statutory obligations as regards continuity of supply, but allowance must be made for unavoidable accidents. At present he does not intend to hold an inquiry.

Replying to a question by Major Glyn as to the average cost per point of electric light in cottages in Cumberland, Derbyshire, Northamptonshire, Essex, Hampshire and Berkshire, the Minister of Transport says he is not able to give the average cost of current per week, per lighting point, in cottages in the counties referred to. So far as he is aware there are only a few cases where electricity is supplied to small consumers at so much per lighting point. There are, however, a number of cases where the undertakers charge in accordance with a two-part tariff consisting of a fixed charge per quarter, plus a small charge per kWh for each.

LEGAL INTELLIGENCE.

Standard Telephones and Cables and Extension of Patent Period.

IN the Chancery Division on Monday, Mr. Justice Luxmoore heard an application under the Patents Acts for the extension of time of certain patents of the Western Electric Co., Ltd., to run.

Mr. Trevor Watson, said the application was made in respect of three patents of August 7th and September 6th, 1913, all of which had now expired. The application was made on behalf of Standard Telephones and Cables Co., who were the Western Electric Co. under another name. The latter operated in Great Britain for a corporation in Chicago to exploit its inventions. The nature of the inventions was improving long-distance telephony, but owing to the war the Post Office abandoned all constructional schemes, and the company became concerned on munition work, and they lost the whole period of the war, not coming back to their usual work till 1919. In fact, the company were dependent on the Post Office laying down long-distance lines. There was no opposition to the application.

His Lordship extended the patents from September, 1929, to August, 1934.

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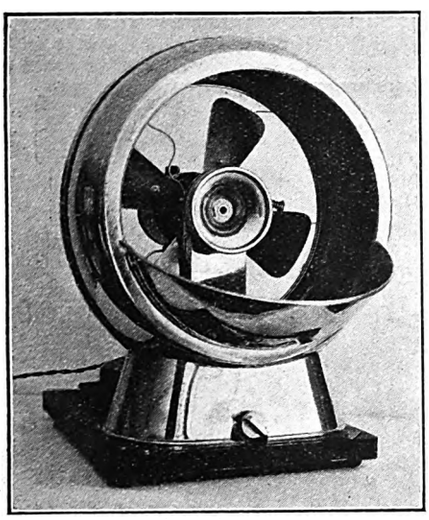
MATERIALS AND EQUIPMENT FOR MANUFACTURERS.

Apparatus for Purifying Air in Works, etc.—A "Carrier Ring" Coupling Device—New Equipment for Fighting Fires—Gas Analysis.

AN interesting air purifier put on the market by the ELECTRICAL EQUIPMENT AND CARBON CO., LTD., of Bank Buildings, 107, New Oxford Street, London, W.C.1, is the "Aerosan." This not only cleanses the air in the building, but also reduces it in temperature by—it is stated—some 50%. It is shown in an illustration on this page, and consists essentially of a combined exhauster and blower driven by an electric motor. A container at the base of the machine is fitted with a solution of "Aerosan essence"—a disinfectant supplied by the firm, and into this container dips a sprocket chain driven from the motor. The solution is thus drawn up gradually to a semi-cylindrical chamber, known as the diffuser, placed in a horizontal line with the centre of the fan. From this point it can be projected into the room in the form of a liquid spray or a vapour, according to the adjustment of a small handle on the side of the case. The surplus liquid runs down a copper tube to the container. A feature of this means of keeping a building disinfected is that the fan can be simply mounted on a bracket.

The Electrical Equipment and Carbon Co. has also introduced a new electric drilling machine, the "Mignon," with a capacity of 10 W. It has a form of switch which is easily operated with the lightest pressure of the finger, and a spirit level is provided. The dimensions are, outside diameter, 2¼ in., total length, 9½ in. The total weight is 2 lbs., 2 oz. The standard model is fitted with 3-jaw chuck for drilling up to 3 mm. in metal, and combined B.C. adaptor and plug; 6 mm. chucks for woodworking can be supplied as extras.

A new type of flexible coupling has been introduced by the POWER PLANT CO., LTD., West Drayton, Middlesex. This "carrier-ring" coupling combines two principles for obtaining flexiblity. There is flexibility due to the mechanical design, and flexibility due to the material used. It is an all-steel, dust-proof coupling of reasonably compact dimensions, with all working surfaces automatically lubricated by grease under pressure. The elastic elements consist of straight spring steel bars, mounted in a carrier ring, which is freely supported on a spherical extension of one of the coupling bosses. These flat steel springs thus form the link between the driving and driven parts of the coupling, and since they are mutually supported at the centre by the carrier ring, each is divided into two separate cantilevers. Then—since the deflection of a cantilever under load is of a parabolic formation—by shaping the teeth of the driving and driven parts of the coupling so that they conform to a parabolic contour of the same order as that described by the springs when under load, a progressive shortening of the length of the cantilevers and a corresponding increase of the permissible load is obtained. The equation is as follows, where W is the loading, L the length, E the modulus of elasticity and I the moment of inertia of a section of the spring.

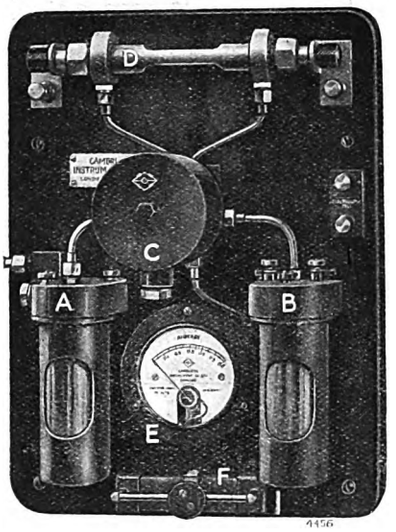


The "Aerosan" air purifier of the Electrical Equipment and Carbon Co., Ltd.

$$\text{Deflection } D = \frac{WL_3}{3EI}$$

$$W = \frac{3EID}{L_3} \text{ that is, W varies as } \frac{I}{L_3}$$

In this way the angular flexibility is obtained. As the springs do not restrict the movement of the two halves of the coupling in an axial direction—within the limits of the cover-ring and the halves abutting the carrier-ring—longitudinal movement is also allowed for. With offset and inclined shafts the coupling describes an elliptical path. As the carrier-ring is supported on a spherical pivot it is free to adapt itself in any way, and can thus lean towards one side or the other under the compulsion of the springs, as they rotate with offset or inclined shafts. The effects of misalignment are in every case minimised by the carrier-ring taking up a mean position.



A "Cambridge" gas analyser used in the liquid air industry.

SADIA, LTD., of 22, Newman Street, Oxford Street, London, W.1, have supplied us with particulars of their latest time switches, designed on the Zbinden system. The standard Sadia switch consists of a precision clockwork movement with lever escapement and temperature compensating gear, fitted in the interior of an insulating dial ring; the transversely mounted switch roller contains the driving motor for itself and for the winding of the clock. Normally the apparatus is arranged for two in-and-out switching operations daily, and for this purpose there are four contact rings, arranged one behind the other, inside the dial ring. The contact rings follow a spiral path, and have a white point at their summit. By superimposing the two middle rings one of the two in-and-out switching operations can be avoided. Hand or automatic apparatus is available.

A new addition to the equipment of the London Fire Brigade is a high-speed emergency tender, provided with a self-contained generating plant for operating three powerful floodlights. The tender is constructed by DENNIS BROTHERS, LTD., of Guildford, and the electrical apparatus is by the GENERAL ELECTRIC CO., LTD. (Magnet House, Kingsway, London, W.C.2). The generator is of the standard Witton fan-ventilated type, giving 110 V, d.c., with a continuous rating of 3½ kW. The generator is shunt wound, has shield-type ball bearings, and runs at 1 650 r.p.m. It is installed under the driver's seat and run through an auxiliary gearbox from the main gearbox of the tender. The switchboard is fixed on the inside wall of the tender, adjacent to the driving seat, and carries a 6 in. diameter voltmeter and ammeter (of moving coil type), a 50 A, d.p. switch for the main circuit, and switchgear for the four distribution circuits. Spare fuses in dummy holders for quick replacement, and a shunt regulator are also provided. For these tenders a special form of cable reel has been designed. It consists of a steel drum—some nine inches in diameter with protected teak ends supported with clamping screws for securing the drum in any fixed position before and after paying out the cable. At each end of the drum a collector ring on an ebonite base is fixed, and current from the generator is fed to these by plunger contacts, which are fixed to iron brackets, with suitable insulation. Three such cable drums are fitted to each tender, and each drum accommodates 100 yards of 16/·021 twin core C.T.S. cable. A watertight pin plug is fitted at one end and two pin sockets at the other. The arrangement chosen allows the cable, complete with connections, to be removed from any drum, for connecting up the floodlights directly to the generator if required. Ordinarily, the supply to each of the three floodlights is by means of the open-type sockets on the switchboard. The floodlights are constructed of aluminium alloy castings and gunmetal, and are designed to house a

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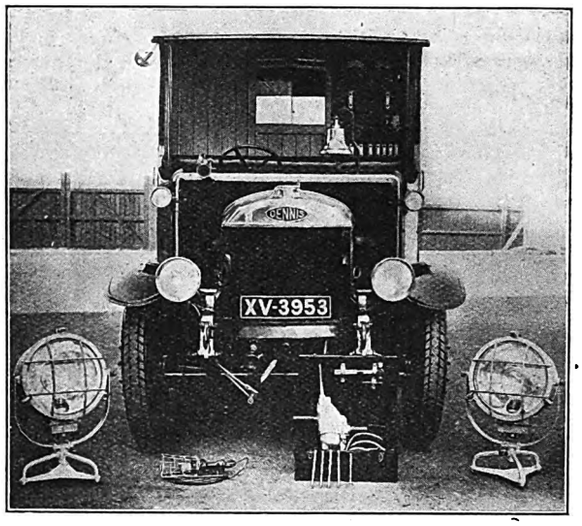
single-piece " Gecoray " silvered glass reflector for use with a 500 W standard gasfilled lamp. The hinged front is fitted with domed heat-resisting glass protected by a strong guard. A quick-focusing system is incorporated—the beam angle being controlled by one large adjusting screw. The units are watertight, and are mounted on wrought iron cradles



The emergency fire tender developed by Dennis Brothers, Ltd., and the General Electric Co., Ltd.

carried on special tripods of low construction, with spiked feet for gripping the ground or pavement. They can be stowed away in the small compartments designed for them on the tender.

The General Electric Co., Ltd., is now also supplying a new automatic commutating rectifier bearing the title " Akk-Emmar." The apparatus is stated to be light, compact and self-contained, and is suitable for charging wireless h.t. and l.t. batteries, motor-car accumulators, etc., and for giving single wave rectification for all non-induction circuits. Special features are the automatic polarity changer and the battery automatic cut-in and cut-out which make the operation of the rectifier entirely automatic.

The apparatus consists of a self-starting synchronous motor, which has mounted on its shaft extension an external combined commutator and slip ring, together with brush gear, for rectifying the alternating current. The switchboard is mounted on the same cast-iron baseplate as the motor. There are two models of the Akk-Emmar: No. 2, which is sized 20 in. by 25 in. by 13 in., and is suitable for charging all types of accumulators, and No. 4—26 in. by 26 in. by 13 in.—which is designed for continuous duty in garages. A particular feature claimed for this machine is its inability to interfere with radio reception. A further model is available, to give double wave rectification for cinema arcs and other purposes.

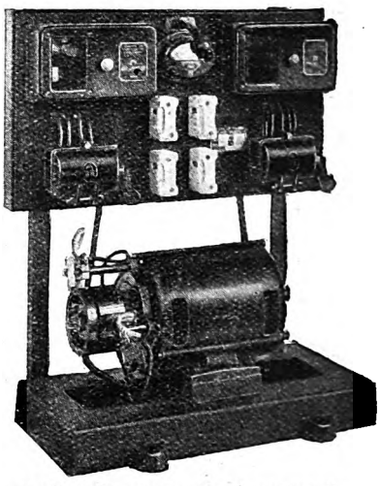
Many manufacturers, in the nitrogen industry, the artificial silk industry and the industries producing electrolytic oxygen and hydrogen, for example, have perforce to interest themselves in the analysis of gases. They may be glad to hear, therefore, of the newly-conceived application of Cambridge instruments to gas analysis. These instruments, which are manufactured by The Cambridge Instrument Co., Ltd., of 45, Grosvenor Place, London, S.W.1, are, for the most part, not new in themselves—it is the mode of their application to the solution of various problems in chemical analysis which is novel. The thermal conductivity method of gas analysis by means of the katharometer was devised by Dr. G. A. Shakespear several years ago, and since the War it has been used considerably in connection with the analysis of boiler flue gases. The method is now extended to the following applications amongst others:—The fixation of atmospheric nitrogen. The liquid air industry. Measurement of sulphur dioxide, organic vapours, oxygen in feed water, hydrogen in the ventilation ducts of submarine batteries, and of carbon dioxide in fruit stores. The cement industry and the rubber industry.

The method, of which the electrical principles—based on a form of the Wheatstone bridge—will need no introduction to our readers, possesses a number of advantages for the purposes of gas analysis. It is capable of detecting very minute changes in gas composition, and the measurements obtained are independent of the rate of flow of the gas. The method may be applied not only to simple and complex mixtures of gases but also to chemically inert gases, and to gases which, though not inert, do not take part in any reaction that may be employed in a measuring device of the chemical type. Continuous direct readings are obtained, and there is no need for intermittent withdrawals of samples. The gas mixture is not altered in composition during the measurement, and when a measurement has to be made at a given point in an enclosed space, there is, we understand, little or no disturbance of the distribution. The time lag is low—the time taken to reach a correct reading depends on the rate of molecular diffusion, on the magnitude of the change in composition to be measured, and on the accuracy necessary for the particular test. In a hydrogen-air mixture, in which the hydrogen content is rising steadily, the lag is about 13 seconds, while the meter will measure a given change in the hydrogen percentage to a new steady value in about 60 seconds—when accuracy within 1% is desired. Another feature of the system is the possibility of connecting several meters to one indicator or to one recorder; all parts are standardised and interchangeable. Little attention is required—the absence of chemicals eliminates the replacement of exhausted reagents.

The little jobs frequently take as long as the big jobs—sometimes they take longer—and for this reason any i expensive gadget which speeds up such jobs is always we comed. Messrs. W. T. Henley's Telegraph Works Co., Ltd., have just introduced a little time saver for making soldered bonds on the lead sheathing of cables. It requires no expert knowledge to use and produces thoroughly effective bonds. This device, known as the Henley Bonding Mould, is shown in the accompanying illustrations, and the following brief instructions explain how it is used:—" Scrape a bright patch on the lead sheathing, fasten the Henley Bonding Mould and earthing strand in position, using the chain fastener, and tighten by means of the milled edge nut as shown in the illustration. Sprinkle a pinch of powdered resin on the strand and lead through the circular opening in top of mould and then fill up with solder. To remove the mould after cooling slack back the nut and unhook chain." Three sizes are made to suit the following cable diameters measured over the lead sheathings:—

Inches.	Mms.
Above 0·945 up to 1·22	(24—31)
Above 1·22 up to 2·008..	(31—51)
Above 2·008 up to 3·11	(51—79)

The Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester, have recently placed upon the market a handy cell filler which they have designed to reduce to a minimum the time and trouble taken in " topping up " cells of their Exide-Ironclad and Exide batteries with distilled water. This cell filler is particularly useful for situations in which the cells are rather inaccessible, since it enables the battery attendant to fill to the correct level even when this cannot be watched through the vent plug hole. When the liquid reaches the correct level a small lamp is automatically illuminated, and the operator then releases a pinch valve, thereby shutting off the further flow of water. By topping up the cells to the correct height and no more, the density of the electrolyte is maintained at a regular value far more easily than is possible by the old uncertain method of filling up by a jug or syringe. All the cells in a battery can be topped up in this manner very rapidly, accurately, and without spilling of water. The cell filler should prove useful to large users of electric vehicles and trucks, motor omnibuses, and commercial vehicles, and to owners of battery service stations.



The " Akk-Emmar " automatic commutating rectifier.

British Insulated Cables, Ltd., Prescot, Lancs, have sent us particulars of " Copperweld," a wire product consisting of a core of tough steel on to which is welded a heavy layer of electrolytic copper. The " Copperweld " process of welding is stated to unite steel and copper so closely that the weld

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cannot be destroyed by hot rolling, cold drawing, forging, bending, twisting or sudden changes of temperature. The copper cannot crack, strip or flake off, so that the wire has a strength approaching that of steel with the corrosion-resisting properties of copper. There are two grades—the standard tensile and the extra high tensile. Standard tensile "Copperweld" is made in two degrees of conductivity, 30% and 40% respectively, of the conductivity of hard-drawn copper, with a breaking load varying between 28 and 45 tons per sq. in. according to the size of wire. Extra high tensile "Copperweld" is made in 30% conductivity only and has a breaking load of 62·5 tons per sq. in. in all sizes.

One of the principal applications for which "Copperweld" is suggested is telephone lines. The three significant considerations for an overhead telephone line—strength, good transmission and low cost—appear to be well catered for by "Copperweld," which, assuming similar span lengths and equal sags for the same temperature, has a load capacity 50% to 75% greater than hard drawn copper. The speech-transmitting qualities for the sizes usually adopted are claimed to be well within commercial limits for telephone lines of moderate length. One hundred and thirty miles of loop of No. 14 S.W.G., ·080 in. diameter "Copperweld," 40% conductivity, has a speech transmission equivalent of 30 miles of standard cable.

The following table is suggested for consideration where it is intended to instal overhead wires for police, fire alarm or railway signal circuits. The comparison is between wires strung side by side on poles spaced 100 ft. apart, each wire being given a sag of 1 ft. when erected at 60 deg. F. For purposes of comparison each wire has been assumed to retain its modulus of elasticity up to the breaking point of the wire :—

Size and kind of Wire all treble braided.	Weight in lbs. per mile.	Approximate external load on Wires required to break them at 0° F.	Relative Factor of Safety.
·102 in. "Copperweld" ..	250	2·47 lb. per lin. ft... ..	100%
·081 in. ,, ..	178	1·65 lb. ,, ,,.. ..	67%
·102 in. H.D. Copper ..	260	1·40 lb. ,, ,,.. ..	57%

Single "Copperweld" wires can be jointed in the same way as copper wires.

In the manufacture of "Copperweld" a round steel billet 40 in. long is cleaned and centred in a cylindrical mould, leaving an annular space. The mould and billet are then raised to a high temperature and the annular space is filled with molten copper. The resulting billet is hot rolled down to a diameter of $\frac{3}{8}$ in., after which the rod is cold drawn to the required size by the usual processes, the proportion of copper to steel remaining constant throughout the operations.

The B.E.N. Patents, Ltd., 92, Tottenham Court Road, London, W.1, have introduced two new items of equipment, the first being a tyre repair unit. This is an outfit for tyre casing repair work, and whereas hitherto such work has been performed by means of a portable electric drill, to which are fixed the necessary attachments, B.E.N. Patents point out that this type of tool is not really suitable for the job, especially where repair work is being carried out on heavy covers. For this reason the B.E.N. flexible drive unit has been produced. These machines are made in two types—model A, mounted on a castor base tripod, and model B, which is designed for mounting on a bench. The design of both is such that the motors swivel and the shafts are free to rotate through 360 deg. The second new machine is a radiator filler valve and in introducing this new item B.E.N. Patents point out that the unit is designed to meet the desire amongst garages and filling stations to dispense with the water can or bucket. The tail piece is designed to take either $\frac{1}{2}$ in. or $\frac{3}{4}$ in. hose.

ELECTRIC LOCOMOTION.

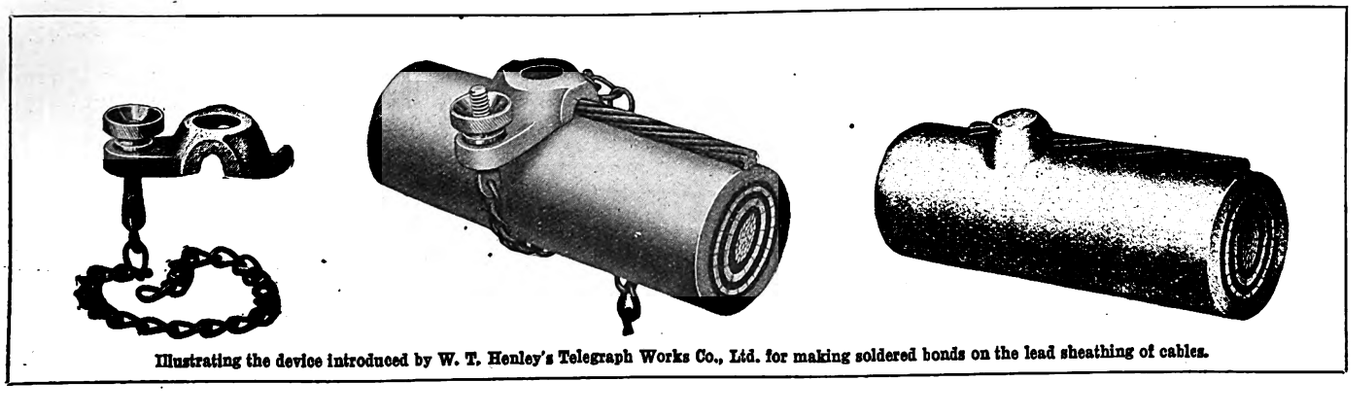
Express Locomotives of the Paris-Lyons and Mediterranean Railway.

THE P.L.M. Railway Co., have recently put into service, on the Mt. Cenis line, electric locomotives which are, it is believed, the most powerful single-unit locomotives yet built. These locomotives which have a one-hour rating of 5 400 H.P. at wheel rim, are capable of developing a maximum speed of 80·7 m.p.h.; they are operated with direct current at 1 500 volts. The electrical equipment of the locomotives was supplied by the Société Oerlikon, of Paris, while the mechanical part was built by the Société de Construction des Batignolles, of Paris. The contract in question comprised four such locomotives. The locomotives are equipped with six driving motors, each built as twin motors and arranged for forced ventilation. The current is collected from the overhead line by means of two pantograph current collectors and from a third rail by means of four contact shoes on either side of the locomotive. All the switchgear serving for grouping the motors, for cutting in and out the starting resistances and for reducing the field, and also the main circuit breakers in the motor circuits are built in the form of electro-pneumatically operated contactors. There are 58 contactors in all. Part of them are operated by means of the master controllers in the drivers' cabs and part by inter-dependent interlocking contacts. Another feature is that the whole equipment is divided electrically into two halves, so that in the case of a break-down of any essential part of the equipment, such as contactor, reverser or starting resistances, the locomotive can still run with one half or the other.

AUTOMOBILE ELECTRICAL ASSOCIATION.

A new trade association was inaugurated on Thursday, October 24th. Membership is open to electrical repairers, but it is intended more specifically for the benefit of those who are interested in the servicing and repair of automobile electrical equipment. This is obvious from the conditions of membership, it being a rule that the Association shall be confined to those whose business is mainly that of servicing the electrical equipment of automobiles and other electrical services, but not engaged in the repair of engines, chassis or coachwork. A strong and representative committee was formed, comprising the following: A. W. Bridges (A. W. Bridges, Newcastle-on-Tyne), J. J. Davis (Express Magneto (Repairs) Electrical Co., Ltd., Yeovil), E. G. Ford (Autocar Electrical Equipment Co., Ltd., London), J. E. Hardy (J. E. Hardy, Glasgow), F. H. Jennings (F. H. Jennings, Dudley), A. E. Ponton (A. E. Ponton and Sons, Bournemouth), J. E. Reilly (Reilly and Brookes, Bolton), J. Robertson (John Robertson (Belfast), Ltd., Belfast), J. Shaw (Magneto Repairs (Leeds), Ltd., Leeds), E. S. R. Thorne (Thorne Bros., Worthing). Readers who are interested should communicate with the Secretary, Automobile Electrical Association, 2, Tichborne Court, High Holborn, London, W.C.1.

We have received from Varley (Oliver Pell Control, Ltd.), 103, Kingsway, London, W.C.2, a radio catalogue which illustrates and describes, not only sets, but also components which the company has just put on the market. With each component purchased an instructional booklet is issued, which not only informs the customer how to use the particular component which he has purchased, but also gives him information regarding other apparatus.



Illustrating the device introduced by W. T. Henley's Telegraph Works Co., Ltd. for making soldered bonds on the lead sheathing of cables.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BRADFORD CORPORATION, November 9th.—Twelve months' supply of stores to the tramways department, including electrical fittings for tramcars, insulating material, insulated bolts, copper controller contacts, etc. Schedules, etc., from Mr. R. H. Wilkinson, general manager, 11, Forster Square, Bradford.

CENTRAL ELECTRICITY BOARD, November 9th.—Supply and erection of overhead 33 000 V transmission lines in South Lincolnshire, in connection with Mid-East England scheme. Specification (No. M.E.E.—S.L.1) from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

WEST RIDING EDUCATION COMMITTEE, November 9th.—Electric light installation at Ferry Fryston Ferrybridge Council School and schoolhouse. Specification, etc., from Mr. C. Harris, divisional clerk, Education Offices, Knottingley.

FORFARSHIRE EDUCATION AUTHORITY, November 11th.—Electric light and power installations at Arbroath High and Technical Schools. Specifications, etc., from Messrs. Begg, Peebles and Shaw, 27, Rutland Square, Edinburgh; deposit £2 2s.

DEWSBURY GUARDIANS, November 12th.—Supply and laying of electric cable at Staincliffe Institution. Specification, etc., from the clerk, Mr. E. T. Tunnicliffe, Wellington Street, Dewsbury.

Flectric Crane.

MANCHESTER CORPORATION, November 12th.—Supply and erection of 5-ton electrically driven overhead travelling crane. Specifications, etc., from the General Manager, Corporation Tramways, 55, Piccadilly, Manchester.

MANCHESTER GUARDIANS, November 12th.—(1) Covering steam and hot water pipes with non-conducting material; and (2) supply of electrical switchboard, at Crumpsall Institution. Particulars from Mr. E. Hargreaves, superintendent of works, Union Offices, All Saints, Manchester.

SWALLOWNEST HOSPITAL, November 13th.—Electric light installation, for South Rotherham and Kiveton Park District Isolation Hospital Committee. Specifications, etc., from the clerk, Mr. A. H. Styring, 6, North Church Street, Sheffield; deposit £1 1s.

TYNE IMPROVEMENT COMMISSION, November 14th.—Twelve months' supply of electrical accessories and incandescent lamps (section 22), etc. Forms of tender from Mr. A. Blacklock, secretary, Tyne Improvement Commission Offices, Berwick Street, Newcastle-on-Tyne.

BELFAST EDUCATION COMMITTEE, November 15th.—Electric light installation at Harding Memorial Public Elementary School, Cregagh Road, Belfast. Specification, etc., from the Education Architect, Victoria Street, Belfast; deposit £1 1s.

FRAMLINGHAM PARISH COUNCIL, November 15th.—Supply and fixing of an electric pump and gearing to the water supply known as Jeaffreson's Memorial Well, Framlingham. Specification can be seen by appointment, with the clerk, Mr. H. C. Taylor, Double Street, Framlingham.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, November 15th.—Supply and erection at Ironbridge power station of (*a*) two 6 000 kVA, 33 000/3 300 V, 50 cycle, indoor type transformers, with off-load tap changing switches; (*b*) two 1 200 kVA, 3 300/400/230 V, 50 cycle, indoor type transformers, with off-load, tap changing switches; (*c*) two 150 kVA, 3 300/400/230 V, 50 cycle, indoor type transformers, exclusive of tap-changing switches. Specification (No. 7) and form of tender from Mr. E. F. Hetherington, at the offices of the Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

WAREHAM CORPORATION, November 16th.—Four centrifugal pumps and electric motors, with automatic control, etc. Specifications from Mr. W. E. Blizard (Messrs. Lemon and Blizard), Castle Lane, Southampton; deposit £2 2s.

GLASGOW CORPORATION, November 18th.—Electric lighting installation at Shieldhall Hospital. Specifications, etc., from the General Manager, Electricity Department, 75, Waterloo Street, Glasgow.

MID-GLAMORGAN WATER BOARD, November 18th.—Electric lighting work, supply of transformers, switchboards, meters, etc., in connection with construction of pumping station, etc., at Schwyll, Ewenny, near Bridgend, and installation of electrical depth transmitters on various reservoirs, with cables, etc. Specifications, etc., from the Board's Offices, Bridgend, or from Messrs. Thomas and Morgan and Partners, civil engineers, Pontypridd; deposit £2 2s.

WARRINGTON CORPORATION, November 18th.—Supply of e.h.t. sub-station switchgear. Specification, etc., from Mr. F. V. L. Mathias, borough electrical and tramways engineer, Warrington; deposit £1 1s.

EAST RETFORD CORPORATION, November 19th.—Electrically driven centrifugal borehole pump (60 000 gall. per hour.) Specification from Mr. S. O. Pacey, Gas and Water Electricity Offices, East Retford; deposit £2 2s.

WALLINGFORD RURAL DISTRICT COUNCIL, November 19th.—Electric light wiring of 34 houses at Cholsey, Berks. Specification, etc., from the Clerk, 7, St. Martin's Street, Wallingford.

FIFE EDUCATION AUTHORITY, November 20th.—Electrical work at reconstructed Cowdenbeath School. Schedules (£1 1s. deposit) from Mr. Geo. Sandilands, architect and master of works, Education Offices, Kirkcaldy.

ALLOA CORPORATION, November 23rd.—Electrical installation work in connection with erection of 36 houses at Ashley Terrace, Alloa. Schedules, etc., from Messrs. J. Melvin and Son, architects, Mar Street, Alloa.

MANAGERS OF CENTRAL LONDON SCHOOL DISTRICT, November 23rd.—Electric motor, with reduction gearing, startor, etc. Specification from Mr. G. P. Morrell, clerk to the Managers, Greenford House, Hanwell, London, W.7.

PLYMOUTH CORPORATION, November 25th.—Supply of steel lamp columns. Specification, etc., from the City Electrical Engineer, Electricity Department, Armada Street, Plymouth.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

INDIAN STORES DEPARTMENT, November 12th.—Battery charging motor generators, transformer and oil switch, for Simla wireless station (order No. N. 10 159). (Reference B.X. 5 774.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 12th.—Four-conductor telephone operators' cords. (Reference B.X. 5 685.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 12th.—Supply of 15 kW generating set for installation on the "Maui Pomare" (tender No. 369). (Reference B.X. 5 683.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 12th.—Supply of v.i.r. cables (P. and T. 151/1914). (Reference B.X. 5 826.)

NEW ZEALAND RAILWAYS, November 12th.—Supply telegraph line material, including copper wire, insulator caps, spindles, arm-bolts, etc. (Reference B.X. 5 824.)

NEW ZEALAND RAILWAYS, November 12th.—Air compressors, machine tools and electric motors. (Reference A.X. 8 736.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Transmitters and associated parts (schedule C. 477). (Reference B.X. 5 653.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 12th.—Receivers and associated parts (schedule C. 477). (Reference B.X. 5 656.)

CHILEAN STATE SUPPLY DEPARTMENT, November 14th.—Telegraph material. (Reference B.X. 5 746.)

INDIAN STORES DEPARTMENT, November 14th.—Supply and erection of crude oil engine-driven d.c. generating set, motor generator set and switchgear, for Military Engineering Services, Razmak (order Nos. N. 9 886 and 10 075). (Reference B.X. 5 744.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 14th.—Supply of 400 000 lb. of hard drawn copper wire, 2 000 lb. of soft drawn copper wire and 2 000 lb. of soft drawn tinned copper wire (tender No. 173). (Reference A.X. 8 510.)

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SOUTH AFRICAN RAILWAYS AND HARBOURS, November 14th.—Telephone cable, terminal strips and paper sleeves (tender No. 1 565). (Reference B.X. 5 813.)

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY Co., November 15th.—(1) Primary battery supplies; and supply of (2) gasfilled and vacuum lamps, (3) overhead contact wire and stranded catenary cable. Specification (10s.) from the secretary, Mr. S. G. S. Young, The White Mansion, 91, Petty France, Westminster, S.W.1.

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 15th.—Supply of 42 000 lb. of galvanised signal wire and 31 500 lb. of galvanised point wire (tender No. P.S. 2 025). (Reference A.X. 8 712.)

ANGORA POSTS, TELEGRAPHS AND TELEPHONES, November 16th.—Supply of telephone wire, cable boxes and insulators. (Reference B.X. 5 846.)

INDIAN STORES DEPARTMENT, November 17th.—Supply of electric cables for 12 months (order No. 9 920). (Reference B.X. 5 808.)

GREAT NORTHERN RAILWAY (IRELAND), November 18th.—Six or 12 months' supply of stores, including electric fittings, lamps, cable and wire (form 11), and signalling materials (form 26). Tender forms (1s. each), from the Secretary, Amiens Street Station, Dublin.

INDIAN STORES DEPARTMENT, November 18th.—Supply and erection of two 20 kW oil engine driven d.c. generators, etc. (order No. N. 10 253). (Reference B.X. 5 757.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 18th.—Resistance spools (P. and T. 151/1 832). (Reference B.X. 5 716.)

EGYPTIAN MINISTRY OF THE INTERIOR, November 19th.—Supply of 160 H.P. Diesel-electric generating set for Manfalout power station (Assiut Province). (Reference B.X. 5 720.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 19th.—Telephone transformers (P. and T. No. 151/1807). (Reference B.X. 5 718.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 19th.—Automatic wall and table telephones (P. and T. No. 151/1 825). (Reference B.X. 5 717.)

Telephone Equipment for Australia.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Supply of telephone generators and motor generators (schedule No. C. 479). (Reference B.X. 5 662.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Motor generators (schedule C. 486). (Reference B.X. 5 694.)

INDIAN STORES DEPARTMENT, November 21st.—Supply of h.d., high conductivity, bare, solid copper conductors, for overhead power transmission, for one year (order No. N.10 280). (Reference A.X. 8 759.)

JOHANNESBURG MUNICIPALITY, November 21st.—Supply of tramcar axles, gear and pinion wheels, etc. (Reference A.X. 8 750.)

CHRISTCHURCH (N.Z.) MUNICIPALITY, November 23rd.—Supply of pump and electric motor, for Beckenham pumping station. (Reference A.X. 8 737.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92.) (Reference B.X. 5 614.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Vitreous resistances, each consisting of wire element wound in vitreous spool, for telegraph battery feeds (schedule C. 489). (Reference B.X. 5 696.)

Melbourne Switchgear Contract.

MELBOURNE CITY COUNCIL, November 27th.—Totally-enclosed, metal clad, 6 000 V, three-phase switchgear (specification No. 1 000). (Reference B.X. 5 708.)

MELBOURNE CITY COUNCIL, November 27th.—Supply of 600 V d.c. switchgear (specification No. 1 001). (Reference B.X. 5 734.)

VICTORIAN RAILWAY COMMISSION, November 27th.—Indication transformers for railway signalling (contract No. 43 412). (Reference B.X. 5 737.)

VICTORIAN RAILWAY COMMISSION, November 27th.—Supply of automatic oil switches (contract No. 34 411). (Reference B.X. 5 735.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General for Western Australia, Savoy House, Strand, London, W.C.2.

EGYPTIAN MINISTRY OF THE INTERIOR, November 30th.—Diesel engine driven electric lighting installation at Abou-Tig. (Reference B.X. 5 791.)

BLOEMFONTEIN MUNICIPALITY, December 2nd.—Supply of two electrically driven low lift pumping units and two electrically driven high lift pumping units, with cables, starters, valves, etc. (contract No. 18, 29/30).

BLOEMFONTEIN MUNICIPALITY, December 2nd.—Supply of copper conductors, poles, transformers, switchgear, etc., for electrification of Mazelspoort Waterworks (contract No. 19, 29/30). (Reference B.X. 5 825.)

INDIAN STORES DEPARTMENT, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

VICTORIAN ELECTRICITY COMMISSION, December 9th.—Supply of 3 000 kVA transformers and spares (specification No. 29/119.) (Reference B.X. 5 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Switchboard keys and parts (schedule No. C. 496). (Reference B.X. 5 776.)

THE staff dinner of British Insulated Cables Ltd., was held on October 28th, at the Adelphi Hotel, Liverpool, and some of the staff and guests are seen in the photograph. The toasts were short and to the point. Owing to the fact that there were 650 diners, dinner was served in two rooms, Mr. G. H. Nisbett, the managing director, speaking in one room and Mr. J. A. Smith, a director of the company, addressing the other. A concert followed the dinner, the artists being the B.I. Prize Quartette (members of the B.I. Silver Band), Miss Margaret Rees and Mr. Foden Williams. A conjuror, included in the programme, produced an "order," to be completed in three weeks, for the electrification of the line from Liverpool to London; this was "accepted" by Mr. Nisbett. Dancing concluded a successful evening.

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POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Electric lamps, lamp caps and sockets for telephone purposes (schedule C. 497). (Reference B.X. 5 783.)

GATOOMA (SOUTHERN RHODESIA) MUNICIPALITY, December 12th.—Two fire-tube boilers, steam engines, alternators and switchboard, etc. (Reference A.X. 8 749.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, December 16th.—Supply and erection of electrically-driven pumping plant, with ironwork, crane and gantries, for Junee water supply. (Reference A.X. 8 740.)

Oscillograph Equipment.

VICTORIAN ELECTRICITY COMMISSION, December 16th.—Oscillograph equipment. (Reference B.X. 5 692.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Secondary batteries (schedule C. 505). (Reference B.X. 5 777.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Telephone fuses, heat coils and protectors (schedule C. 498). (Reference B.X. 5 784.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Loading coil pots (schedule C. 499). (Reference B.X. 5 785.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 27th.—Telegraph material, including g.i. tubular arms, insulators, upper tubes for poles, etc. (tender No. 175). (Reference A.X. 8 734.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, December 28th.—Supply and erection at site of Mankabad Barracks of three Diesel engine driven electric generators, and sinking of two wells. Specifications (£1 os. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 4th.—Supply and erection at site of Meadi Barracks, Cairo, of two Diesel engines to drive existing generators. Specifications (£1 os. 6d. not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of testing instruments (schedule C. 504). (Reference B.X. 5 786.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of timing clocks (schedule No. C. 507). (Reference B.X. 5 762.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of contact pressure testers (schedule No. C. 516). (Reference B.X. 5 821.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of telephone hand sets (schedule C. 526). (Reference B.X. 5 823.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 13th.—Supply of four-point jacks (P. and T. 151/1897). (Reference B.X. 5 840.)

VICTORIAN ELECTRICITY COMMISSION, January 13th.—Supply of 2 200 V switchgear and accessories (specification No. 30/2). (Reference B.X. 5 827.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBORUNE, January 14th.—Supply of ringing motor-generator sets, for automatic telephone exchanges. (Reference B.X. 5 839.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of telephone indicators (schedule C. 518). (Reference B.X. 5 822.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 15th.—Supply of automatic telephone exchange equipment for new station at Auckland. (Reference B.X. 5 841.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.

Tenders Accepted.

LONDONDERRY ASYLUM.—L. D. Cooke, electric light installation, £425.

WORKSOP GUARDIANS.—R. Shaw and Son, re-wiring Kilton Hill Infirmary, £295.

ARKLOW HARBOUR BOARD.—Ednmundson, erection of occulting light on pierhead, £251.

MIDDLESEX COUNTY COUNCIL.—Hackbridge Cable Co., cable for Porters Park Asylum, £275.

BELFAST CORPORATION.—Vaughan Crane Co., Ltd., two overhead cranes for sub-stations, £258.

GLOUCESTERSHIRE COUNTY COUNCIL.—Bevan and Son, electric light installation at Wotton and Barnwood Mental Hospitals, £10 000 (estimated).

TORQUAY CORPORATION.—British Thomson-Houston Co., Ltd., £482; spare apparatus and accessories required for 7 000 kW turbo-alternator, £482.

TYNEMOUTH CORPORATION.—Mackintosh Cable Co., Ltd., supply of cable, £389 4s. 6d.; J. H. Holmes and Co., supply of switchboard at Ingleside sub-station, £79 10s.

MARYLEBONE (LONDON) BOROUGH COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., supply of portable relay testing transformer set, £450. (Recommended.)

DEAL CORPORATION.—South-East Kent Power Co., electric light installation at Town Hall, £81. Also tendered: G. A. House, £108; E. W. Smith, £113; C. O. Clark, £105.

LIVERPOOL CORPORATION.—Tramway special trackworks: Adelphi Junction (portion), Hadfields, Ltd., £1 029; three standard crossovers, Titan Trackwork, Ltd., £370 each.

GLASGOW CORPORATION.—A. Reyrolle and Co., Ltd., double tier switchgear, £536; Electrical Apparatus Co., meters, £587 10s.; John Grieve and Co., electric crane, £385; Crompton-Parkinson, Ltd., replacement of 12 motors, £326 10s. (All recommended.)

NEWRY URBAN DISTRICT COUNCIL.—Curran Bros., electric wiring of Town Hall, £502. Brooks, Thomas and Co., whose tender, at £470, was originally accepted, were not prepared to go on with the contract because they had not got the wiring of the Technical School also.

BARKING URBAN DISTRICT COUNCIL.—A.C.E.C., supply of 1 100 yds. of 0·25 four-core cable, £918; Pooley and Austin, supply of switchgear for erection at works of Messrs. Cross, Sherwood and Heald, Ltd., £107 10s.; Derby Cables, Ltd., supply of 1 500 yds. of 0·1 sq. in. four-core cable, £690. (All recommended.)

Telephone Equipment.

GENERAL POST OFFICE.—Batteries, Synthetic Ammonia and Nitrates automatic private branch telephone exchange equipment (Billingham, Stockton-on-Tees), Premier Accumulator Co. (1921), Ltd.; Telephone exchange equipment, Gerrard, Automatic Telephone Manufacturing Co., Ltd.; Harrow, Automatic Telephone Manufacturing Co., Ltd., Merrylee (Glasgow), General Electric Co., Ltd.

SALFORD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply and erection of switchgear for Trafford sub-station, £176; Ferguson, Pailin, Ltd., supply and erection of 33 000 V switchgear at Frederick Road station, £1 174; Fuller Electrical and Manufacturing Co., Ltd., supply and erection of 10 000 kVA, three-phase, 33 000/6 600 V, step-down transformer at Trafford sub-station, £2 860. (All recommended.)

CROYDON CORPORATION.—Turbo-alternator, etc., Metropolitan-Vickers Electrical Co., Ltd., £76 851 (accepted) and £74 396; C. A. Parsons and Co., Ltd., £74 640 and £74 980; British Thomson-Houston Co., Ltd., £76 200, £78 543, £77 625, £77 963 and £74 241; English Electric Co., Ltd., £71 260, £79 512, £81 860 and £84 801; Richardsons, Westgarth and Co., Ltd., £77 800, £76 550, £76 500, £75 150, £73 900 and £73 850; Fraser and Chalmers Engineering Works, £73 147 and £75 647; Brush Electrical Engineering Co., Ltd., £71 220. Cooling tower and circulating water culvert—one concrete tower, Van Iterson type, 164 ft. high, A. E. Farr, £18 753; also tendered, Purdie, Lumsden and Co., Ltd. (withdrawn), £16 680; Wilson, Lovatt and Sons, £20 291; Yorkshire Hennebique, £20 365; Joshua Henshaw and Sons, £22 650; L. J. Speight, Ltd., £22 654; Foundation Co., Ltd., £26 290; one concrete tower, not Van Iterson type, 140 ft. high: Film Cooling Towers, Ltd., £16 000; Davenport Engineering Co., Ltd., £20 469; three wooden towers, 160 ft. high: Premier Cooler and Engineering Co., Ltd., £15 180; Film Cooling Towers, Ltd., £15 600; Davenport Engineering Co., Ltd., £16 139. Boiler-house plant, Babcock & Wilcox, Ltd., £108 809 (adjusted price £101 712); also tendered: J. Thompson, Ltd., £84 954; International Combustion, Ltd., £86 545; ditto powdered fuel scheme, £86 658; Stirling Boiler Co., Ltd., £108 865; Vickers Boiler Co., Ltd., £113 840. Switchgear, English Electric Co., Ltd., £47 220 (adjusted price for Corporation requirements, £44 227); also tendered: British Thomson-Houston Co., Ltd., £49 102; General Electric Co., Ltd., £49 223; A. Reyrolle and Co., Ltd., £49 968; Metropolitan-Vickers Electric Co., Ltd., £50 538; Ferguson, Pailin, Ltd., £51 069. Note.—The English Electric Co.'s adjusted price for Corporation requirements is £44 227.

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WORK IN PROSPECT.

ALDERSHOT.—Erection of new school, at Manor Park. Particulars from Mr. James Neave.

ARNOLD.—50 or 60 houses for U.D.C. Particulars from Surveyor.

BLACKPOOL.—Erection of amusement hall at the Winter Gardens. Particulars from Messrs. Hughes and Stirling, architects, Liverpool.

BRADFORD.—Adaptation of Poor Children's Mission for use as a cinema. Particulars from Mr. F. J. Hudson, Thurnscoe Road.

BRAINTREE.—20 houses at Bocking, for R.D.C. Particulars from P. Berry and Co., contractors.

BRIGHTON.—Rebuilding of Nos. 193-4, Western Road as offices and flats, to cost £10 600. Particulars from Borough Engineer.

CAMBRIDGE.—Conversion of "Old Vic" into showrooms and offices. Particulars from Messrs. North, Robin and Wilsden, architects, or A. Negus and Son, contractors.

CARDIFF.—Secondary school at North and New Zealand Roads, to cost £42 136. Particulars from City Engineer, or Mr. W. S. Eglen, contractor, Cardiff.

CATTERICK CAMP.—Conversion of the Miss Sande's Soldiers Home Cinema into swimming baths, to cost £5 000. Particulars from Messrs. Tarran and Eyre, architects, Middlesbrough.

CHISLEHURST.—18 shops, at Platt's Wood Road and Station Square. Particulars from Messrs. Montagu Holmes and Sons, architects, 35, Paternoster Row, E.C.4.

COVENTRY.—Additional classrooms at Balsall Street School. Particulars from the County Architect.—New Wesleyan Central Hall. Particulars from Mr. C. Redgrave, architect.

COWDENBEATH.—Electrical work, etc., in connection with the reconstruction of Broad Street school, for Fife E.A. Particulars from Mr. G. Sandilands, architect, Kirkcaldy.

DEWSBURY.—New secondary school for girls. Particulars from Mr. H. Dearden, borough engineer.

DONCASTER.—New central school. Particulars from Mr. E. V. Dyson, architect.

EASTBOURNE.—Bandstand, dancing hall, etc., at the Redoubt, to cost £35 000. Particulars from Borough Engineer.

EAST HAM.—Alterations to Empire Kinema, Barking Road. Particulars from Mr. W. S. Trent, architect.

EAST WICKHAM.—New church of St. Michael. Particulars from Mr. J. F. Ford, architect, 35, Finsbury Square.

ELLESMERE PORT.—100 houses, for U.D.C. Particulars from Mr. J. M. Hudson, surveyor.

FARNWORTH.—Extension to St. James's Schools, to seat 400 and to cost £5 000. Particulars from Mr. F. Thorpe, architect, Oldham.

GLASGOW.—354 houses at Ashfield, Possilpark. Particulars from the Town Council Housing Department.

HANLEY.—Factory extensions to premises of Twynfords, Ltd., Cliff Vale, Hanley. Particulars from Messrs. Scrivener and Sons, architects, Hanley.

HAYES.—104 houses, at Hayes Gate Estate. Particulars from Mr. R. T. Warren.

KNUTSFORD.—Alterations and extensions to hospital administrative block. Particulars from Mr. W. Kennedy, architect, or L. Brown and Sons, Ltd., Wilmslow, contractors.

LONDON (HOLBORN).—Rebuilding of 7-18, High Holborn, for Prudential Assurance Co. Particulars from Mr. J. H. Pitt, architect.

MIDDLETON.—Permanent clinic, in Durnford Street, to cost £6 500. Particulars from Mr. D. Harrison, borough surveyor.

ORRELL.—New clinic and child welfare centre, in Orrell Road. Particulars from Mr. S. Wilkinson, Preston.

OXFORD.—42 houses at Green Road. Particulars from Messrs. Ives and Rushley.

PRESTON.—Erection of a new grammar school at Leyland. Extensions to the grammar school at Hutton. Particulars in both cases from Mr. Stephen Wilkinson.

RETFORD.—Additions to Retford and District Hospital, to cost £5 000. Particulars from Messrs. Brierley and Rutherford, architects, York.

RICKMANSWORTH.—New schools, for Royal Masonic Institution, to cost £350 000. Particulars for first portion from Denman and Son, architects, or A. Boxall, quantity surveyor.

STOCKTON-ON-TEES.—Extensions to old telephone exchange premises, for Stockton Co-operative Society, Ltd. Particulars from Mr. Halt, architect.

WIGAN.—Additional accommodation at Beech Hill School. Particulars from Borough Engineer.

TRADE PUBLICATIONS.

MACHINE tool control is dealt with in leaflet 305, just issued by BROOKHIRST SWITCHGEAR, LTD., Northgates Works, Chester.

Tee or junction boxes for use with C. T. S. cables, is the subject of leaflet No. 2065 (October, 1929), just published by SIEMENS BROTHERS AND CO., LTD., Woolwich, London, S.E.18.

An attractively coloured showcard just published by Berry's Electric (1928) Ltd.

The MARCONIPHONE CO., LTD., 210/212, Tottenham Court Road, London, W.1, has published a revised edition of the "Marconi" valve catalogue which gives full particulars of all types.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, have issued four new folders dealing with electric lamps. The references are No. 101L (general list), No. 173L ("Duo-Savelite"), No. 181L ("Argento"), and No. 182L ("Arlita").

The D.P. BATTERY CO., LTD., Bakewell, Derbyshire, has issued a special folder dealing with "Kathanode" 'bus lighting batteries. Another publication, entitled "Kathanode Goes Racing," deals with the employment of these batteries in connection with the operation of totalisators.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C., has issued new publications with respect to radio components and receivers. The numbers of these new issues are 6 494 ("Neutrosonic" short wave set), 6 500 (5-valve portable), 6 628 ("Phonovox" pick-up), 6 496 ("A.C.3" receiver), 6 629 and 6 501 (components).

We have received from LIGHTING TRADES, LTD., of Oriel House, 30-31, Farringdon Street, London, E.C.4, in association with the Welsbach Light Co., Ltd., a copy of a new catalogue of electric lighting glassware containing a wide and varied range of patterns. This is the first catalogue issued jointly for the two companies and supersedes any previous publication.

PETTERS, LTD., Westland Works, Yeovil, have sent us a copy of catalogue, publication No. 1 716, showing the Atomic Diesel stationary type oil engine. This catalogue contains a review of the merits of the two-stroke cycle engine, as compared with the four-stroke cycle engine, and a fairly complete technical description of the various parts of the engine itself.

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ELECTRICITY SUPPLY.

London Frequency Changes—Proposed Extensions at Southend, Stockport, Bradford and Portsmouth—Hull's Record Week—The Supply Industry in Penang—Suggested New Boiler Plant at Bath—Marylebone (London) B.C. and the London Power Company.

BARNSLEY T.C. has applied for a loan of £6 330 for distribution mains extensions.

Guildford Electricity Committee is seeking sanction to borrow £4 770 for street lighting.

Tynemouth Electricity Committee seeks sanction to a loan of £10 000 for mains and services.

Southend Corporation has applied for sanction to a loan of £68 000 for the purchase of electrical plant.

Seaham Harbour Electricity Committee proposes to borrow a further £6 000 in connection with assisted wiring.

St. Pancras (London) Electricity Committee is to convert 80 street lamps from gas to electricity at a cost of £356.

South Shields Lighting Committee has adopted a scheme for the conversion of all gas street lamps to electricity at a cost of £42 865.

Eastbourne T.C. seeks sanction to borrow £5 000 for extensions of sub-stations, and £25 000 for further mains and services.

An offer of Birkenhead T.C. to supply current to the district by means of overhead lines has been accepted by Greasby Council.

Stockport T.C. is recommended to apply for a loan of £171 000 in connection with the development of the Millgate electricity works.

Grimsby T.C. has applied to the Electricity Commissioners for sanction to extend the plant at the generating station at an estimated cost of £63 000.

Ballymena U.D.C. intends to apply to the Northern Ireland Electricity Commissioners for a Special Order authorising the Council to supply electricity in the district.

Keighley T.C. has received sanction from the Electricity Commissioners to the borrowing of £18 090 for mains, substations and equipment, and street lighting fittings.

Bermondsey (London) Electricity Committee has obtained sanction to borrow £20 000 for mains and services; £7 500 for meters and £13 500 for consumers' wiring installations.

West Lancashire Rural District Council is making application for a loan of £6 015 in connection with a scheme for supplying electric cookers, kettles and a free wiring scheme.

Bradford Electricity Committee recommends the purchase of property at a cost of £36 000 from the Bradford Dyers' Association for extension of the Valley Road power station.

Strood R.D.C. has agreed to an application by the Kent Electric Power Co. for permission to extend its mains, partly overhead and partly underground, from Rochester to Snodland.

Droxford R.D.C. has approached the West Hampshire Electricity Co. with a view to the provision of additional compulsory distribution mains in certain parts of the district.

Southend-on-Sea T.C. has received sanction to a further loan of £25 623 for land, buildings, and mains, required in connection with the change-over in certain parts of the borough.

Manchester Electricity Committee is to erect a transformer station in Cumberland Street, Deansgate, at a cost of £40 000. Sanction is to be sought for borrowing £250 000 for mains extensions.

Shinley Electricity Committee has agreed that the minimum fixed half-yearly charge should be 17s. 6d. in the case of domestic consumers and £2 2s. in the case of house and shop consumers.

Portsmouth Electricity Committee is to ask for sanction for loans of £100 000 for mains and services; £40 000 for sub-station equipment; £10 000 for h.t. mains in the city, and £2 700 for transformer kiosks.

At a recent public meeting at Ide Hill it was decided, subject to the consent of the R.D.C., that a supply of current should be given to the village by the Sevenoaks Electricity Co. by means of overhead lines.

Hull Electricity Department created a record during the week ended October 19th, by connecting 270 houses for domestic supplies of electricity. Applications received in six months for domestic supplies number 7 627.

The revenue of the George Town, Penang, municipal electricity department in 1928 was £155 782, the gross profit £69 769, and the net profit £27 952. Electricity sold amounted to 10 879 514 kWh, an increase of 1 296 466 kWh.

The Minister of Transport has announced that he is unable to accede to the application of the Durham and Cleveland Electricity Co. for permission to erect overhead cables for the supply of current to certain streets at Barnard Castle.

Holme Cultram U.D.C. has given its consent to an application for a Special Order by Old Silkstone Collieries, Ltd., of Dodsworth, near Barnsley, to supply current within the urban district, subject to a main being carried through Abbey Town.

Lewisham (London) Works Committee recommends that two miles of the main roads in the borough be provided with improved lighting, one mile to be dealt with by the South Metropolitan Gas Co., and one mile by the South Metropolitan Electric Light and Power Co.

The Electricity Commissioners for Northern Ireland are to issue a licence to Mr. Hamilton, of Kilkeel, for the electric lighting of Warrenpoint. At a recent inquiry the Commissioners considered four schemes for the district, including one for supply in bulk from Newry's new station.

Rochdale Electricity Committee recommends the Council to replace the existing generating plant at the electricity works by modern turbo-generating plant of such capacity as may be found necessary. The Committee is satisfied that the proposed installation would substantially reduce the generating costs.

London County Council has consented to a proposal of the London Electric Supply Corporation, Ltd., to alter its existing periodicities of supply from 85 cycles and 25 cycles to 50 cycles and to establish an a.c. system at 230/400 V, at first in addition to, and subsequently in substitution for, the existing system.

Barking Electricity Committee has received sanction to borrow £1 200 for buildings; £16 870 for mains and services; £4 875 for transformers and switchgear, and £950 for house wiring installations.—The U.D.C. is asking sanction to a loan of £3 100 for laying additional mains to the Hertford Road district.

The Unemployment Grants Committee has sanctioned 50% interest on a loan of £33 174 for the change-over from d.c. to a.c. in Accrington's local supply. The amounts sanctioned included £22 750, for 25 years, in respect of mains; £9 000 for seven years for change of motors; £1 500 for ten years for meters.

Bath City Council has agreed to ask for powers to borrow £35 829 for additional plant, mains and sub-stations. It is proposed to instal an additional 60 000 lb. per hour boiler, with accessories, at an estimated cost of £22 540, and to provide new sub-stations and additional mains, to cost £13 289.

Ribchester P.C. has discussed an electricity scheme. Mr. Gill has submitted details of a scheme, including a power house, and estimated to cost about £5 000. Mr. Gill suggests the formation of a company, and that householders should take up shares to the amount of about £25 per house. A canvass is to be made.

Marylebone (London) B.C. has considered a report from its Medical Officer of Health, after 28 observations, on the emission of smoke and grit from the generating station of the London Power Co., St. John's Wood, and the Council has decided that it justifies the service of a statutory notice under the Public Health (London) Acts.

London County Council has refused consent to the County of London Electric Supply Co., Ltd., to erect an overhead electric transmission line across the portion of Becontree south of Ripple Road, as it is thought that the erection of an overhead line in the position proposed might seriously prejudice the future development of this part of the estate.

Londonderry Corporation has approved of a recommendation of the Electrical Engineer that in order to encourage the use of electricity for shop window lighting after peak-load hours, the Corporation should, in the case of early closing shops, charge a special rate of 3d. per kWh for shop window lighting between closing time and midnight, except Saturdays and Sundays.

The street lighting service of Coychurch village came into operation on October 25th. The electrification of Vale of Glamorgan villages has been proceeding apace during the past few years, with the result that Cowbridge, St. Hilary, Llandough, Llantwit Major, Llanmaes, Aberthin, Pencoed, Ystradowen, and several smaller villages, have now their own electricity supply. Current is taken from the South Wales Electrical Power Distribution Co.

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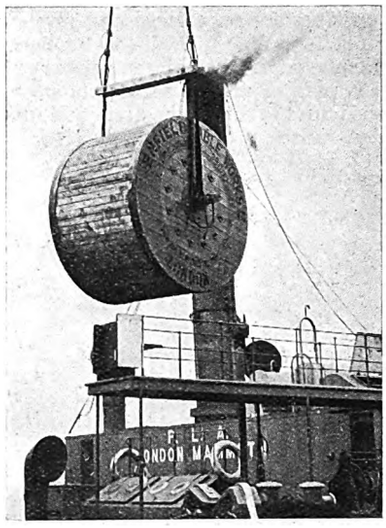
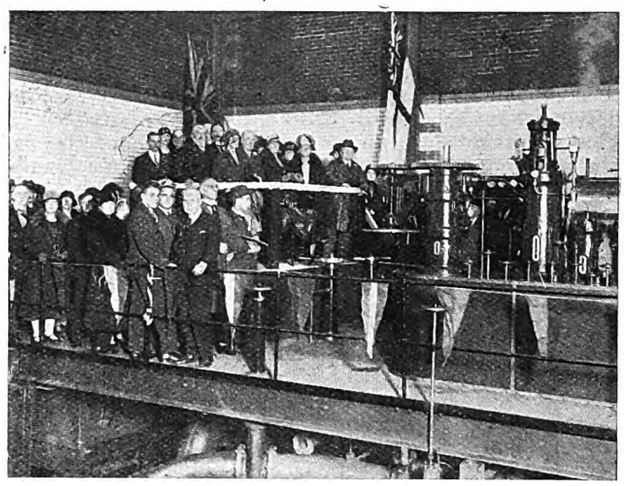
ELECTRICAL PICTURES.

The November window display of the E.D.A. reminds us that Christmas spending commences this month. The display utilises the cube blocks which were introduced last season, and if desired the figure of Father Christmas may be omitted. The colour scheme is chiefly red and black.

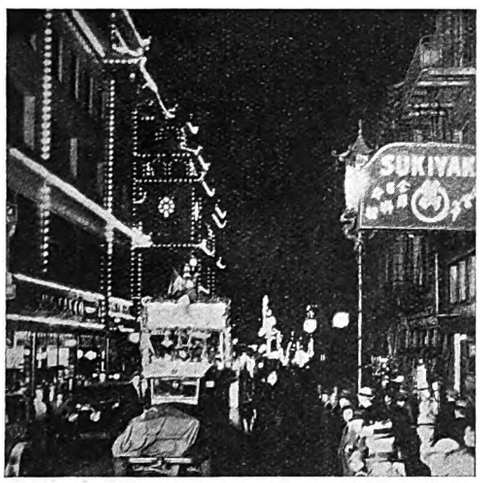


Part of the consignment of 33 000 V cable which is to be submerged in Sydney Harbour, in connection with local electrical development.

The stand of Ferranti, Ltd., at the recent Manchester Radio Exhibition. The stand was finished in white, blue and gold, and was floodlighted throughout the show. The special public address arrangements and the loud-speaker feed to all stands were other Ferranti features.



Group taken on the occasion of the opening, on October 31st, of the new extensions at the Central power station of the Stoke-on-Trent Corporation. The new plant includes a 12 500 kW turbo-alternator, this being the fifth set of Metropolitan-Vickers manufacture in the Central station.



A scene in San Francisco's "Chinatown" during the recent celebrations in connection with the eighteenth anniversary of the birth of the Chinese Republic.

An unusual view of the Coliseum at Rome during the "Edison Celebrations." All places of historic interest as well as public buildings were floodlighted for some days previous to October 21st, the final scenes of the official celebration period being something of a carnival show.

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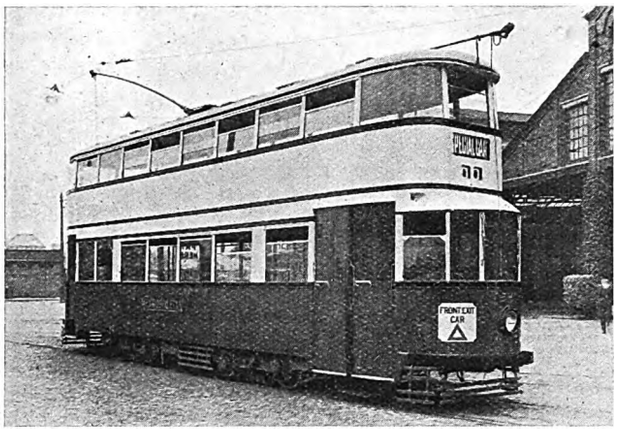
ELECTRIC TRACTION.

G.I.P.'s First Main Line Electrified Service Opened.

THE Great Indian Peninsula Railway inaugurated service on Tuesday on a large and important section of the first main railway line in India to be electrified, namely, Bombay to Poona, a distance of 131 miles. The electrification of this line is part of an extensive scheme which includes suburban service in the Bombay area and main line service on two inland routes.



A new M.E.T. car which was put into service in North London, on Wednesday.

The L.N.E.R. Co. hope to include, amongst development schemes now being drawn up, the electrification of the company's London suburban lines.

It is expected that the conversion of St. Ann's Well Road and Wilford Bridge (Nottingham) tramways to a trolley bus service will take place about the middle of November. A dozen trolley vehicles have been ordered and an advanced stage has been reached in the overhead equipment work. A great extension of the railless trolley system is projected at Nottingham. Powers are to be sought to obviate the necessity of applying for permission to make changes of system upon particular routes.

Mr. William Marsh, engineer and manager of Brighton tramways, has reported to the Tramway Committee that the re-arrangement of the supply feeders which was made in the autumn of 1927 now appears to be inadequate. During the last pre-war year the consumption of current was 1¾ million kWh, this year it will be about 4¼ millions. It will be necessary to provide some larger cables for some districts, those displaced being used elsewhere to supplement smaller ones in their turn. The Committee has authorised Mr. Marsh to carry out the necessary re-arrangement and to requisition from time to time whatever new cables may be required.

A train on the Buenos Aires Great Southern Railway, hauled by a Diesel electric locomotive, recently made a non-stop run of 775 miles in 20 hours and 37 minutes, an average of about 37¼ miles per hour. The train, composed of the locomotive and two coaches, had a total weight of 159 tons. On several parts of the journey a speed of 46½ miles per hour was reached. The power plant consists of a Beardmore eight-cylinder four-cycle Diesel engine giving 375 B.H.P. at 700 r.p.m. direct coupled to a Metropolitan-Vickers 300 kW compound wound d.c. generator. The oil consumption was about 2·805 lb. per mile run.

At a recent meeting of Belfast Corporation, Ald. W H. Alexander asked whether the reforms outlined in the M'Clure report in 1927 with regard to the Corporation tramways had been carried out, and how much of the £31 408 (the amount of the saving in salaries and wages which the M'Clure Committee considered necessary) had been made during the past year. The chairman of the committee, Coun. M'Clure, said the trams were losing £2 000 per week from bus competition until the agreement was entered into to purchase the rival bus services. For the present year, at the present rate of running cost, the saving in working cost would be equal to £66 148. They would not touch the wages so long as satisfactory results could be obtained by proper organisation. Since he had learned by experience that the public preferred a tram at 2d. to a bus at 3d., he was no advocate for tearing up the tram lines and putting on buses. The Corporation has decided to seek powers to run railless trolley cars in the city.

LIGHTING LECTURES.

Extensive Programme Arranged for November and December.

THE E.L.M.A. Lighting Service Bureau has arranged for a comprehensive programme of lectures to be given between now and the end of the year, and these will cover practically every phase of lighting. The lectures will be given in various parts of the country as below :—

Date.	Audience.	Place.	Subject.	Time.
Nov.				
8th	Specialist ..	Edinburgh ..	Architectural Lighting	7.30 p.m.
11th	20th Design Course	Savoy Street	Industrial ..	7.30 p.m.
	Guildford Display Association	Guildford ..	Shop lighting .	7.30 p.m.
	Rotary Club ..	Aldershot ..	Modern Lighting	1 p.m.
12th	Forum Association	Rugby	Modern Lighting Methods	—
	E.A.W.	Rugby	Home Lighting	—
12th	Elliot Stone .	Savoy Street	Shop Lighting .	7 p.m.
	Chamber of Commerce	Clacton	Shop Lighting ..	7 p.m.
13th	Chamber of Trade	Bedford.....	Shop Lighting ..	7.30 p.m.
	Specialist	Bristol	Floodlighting ..	7.30 p.m.
	Trade	Manchester .	Glareless Light .	—
	Ironmongers' Association	Savoy Street	Shop Lighting ..	7.45 p.m.
14th	E.P.E.A.	Cardiff	Floodlighting ..	7 p.m.
	Rotary Club .	Gosport	Modern Lighting	1 p.m.
	Rotary Club .	Watford	Modern Lighting	1 p.m.
15th	E.A.W.	Gloucester ..	Home Lighting .	—
18th	20th Design Course	Savoy Street	Floodlighting ..	7.30 p.m.
	West of England Display	Exeter	Shop Lighting ..	7.30 p.m.
19th	Rotary Club .	Lytham.....	Modern Lighting	1 p.m.
	Rotary Club .	Jarrow	Modern Lighting	1 p.m.
	Public	Torquay	Home Lighting .	7 p.m.
	Public	Darlington ..	Home Lighting .	7.30 p.m.
20th	E.A.W.	Cardiff	Home Lighting .	7.30 p.m.
	Rotary Club .	Stepney.....	Modern Lighting	1 p.m.
21st	Rotary Club .	Sittingbourne	Modern Lighting	7 p.m.
	Rotary Club .	Acton	Modern Lighting	1 p.m.
22nd	Works and Roads Congress	London	Street Lighting .	3 p.m.
25th	20th Design Course	Savoy Street	Architectural Lighting	7.30 p.m.
26th	Rotary Club .	Greenwich ..	Modern Lighting Methods	1 p.m.
	Rotary Club .	Littlehampton	Modern Lighting Methods	1 p.m.
	Specialist	Sheffield	Industrial Lighting	7.30 p.m.
	Associated Municipal Engineers	Savoy Street	Industrial Lighting	3 p.m.
27th	Golders Green Chamber of Commerce	Savoy Street	Shop Lighting ..	4 p.m.
	Rotary Club .	Hinckley ...	Modern Lighting	1 p.m.
	Specialist	Liverpool ...	Industrial Lighting	7.30 p.m.
28th	Specialist	Newcastle ..	Industrial Lighting	7.30 p.m.
29th	Specialist	Edinburgh ..	Industrial Lighting	7.30 p.m.
Dec.				
2nd	20th Design Course	Savoy Street	General Problems	7.30 p.m.
	Engineers' Association	Southampton	Industrial Lighting	7.30 p.m.
	Specialist.....	Nottingham	Industrial Lighting	7.30 p.m.
3rd	Specialist	Birmingham	Industrial Lighting	7.30 p.m.
	Rotary Club .	High Wycombe	Modern Lighting Methods	1 p.m.
	Rotary Club .	Wimbledon..	Modern Lighting	1 p.m.
4th	Specialist	Bristol	—	7.30 p.m.
	Architectural Association	Edinburgh ..	Architectural Lighting	—
9th	Rotary Club .	Wigan	Modern Lighting Methods	1 p.m.
	Rotary Club .	Upper Norwood	Modern Lighting Methods	1 p.m.
10th	Rotary Club .	Aberdare....	Modern Lighting	1 p.m.
	Rotary Club .	Bromley	Modern Lighting	1 p.m.
11th	Rotary Club .	Erith	Modern Lighting	1 p.m.
17th	Rotary Club .	Wellington .	Modern Lighting	1 p.m.
18th	Rotary Club .	Maidenhead .	Modern Lighting	1 p.m.
20th	Rotary Club .	Hull	Modern Lighting	1 p.m.
31st	Rotary Club .	Paddington .	Modern Lighting	1 p.m.

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COMPANY NEWS.

Big Rise in Price of Metropolitan Electric Supply Co.'s Shares—General Electric and Associated Electrical Industries' Ordinary also Rise—Hydro-Thermal Power Co.'s Avonmouth Power Scheme—Directors' Reports and Dividend Announcements.

THE augmented list of electrical share quotations which we publish for the first time this week shows several outstanding features. The ordinary shares of the Metropolitan Electric Supply Company, which are to be increased by the creation of another half-million, have risen from 47s. 6d. to 56s. 3d., an improvement in a week of 8s. 9d. North Metropolitan, on the other hand, are 5s. lower, at about 52s. Midland Counties Supply ordinary shares have changed hands at under 30s., to which the price has been marked down from last week's quotation of 33s. Clyde Valley shares have also been sold, and have fallen half-a-crown, from 41s. 3d. to 38s. 9d. Other weak supply shares have been Newcastle and District, which have receded from 28s. 9d. to 27s. 6d. ; Yorkshire, from 35s. to 34s. ; and Scottish Power, from 30s. 6d. to 30s. On the other hand, County of London ordinary have hardened from 51s. 6d. to 52s. 6d., and Shropshire, Worcestershire and Staffordshire, 6% preference, from 21s. 6d. to 22s. In the manufacturing section, General Electrics have recovered from 45s. to 48s. 9d. Associated Electrical Industries ordinary shares have been in demand, the price improving 2s. 6d., from 31s. 3d. to 33s. 9d. Among cable manufacturing companies, W. T. Henley's ordinary shares are down 2s. 6d. to £6 5s., British Insulateds show a bigger proportionate decline from £4 to £3 17s. 6d., and Enfield Cable Works have at £4 17s. 6d. shed 1s. 3d. Cables and Wireless issues have again been an active market, but show little change on balance. Marconi's International Marine shares at 43s. 9d. are 1s. 3d. to the good. The ordinary stock of the American Telephone and Telegraph Co. has risen 5 points to 245.

Although the recent set-back in America has not had any material effect upon our market for electrical shares, prices in numerous instances stand at an attractive level. Newcastle and District and Scottish Power shares, to both of which we have referred, can be purchased to yield approximately 5½ per cent. The dividend on the former has been 7½ per cent. for each of the last two years, while the Scottish Power Co. for each of the past seven years has distributed 8 per cent.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	21/6	21/6	22/6	19/9
6½	" " C. Cum. Pref. ..	21/6	21/6	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	61/10½	61/10½	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(*d*)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
(*f*) 12	Calcutta E. Supp. Ord.	54/4½	54/4½	56/-	32/6
5	" " 5% Cum. Pref.	21/3	21/3	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(*a*)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(*b*)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	38/9	41/3	41/6	26/6
8	" " " 8% Pref.	28/6	29/4½	29/6	26/-
7	Cornwall Power 7% Pref. ..	24/4½	24/4½	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	52/6	51/6	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(*g*)	Electric Supp. Corp. Ord. ..	51/10½	51/10½	59/6	29/6
6	" " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/7½	35/7½	45/-	26/9
4	Fife Tram. Lt. & P Ord.	13/9	13/9	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " 4½% 1st Mt.Deb.Stk.	89	89	92	80½
(*e*)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	28/-	28/-	32/9	22/10
6	" " " 6% C. 1st Pref. ..	27/-	27/-	28/6	24/9
7	" " " 7% Cum. Part.P.	28/6	28/6	31/3	24/6
5	London Power Co. 5% Deb. Stk.	97	97	104	95
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/6	27/6	37/6	23/-
10	Melbourne Electric Ord. Stk. ..	177½	177½	180	150
1/9½	Metro. Elec. Sup. Ord.	56/3	47/6	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	30/-	33/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	34/4½	34/4½	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	28/9	31/9	17/6
1/2½	N'castle-upon-TyneElec.Sup.Ord.	26/3	26/3	30/3	19/3
6	N. Metro. Elec. Ord.	51/10½	56/10½	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
11	River Plate Elec. Ord. Stk. ..	210*	210	226	187½
(*c*)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
8	Scottish Power Ord.	30/-	30/6	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	21/6	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	26/6	26/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	20/-	20/-	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	92	91½	98½	86½
7	Urban E.S. Ord.	36/10½*	38/1½	46/6	18/-
5	Victoria Falls Power Ord. ..	60/-	60/-	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	81½	81½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	87½	86½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	122½	152	117
7·67	" " " " 6% Pf. Stk.	124½	124½	133	103½
6	Calcutta Trams Ord.	15/7½	16/3	24/-	14/6
5	" " " 5% Cum.Pf.	13/9	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71½	71	72	54
4	" " " 4% Deb. ..	77	77	83	77½
4	City & S. Lon. 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	74	72	73½	62
5	" " " 5% Deb. ..	70½	68½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	61	61½	81	54½
3½	" " " 3½% Pf. Stk.	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	73	73	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	86½	86½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	22/-	22/-	28/2	11/-
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " 1st Deb. ..	57	57	78	60
5	Winnipeg Elec. Refdg. Mt. Stk. ..	84½	84½	92	77
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	33/9	31/3	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb.	75½	75½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	80/-	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/-	23/3	24/9	19/7
7	" " " 7% Deb.	102½*	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126½	126½	153½	120
15	Callender's Cable Ord.	75/-*	75/-	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum.Pt.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/-	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/-
4	" " 1st Mt. Deb. ..	66½	66½	75	68
20	Enfield Cable Works Ord. ..	97/6	98/9	82/-	60/-
7½	" " " 7½% Cum.Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	7/6	7/6	15/9	5/-
—	" " 6% C.P.	8/9	8/9	18/9	7/-
5½	" " 1st Mt. Deb. ..	88	88	103½	86
6	" " Conv. Deb. ..	71½	71½	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/-	19/9	92/3	18/1
10	" " 7% Partic. Pref. ..	29/6	29/6	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	48/9	45/-	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P. ..	25/-	25/-	27·9	22/9
7	" " 1st Mt. Deb. ..	103½	103½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	125/-	127/6	120/-	69/3
10	International Auto. Telephone O.	35/-	35/-	50/6	35/-
10	Johnson & Phillips Ord.	40/-	40/-	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord. ..	27/6	27/6	36/6	24/9
10	" " " Cum. Pref.	32/6	32/6	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/3	21/3	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	245	240	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Tele. Ord. Stk. ..	60½	61½	63½	56½
6	" " " 6% Prefd. Stk...	98½	98½	105½	91
1½	" " " Deferred Stk...	24½	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	82	82	—	—
—	"B" Ord. Stk.	50½	50½	—	—
—	5½% Cum. Pref. Stk. ..	97½	98	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	76	76	81½	74
4	Eastern Extension 4% Deb. Stk.	76	75	80	74½
22	Great Northern Telegraph (£10)	29	29½	43½	20
10	Indo-European (£25)	47½*	47½	48½	30
—	International Teleph. & Teleg. ..	$90	$90	161½	48½
15	Marconi's Int. Mar.	43/9	42/6	90/-	16/6
4½	New York Tele. 4½% Mt. Bds. ..	96½	99	101	90
12	Oriental Telephone Ord.	38/9	38/9	65/-	41/-
4	Western Tel. 4% Deb. Stk. ..	76	75	82	76
4½	United R. Plate Tele. 4½% Deb.	85/-	87½	89½	82
4	Western Tel. 4% Deb. Stk. ..	76	75	82	76

(*a*) 19½d. per share. (*b*) 1s. 9·3d. per share. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 7·181d. per share. (*f*) Plus 4d. bonus. * Ex dividend. (*g*) 2s. 2½d. per share.

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OXFORD ELECTRIC CO., LTD.—Div. at rate of 7% p.a., less tax, has bn. declared.

DUBILIER CONDENSER CO. (1925), Ltd.—Usual half-yearly div. on 7½% cum. pref. shs. will be payable on Nov. 30.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—Intm. div. of 1s. 6d. p. sh., less tax, on ord. shs. will be paid on Dec. 2.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—A mtg. was held on Wednesday to consider a resolutn. to increase cap. to £2 500 000, by creatn. of 500 000 £1 ord. shs.

EDISON SWAN ELECTRIC CO., LTD.—Pft. for 18 months to Dec. 31, 1928, £21 036. Div. amtg. to £9 000 was paid on ord. shs. for year to June 30, 1928. To deb. sinkg. fund £2 000; to res., £2 500; fwd. £12 619.

ELECTRICAL SECURITIES HOLDING CO. (JAPAN).—This co., with cap. stk. of three million yen, has been incorporated in Tokyo. It proposes to own stks. and bonds of electric, gas, railway and other companies.

CITY OF BUENOS AIRES TRAMWAYS CO. (1904), LTD.—Qrtrly. div. at rate of 5% p.a., less tax, to Sept. 30, 1929, will be payable on Nov. 16. Transfer books are closed from Nov. 8 to 14, inclusive, for preparation of div. warrts.

Marconi International Interim Dividend.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—Intm. div. of 5% (1s. p. sh.), less tax, is payable in respect of year 1929. Coupon (No. 35) may be left at Head Office, Marconi House, Strand, London, W.C.2, for four clear days for preparatn. of div. warrts.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Hldrs. of 7% 1st mtge. convertible deb. stk. are reminded that their option to convert their stk. into fully paid ord. shs. expires at the close of this year. Applications and stk. certificates must be lodged at the company's transfer office by Dec. 2.

BRISTOL TRAMWAYS AND CARRIAGE CO., LTD.—Directors propose to subdivide present £10 pref. and ord. shs. into shs. of £1 and to apply for the quotation of the pref. and ord. shs. on the London Stock Exchange. An extraordinary mtg. to consider the necessary resolutns. will be held on Nov. 26.

NATIONAL TELEWRITER CO., LTD.—Net pft. for year ended June 30, 1929, £1 190, agst. £1 254, makg. credit blce. £7 159. New license from Postmaster-General for use of telewriters on Post Office private wires, directors state, will be granted on satisfactory terms for 14 years from April 30 last. It is proposed to pay div. of 2d. p. sh. (agst. 2½d.) on pfd. ord. of £1 each.

NEW ENGLAND POWER ASSOCIATION.—This co., which is controlled by International Hydro-Electric System, a division of International Paper and Power Co., produced 1 292 759 000 kWh in the first nine months of this year, 32% greater than in the corresponding period of 1928 and 64% greater than in the first nine months of 1927. Its output in the twelve months ended Sept. 30, 1929, was 1 690 778 000 kWh, an increase of 30% over its output in the twelve months ended Sept. 30, 1928.

SOCIETE INTERNATIONALE D'ENERGIE HYDRO-ELECTRIQUE (SIDRO).—Subscriptns. are invited until Nov. 15, incl., for 117 000 one-fifth part ord. shs. at 1 750 fr. The new issue of part shs. is offered by pref. to hldrs. of 650 000 pref. shs. and 44 000 ord. shs. of 1 250 fr. divided into 220 000 part shs. of one-fifth, bearing the numbers 1 to 44 000, part shs. 1 to 5, who have the opportunity of subscribing: (1) Non-reducible—a part sh. of one-fifth ord. sh. for 8 pref. or part of one-fifth ord. sh. presented in support of the subscriptn.; (2) reducible—the remaining 8 250 part shs. of one-fifth new ord. shs., together with those which have not been absorbed by the exercising of the non-reducible subscriptn. rights. The offices at which the lists are open include those of Baring Bros. and Co., 8, Bishopsgate, E.C.2, and J. Henry Schroder and Co., 145, Leadenhall Street, E.C.3, London.

NORTH AMERICAN CO.—An increase in earngs. of 30.39% over previous year is reported for the twelve months ended Sept. 30, 1929, by this co., the largest electric light and power producing concern under single ownership in the United States. Amt. available for common stk., after all operatg. exes., int. charges, pfd. divs., depreciatn. and reserves, is $26 952 012 (£5 390 402), equivalent to $5.17 p. sh. on average number of common shs. outstandg. during year, compared with $20 668 750 (£4 133 750), or $4.40 p. sh., for precedg. twelve months. Gross earngs. for year under review amtd. to $145 624 060 (£29 124 812), agst. $130 668 369 (£26 133 674) last year, while operatg. exs. increased to $75 846 726 (£15 169 345), compared with $67 723 091 (£13 544 618) for previous year. Appropriatns. for depreciatn. reserves are shown at $15 399 988 (£3 079 998), increase $1 745 691 (£349 138) over figure for Sept. 30, 1928.

ASSOCIATED GAS AND ELECTRIC CO.—Directors are giving to stkhldrs., hldrs. of fully registered convertible securities, and certn. other security hldrs., of record at Oct. 31, rights to subscribe for one $8 interest-bearing allotmt. certificate for ea. eight shs. of stk. or ea. $800 principal amt. of fully registered convertible securities then held. Each allotmt. certificate will entitle hldr. to receive on or after July 1, 1930: (1) One sh. of common stk., class A, of General Gas and Electric Corporation as at present constituted or five new shs. after completn. of pendg. split-up proceedgs.; (2) one-fifth share of $5 div. series pfd. stk. Associated Gas and Electric; and (3) one deb. right of Associated Gas and Electric as at present constituted or five rights on completn. of proposed split-up. It is proposed to split up the common stks. of General Gas and Electric on the basis of five new shs. for each one sh. outstandg. The $5 div. series pfd. stk. of Associated Gas and Electric ranks on an equality with all other outstandg. pfd. stks., is entitled to divs. at annual rate of $5 p. sh. in priority to class "A," class "B" and common stks., and is redeemable at $102 p. sh. The directors of Associated Gas and Electric have declared regular qrtrly. div. on class "A" stk. payable Nov. 1 at rate of 1/40th of a sh. of class "A" stk. for ea. sh. held.

TELEPHONE MANUFACTURING CO., LTD.—The Board has formulated its scheme for segregating the assets, and an extraordinary gen. mtg. has been called for 11.30 a.m., on Nov. 25, at Cannon Street Hotel, London, E.C., to consider the directors' proposals. It is intended:—(*a*) To wind up company voluntarily; (*b*) to register Telephone Rentals, with cap. of £600 000 in 5s. shs., as a hldg. concern for the 17 subsidiary undertakgs. which instal telephone instrumts. and other apparatus on a rental basis; and (*c*) to register Telephone Manufacturing Co. (1929), with cap. of £250 000 in 5s. shs., to acquire business of mfg. telephone and ancillary apparatus for the installatn. companies, General Post Office, etc. Present authorised and issued cap. is £1 000 000 in 10s. shs., and it is proposed that for every sh. shhldrs. shall receive at the rate of one 5s. sh. in the new holding co. and one 5s. sh. in the new mfg. co. for every two held. The present scheme was prompted by the fact that, while the installatn. side of the business showed a pft, this was offset through losses incurred by unremunerative prices received by the mfg. side under contracts, principally with the General Post Office. The directors consider that by removing the burden of mfg. losses from the installatn. pfts. some return on the cap. should be possible. The Board also believes the reorganisatn. should place the mfg. co. on a pft.-earng. basis.

Company Meetings.

PHILIPS' GLOWLAMPWORKS, LTD. (HOLLAND).—At the general meeting on Monday, the shareholders unanimously adopted a proposal to increase the capital. Replying to questions, Dr. Philips announced that he anticipated a greatly increased output, particularly of wireless sets, and ascribed the recent dismissals to rationalisation and the introduction of new machinery.

WILLIAM BEARDMORE AND CO., LTD.—At the meeting on October 24th, Mr. L. C. Ord, who presided, said the Indian State Railways had ordered two Diesel electric locomotives, which were under construction and almost completed, and a mobile 100 H.P. Diesel generating set had been supplied to the engineering department of His Majesty's Post Office. A great future was anticipated for this form of motive power for railway traction and for other purposes, in the development of which the company had taken a leading part and was continuing to do so.

RHODESIAN ANGLO-AMERICAN, LTD.—At an extraordinary meeting of the company last week, Sir E. Davis (chairman) said it was in the interests of the whole of the Northern Rhodesian mining industry that there should be made available suitable and cheap power. With this object in view, it was proposed to form a company to inquire into the possibility of the creation of a large hydro-electric power station, a preliminary report upon which had been made by Mr. F. E. Kanthack. The site of the power station was situated slightly over 100 miles from the copper mines. The project was one that warranted full investigation.

ATLAS LIGHT AND POWER CO., LTD.—Mr. W. Sandford Poole, presiding at the meeting on October 30th, said, in reference to the sale of the company's Argentine interests, the total purchase price of £8 878 000 (of which £8 500 000 represented capital, and £378 000 interest and other credits

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for revenue account) had been received. With regard to the holdings in two tramway companies in Montevideo, which were excluded from the sale, all legal formalities for the fusion of the companies had been completed, but full liberty to run the combined businesses as one had not yet been obtained. The company was fortunate in having large sums of money available for investment at a time when prices were depressed, and shareholders might rest assured that the Board would do their best to invest these funds wisely as and when they considered the time had arrived. A resolution was passed to change the name of the company to the Atlas Electric and General Trust, Ltd.

RUTHS STEAM STORAGE, LTD.—Mr. W. S. Eyre, presiding at the meeting on Monday, said last month three of the directors, with two other British engineers, travelled to Germany and there saw the starting up of the Ruths steam accumulator plant at the Charlottenburg station, and inspected the organisation which Dr. Ruths had built up in Germany. It was a convincing demonstration of the magnitude of the value and scope of the system. The chairman of the Central Electricity Board, when approached with the request that they should send one of their engineers with the company's directors to investigate the Charlottenburg plant, said at once: "We are glad to do this for two reasons: first, I feel that it is desirable to look into all matters that may have a bearing on our own technical problems, and, secondly, I feel that it is our duty as a public board to take whatever steps we can to further any technical development that promises to be of assistance to British industries." He now came to a matter of major importance, and that was the future of Dr. Ruths' system in the central electricity stations throughout the world. A reference had already been made to the visit paid by some of the directors last month to Germany. In the party were two outstanding British engineers, who saw the Charlottenburg plant actually at work, and also visited a smaller though important peak-load installation in the city of Chemnitz, where it had been giving very satisfactory results for the past two years. Dr. Ruths' German company had recently received contracts for two peak-load accumulator plants similar to the Charlottenburg installation, though smaller, one for the city of Gothenburg and one for the city of Hattingen. Both these plants were under construction, and there were peak-load projects under consideration by the authorities in 18 of the leading cities in Europe.

HYDRO THERMAL POWER, LTD.—At the statutory meeting, held on October 30th, at 3, Victoria Street, London, Brig.-Gen. E. L. Spears (chairman) said their company owned the world's patent rights of an invention calculated to put a new value on water power. The system consisted of a combination of well-known elements, all of which were already in commercial use. Its novelty was the co-ordination of these elements in such a manner as to produce a result which had never before been obtained. Technical details had been dealt with fully in the report by the company's consultants, Messrs. C. S. Meik and Buchanan, and Messrs. Kincaid, Waller, Manville and Dawson, which had been put before the shareholders. Briefly it was claimed that the company's system provided a means of utilising water power resources with an important saving on capital and working costs. It was applicable to numerous hydro-electric schemes at present under consideration, as well as others whose conditions had hitherto been adjudged uneconomical. It also for the first time made practical the commercial utilisation of intermittent and fluctuating sources of hydraulic power, such as the rise and fall of tides. To demonstrate the practicability and commercial utility of the system, it was decided to instal a unit at Avonmouth Docks to operate under actual tidal conditions, and this unit would be in operation within three or four months. The firms engaged upon the manufacture of the plant were Messrs. Heenan and Froude, Ltd., in conjunction with the English Electric Co., Ltd., Messrs. Ruths Steam Storage, Ltd., and Messrs. Boving and Co., Ltd. Literature which has been issued states that the inventor of the system is Mr. Paul Shiskoff, and that the following are features of the scheme. The plant includes a water turbine coupled to an electric generator, while coupled also to the water turbine will be a water heater to absorb the surplus power. The water thus heated will be retained in a thermal storage vessel at a temperature corresponding to a high pressure, and the power so conserved will be used when required to drive another generator and so provide the additional energy required under special conditions of load, or will be primarily at command to generate power at such stages of the tide when the main water turbines could not be employed on account of the small difference in level betwen the impounded water and the river. The water for the turbines will be withdrawn from the Avonmouth Docks and discharged into the river over such period as will admit of an economical difference in head, and when this does not obtain, the power generation will be changed over to the storage system. The present experimental plant will be approximately of 250 H.P. capacity, and the primary and secondary generators will be of 50 kW each.

New Companies.

J. S. TOWELL, LTD.—Cap., £50 000. Electrical installers, etc. A first director: J. S. Towell, Wide Bargate, Boston.

BRENT ENGINEERING CO., LTD.—Cap., £100. Engineers, electrical and wireless engineers, etc. Reg. Office: 31, Walbrook, London, E.C.4.

LUMINIFEROUS SIGNS, LTD.—Cap., £8 000. Electrical appliances, etc. Solicitors: C. Butcher and Simon Burns, 32, Gresham Street, London, E.C.2.

HIGH TENSION WIRES, LTD.—Cap., £100. Manufacturers of wireless goods, mechanical and electrical engineers, etc. Reg. Office: 17, Ironmonger Lane, London, E.C.2.

JOHN COSENS, LTD.—Cap., £3 500. To acquire business of ironmonger, electrician, etc., now carried on by W. T. Cosens at 62/64, Bohemia Road, St. Leonards-on-Sea, as "John Cosens."

GODMAN BRITTAIN AND NUTTER, LTD.—Cap., £2 100. Manufacturers of and dealers in internal combustion steam, electrical, Diesel and other vehicles. etc. Solicitors: Boyce, Evans and Sheppard, 14, Stratford Place, London, W.1.

H. GILL AND SONS (HULL), LTD.—Cap., £2 000. To acquire business of electrical, radio and general engineers, etc., carried on at Hull by C. S. Gill, Millicent G. Gill and L. V. Gill as "H. Gill and Sons." Reg. Office: 328, Holderness Road, Hull.

HERD AND CO., LTD.—Cap., £500. Electrical and mechanical and electrical engineers, manufacturers of and dealers in electric, magnetic, telegraphic, telephonic and other appliances and apparatus. Reg. Office: D2, Exchange Buildings, Liverpool.

LAMLITE SIGNS, LTD.—Cap., £1 000. Designers and manufacturers of and dealers in animated, scintillating, brilliant-reflex, mechanical, electrical, flashing, rotating and other advertising signs, etc. Reg. Office: 5/7, Savile Row, Newcastle-on-Tyne.

HENDON LAMP AND ACCESSORIES CO., LTD.—Cap., £1 000. To acquire business of electrical engineer and contractor and dealer in electrical accessories, appliances and apparatus carried on by C. D. Falcke at 104, Southampton Row, W.C., as "Hendon Lamp and Accessories Co."

MOULDING DEVELOPMENTS, LTD.—Cap., £1 000. To adopt agreement with Speyer Schwerdt and Co. (1929), Ltd., and to carry on business of manufacturers, importers and exporters of and dealers in insulators; telegraphic, telephonic and electrical engineers, etc. Reg. Office: 5 and 7, Golden Lane, London, E.C.1.

METAL AND CHEMICAL PRICES.

TUESDAY, November 5th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£75 0 0	—	£1 10 0
Electro Wirebars	,,	£84 0 0	—	10s. 0d.
H.C. Wires, basis	per lb.	11¾d.	—	—
Sheet	,,	11¾d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2¾d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10¾d.	—	¼d.
Wire ,,	,,	11¼d.	—	¼d.
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£24 0 0	—	£1 0 0
Foreign or Colonial	,,	£22 5 0	—	£1 2 6
Tin—				
Ingot	per ton	£182 0 0	—	£1 15 0
Wire, basis	per lb.	2s. 5¼d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£21 17 6	—	5s. 0d.
Mercury	per bottle	£22 12 6	—	—

Sulphur—Flowers, Ton £12 0 0 Roll, ,, £10 10 0 *Copper Sulphate* .. Ton £25 to £25 10 0 *Boric Acid* (Crystals) ,, £20 0 0

Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¾d. *Sodium Bichromate*—Per lb. 3¼d.

Rubber—Para fine, 9½d.; plantation, 1st latex, 8⅞d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

In sympathy with the weakness in other metals and influenced by events in Wall Street, the market last week, according to James Forster and Co., opened easier by 5s. per ton, while later prices were flat, and a further 20s. per ton lower, November lead selling down to £22 2s. 6d., and January to £22 5s. A slight reaction set in towards the end of the week, but subsequently relapsed. The American official price dropped from 6·90 cents to 6·50 cents, a fall of 35s. per ton.

Closing prices on November 1st were £22 3s. 9d. for November, £22 5s. for December, £22 6s. 3d. for January, and £22 7s. 6d. for February, about 23s. 9d. per ton lower on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ABBA ELECTRICAL CO., LTD., Abba Works, Engine Street, Smethwick, electrical merchants. £15 12s. 4d. September 30th.

BLACKMORE, G., 62, Coventry Road, Market Harborough, wireless dealer. £14 6s. September 24th.

BULLOCK, Mr. H. A., Barbourne Road, Worcester, electrical contractor. £12 10s. 6d. September 26th.

DARCH, Mr. W., 43A, St. Thomas Street, Weymouth, wireless dealer. £18 12s. 2d. September 23rd.

EGERTON AND CO., Pear Tree Road, Derby, electricians. £13 7s. 10d. October 4th.

FERRIDAY, Lance, The Arcade Wireless Shop, High Street, Stockton-on-Tees, wireless engineer, £17 16s. 1d. August 14th.

KERR AND CO., 3, The Crescent, Fisher Street, Workington, radio dealers. £11 3s. 4d. September 23rd.

LYON, Mr. C. B., Culham, 18, Mount Park, Carshalton, radio dealer. £18 1s. 8d. September 20th.

PHILLIPS, W. W., 80, Elkington Road, Burry Port, wireless dealer. £48 8s. 8d. September 25th.

SHILVOCK, G., AND SONS, 197, Station Road, Rugby, electrical engineers. £15 4s. 8d. September 24th.

SLATTER, G. A., AND CO., Bridge Street, Crook, electrical engineers. £17 18s. 10d. October 2nd.

SWORD AND CO., 29, Withington Road, Whalley Road, Manchester, electrical engineers. £10 5s. September 30th.

WEEKS AND CLARKE, 261, Haydons Road, Wimbledon, wireless factors. £16 13s. 2d. September 23rd.

WILKINS, Mr. J., 12, Park View Road, Croydon, wireless dealer. £23 16s. September 23.

WILLIAMS, Mr. D., 55, High Street, Abertridwr, electrical and radio engineer. £31 8s. 3d. September 24.

WINCUP, G. R., 81, Salisbury Road, Kilburn, wireless engineer. £10 5s. September 24.

Bills of Sale.

SCULLY, John Patrick, 75, Knockland Road, Tuebrook, Liverpool, electrical equipment dealer. Dated October 19th, filed October 22nd. £40.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

BAILEY AND INCLEDON, LTD., electrical engineers, 34, Duke Street, London, S.W.1. In pursuance of the provisions of the Companies (Consolidation) Act, a meeting of the creditors of the above was held on November 4th, at Anderton's Hotel, Fleet Street, E.C., when a statement of affairs was submitted which showed liabilities of £4 178 (£2 421 to the trade) and assets estimated to realise £3 395, less preferential claims of £2 286, leaving net assets of £1 109.

It was reported that late in 1928 one of the directors sued the company in respect of arrears of directors' fees, and recovered some £200. At a later date a further action was commenced, and subsequently the company passed resolutions for voluntary liquidation. The summarised trading profit and loss account for the period from August 19th, 1926, to October 18th, 1929, showed that the company's expenses were £4 007, whilst the directors' remuneration had been £2 965. The gross profit was £2 350, on a turnover of £27 683, and there was a net loss of £4 623. The deficiency account at October 18th, 1929, showed that the issued capital of the company was £3 000, whilst the amount written off the book debts, stock, work in progress, goodwill, etc., was £1 446. There was a deficiency as regards contributories of £6 069.

It appeared that the company was formed about the middle of August, 1926, to take over a business previously carried on by Mr. Bailey and Mr. Incledon. During the first two years the company took over some partly completed contracts, and they showed some very heavy losses, and during the first year, owing to an error in estimating, a large contract showed an actual gross loss of over £500.

It was decided that Mr. E. H. Hawkins, of Messrs. Poppleton, Appleby and Hawkins, should be appointed as joint liquidator with Mr. Weller, the liquidator appointed by the company. The following are creditors: Baxter, E. J., Watford, £1 568; B. D. and Co., London, £110; Bergman Electric Wire Co., Ltd., £65; Brindley, F. and B., £76; Bern, G., Ltd., £10; Coquantin, M., and Co., £38; Courtin and Walsh, Ltd., £53; Falk, Stadelmann and Co., Ltd., £72; Homefinders (1915), Ltd., £10; International Lamps, £42; Keith and Blackman Janes, Ltd., £37; Seeman (Arnold) and Co., £43; Shaw (John) and Sons, Ltd., £58; Turner and Evans, £25; Wholesale Electric Lamp Co., Ltd., £46; creditors under £10, £11.

London Gazette, etc.

Company Winding-up.

MANCHESTER PRIVATE TELEPHONE AND ELECTRIC LIGHTING CO., LTD. Winding-up Order, October 28th.

Winding-up Petition.

STANDARD PLATINUM CONTACTS, LTD. A creditor's petition for winding-up has been presented by Henrion Carbons, Ltd., Kinnaird House, Pall Mall East, London, S.W.1, electrical engineers, and is to be heard at the Royal Courts of Justice, Strand, W.C.2, on November 11th.

Companies Winding-up Voluntarily.

BRITISH ELECTRICAL REPRODUCTION CO., LTD. By reason of its liabilities, October 28th. R. L. Latimer, chartered accountant, appointed as liquidator. Meeting of creditors at 4B, Frederick's Place, Old Jewry, London, E.C.2, on Tuesday, November 12th, at 12.30 p.m.

UNIVERSAL AND GENERAL RADIO CO., LTD. By reason of its liabilities, October 26th. H. N. Murray, Revenue House, 7–8, Poultry, London, E.C.4, chartered accountant, appointed as liquidator.

WIRELESS LIGHTS, LTD. By reason of its liabilities, October 30th. G. Hay, chartered accountant, of the firm of Spain Brothers and Co., 45, London Wall, E.C.2, appointed as liquidator. Meeting of creditors, at 40, Hatton Garden, E.C.2, on Friday, November 15th, at 9 a.m.

Bankruptcy Information.

WESTBURY, Leslie William, lately trading as L. W. WESTBURY AND CO., and also as the WALSALL RADIO CO., at 146, Lichfield Street, Walsall, wireless goods dealer. Receiving order, November 1st. Debtor's petition.

Application for Discharge.

HURLES, Edward James Gordon, 8, Blackfriars Road, London, S.E., wireless dealer. Hearing, November 29th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Order Made on Application for Discharge.

HYDE, Hubert Algernon, 148, Weston Park, Crouch End, North London, lately 2, East Street, Bromley, Kent, wireless dealer. Discharged November 22nd, subject to judgment for £90.

Bankruptcy Proceedings.

STONE, George Frederick Amos (trading as THE STONE MANUFACTURING CO.), electrical accessories manufacturer, 108, Great Saffron Hill, London. The statement of affairs in this bankruptcy shows liabilities £2 279, of which £1 921 are returned as expected to rank, and net assets £30. The debtor commenced business on his own account in June, 1920, with £150 to £200 savings as capital, under the style of the General Maintenance Electrical Co., 14, High Street, Pinner. He shortly afterwards took in a partner and they continued trading under the same trading name until September, 1921, when the business was absorbed by Modern Electric Supply Co., Ltd. which was formed for this purpose. He was afterwards appointed sales manager, and remained with the company until it went into liquidation. In September, 1923, with under £200 as capital, he commenced business on his own account as a wholesale dealer in gas and wireless goods under the style of Lighting Supplies Co., at No. 2, Finsbury Place, E.C. This was successful, and two further shops were taken at Nos. 4 and 5, Finsbury Place. In July, 1925, he formed Finston Manufacturing Co., Ltd., who took over the last-mentioned business and traded from 45, Horseferry Road, S.W.1; as vendor he was allotted shares and was appointed joint managing director, which position he held until July, 1927. The company subsequently went into voluntary liquidation. In July, 1927, with £80 borrowed capital, he commenced trading as an electrical accessories manufacturer under the style of Stone Manufacturing Co., at 108 and 109, Great Saffron Hill, E.C.1. He was handicapped by insufficient working capital, and ceased tradiug on July 12th last, when he called his creditors together and executed a deed of assignment in favour of a trustee, but a bankruptcy petition was eventually presented and these proceedings ensued. Since July 20th last he has been employed as a traveller at a salary of £3 10s. per week.

STRATHDEE, Andrew Knox Ewart, trading as EMSCO RADIO, 923, Romford Road, Manor Park, London, electrical engineer. Adjudicated a bankrupt on July 6th last, with ranking liabilities estimated at £614, the debtor applied to Mr. Registrar Mellor in the London Bankruptcy Court last week for his order of discharge. The Official Receiver said that the assets, which were valued by the debtor at £310, had realised £55, and further small sums might be recovered from book debts. The debtor, who began business as an electrical engineer in November, 1918, began in November, 1922, also to deal in wireless apparatus. He attributed his insolvency to his ill-health, to bad debts, and to depreciation of stock on account of removals and storage. The Official Receiver opposed the application on the grounds that the debtor's assets were not of a value equal to 10s. in the £, and that he had omitted to keep proper books of account. His Honour suspended the discharge for three months.

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ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

CLARIFOIL.—501 048. Class 50. Films or pellicles made from cellulose acetate or other cellulose derivatives or cellulose, and sold in the form of sheets, bands or strips, for wrapping or packing or electrical insulating purposes. British Celanese, Ltd., Celanese House, 22 and 23, Hanover Square, London, W.1; manufacturers. March 18th, 1929. To be associated with No. 501 049 (2 687.)

KLARIFOIL.—501 049. Class 50. Films or pellicles made from cellulose acetate or other cellulose derivatives or cellulose. and sold in the form of sheets, bands, or strips for wrapping or packing or electrical insulating purposes. British Celanese, Ltd., Celanese House, 22 and 23, Hanover Square, London, W.1; manufacturers. March 18th, 1929. (To be associated with No. 501 048 (2 687).)

DORIAN WIRELESS.—500 027. Class 8. Wireless telephonic and telegraphic apparatus. The Dorian Wireless Co., Ltd., Canberra House, 315, Regent Street, London, W.1; manufacturers of portable wireless receivers. February 14th, 1929.

SUPACON.—501 917. Class 8. Electric cables. Superlamp, Ltd., 92 and 94, Paul Street, London, E.C.2; wholesale dealers in electrical and radio goods. April 18th, 1929. (By consent.)

ATSA.—500 794. Class 8. Philosophical and scientific instruments. Société Anonyme Accumulateurs Tudor, 60, Chaussee de Charleroi, Brussels, Belgium; manufacturers. March 8th. 1929.

MEMOTA.—502 077. Class 8. Thermostatically controlled switches for use in connection with electric motors. Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Barford Street, Birmingham; manufacturers. April 24th, 1929. (To be associated with No. 337 390 (1 760) and others.)

PEDIGREE.—504 217. Class 8. Instruments and apparatus for radio-signalling, sound reproducers and thermionic amplifiers, gramophones, gramophone pick-ups, and parts of same. Harold Taylor, "Woodhill," Ormes Lane, Compton, Wolverhampton; radio engineer. July 4th, 1929.

A.B.L. BEZEG (sign).—501 200. Class 13. Plug connectors, wall plugs, utensils, plugs, plug sockets, complete lead-in connections for electrical apparatus and appliances, and heating elements for electric stoves, all being metal goods. Bayerische Elektro-Zubehor Aktiengesellschaft, 6A, Wagnerstrasse, Lauf, near Nuremburg, Germany; electrical engineers. March 23rd, 1929. Registration of this trade mark shall give no right to the exclusive use of the letters "A.B.L." In use the words "plug connectors" may appear on the mark or may be varied by the substitution of the names of other articles included in the specification of goods.

ELFA.—500 525. Class 8. Electric batteries (not for medical purposes). Naamlooze Vennootschap Werktuigenfabriek "Rotator," Valkenburgerstraat 5A, Amsterdam,; manufacturers. February 28th, 1929. (To be associated with No. 500 526 (2 686) xiii.)

"FULCAPAC."—503 321. Class 8. Electric batteries (not for medical purposes). Symphony Gramophone and Radio (Foreign), Ltd., trading as The Fulcapac Battery Co., Chesham House, 150, Regent Street, London, W.1; dealers in wireless apparatus. June 4th, 1929.

RESERWATT.—504 710. Class 8. Ignition batteries for internal combustion engines. Société des Magnetos R.B., 2 to 8, Rue Ernest Lefevre, Paris, France; manufacturers. July 23rd, 1929. (Date claimed under International Convention, April 11th, 1929.)

HARLIE.—504 832. Class 8. Wireless telephonic apparatus and parts thereof and gramophones. Harlie Brothers, 3, Balham Road, Lower Edmonton, London, N.9; manufacturers and merchants. July 27th, 1929.

AGAPHONE.—504 919. Class 8. Gramophones and records and accessories therefor; and wireless telephonic apparatus. Lionel Black, 147, Holborn, London, E.C.1; merchant and importer. July 30th, 1929.

DYSONUS.—505 010. Class 8. Philosophical and scientific instruments. Hardyson Radio, Ltd., 13, Market Street, Huddersfield; manufacturers of musical and scientific instruments. August 2nd, 1929. (To be associated with No. 505 011 (2 686) ix.)

ELFA.—500 526. Class 13. Electric hand torches. Naamlooze Vennootschap Werktuigenfabriek "Rotator," Valkenburgerstraat 5A, Amsterdam; manufacturers. February 28, 1929. (To be associated with No. 500 525 (2 686) viii.)

TOASTMISTRESS.—503 947.—Class 18. Electric toasting stoves. Waters-Genter Co., 213 to 217, North Second Street, Minneapolis, Minnesota; manufacturers of electrical apparatus. June 25th, 1929. (To be associated with No. 502 773 (2 681.)

TURNLIGHT (sign). B493 287. Class 8. Electric batteries (not for medical purposes). Batterien-u Elemente-Fabrik System Zeiler Aktiengesellschaft, Rungestrasse 20, Berlin, S.O. 16; manufacturers. July 13th, 1928. User claimed from May 24th, 1924.

JUMBO. 502 066. Class 8. Talking machines and wireless telephonic and telegraphic apparatus and parts thereof. The Parlophone Co., Ltd., 1, Broad Street Place, London, E.C.2; manufacturers. April 23rd, 1929. To be associated with No. 299 534 (1 580) and others.

SYMMETAR.—505 066. Class 8. Philosophical and scientific instruments. I. G. Farbenindustrie Atkiengesellschaft, Mainzerlandstrasse 28, Frankfort-on-Main; manufacturers. August 6th, 1929.

JUMBO (sign). 502 597. Class 8. Talking machines and wireless telephonic and telegraphic apparatus and parts thereof. The Parlophone Co., Ltd., 1, Broad Street Place, London, E.C.2; manufacturers. April 23rd, 1929. To be associated with No. 299 534 (1 580) and others.

DUBLETO. 505 484. Class 8. Electric cables. Ward and Goldstone. Ltd., Samson Works, Frederick Road, Pendleton, Manchester; electrical engineers. August 23rd, 1929.

DYALMO.—505 352. Class 6. Electric lighting, power and ignition machines and parts thereof for motor vehicles and cycles. The M-L Magneto Syndicate, Ltd., Victoria Works, Lower Ford Street, Coventry; manufacturers. August 16th, 1929.

MAXITONE.—502 142. Class 8. Philosophical and scientific instruments. Lugton and Co., Ltd., 133 and 135, Old Street, London, E.C.1; talking machine factors. April 25th, 1929. To be associated with No. 368 312 (1952) and others.

CAMEL ACCUMULATOR (sign).—503 954. Class 8. Electric accumulators (not for medical purposes). Maurice Marks, trading as the Camberwell Supply Stores, 185, Camberwell Road, London, S.E.5; electrical engineer. June 25th, 1929. (By consent.)

CINEXPO.—505 459. Class 8. Philosophical and scientific instruments. Photo Marketing Corporation, 152, West 42nd Street, New York, merchants. August 21st, 1929.

IDEAL (sign).—501 395. Class 8. Wireless telephonic apparatus and parts thereof. Electradio Co., Ltd., 25, Westbourne Grove, London, W.2; manufacturers and merchants. March 28th, 1929. (By consent.) Registration of this trade mark shall give no right to the exclusive use of the word "Ideal."

SYMENTIS.—503 724. Class 50. Electrical insulating material, plastic compositions of phenol and formaldehyde for use as binding agents for electrical insulating material, electrical insulating panels made of material covered by Class 50. William Arthur Jones and Henry Allaun, trading in co-partnership, 74, Blackfriars Road, Salford; manufacturers. June 18th, 1929.

MASTOL.—503 725. Class 50. Electrical insulating material, plastic compositions of phenol and formaldehyde for use as binding agents for electrical insulating material, and electrical insulating panels made of material covered by Class 50. William Arthur Jones and Henry Allaun, trading in co-partnership, 74, Blackfriars Road, Salford; manufacturers. June 18th, 1929.

RANGER.—502 107. Class 8. Electrical dry cells (not for medical purposes). J. F. Smith (Birmingham), Ltd., 92, Hurst Street, Birmingham; merchants. April 25th, 1929.

JUMBO.—502 597. Class 8. Records. Wireless telephonic and telegraphic apparatus and parts thereof. The Parlophone Co., Ltd., 1, Broad Street Place, London, E.C.2; manufacturers. May 8th, 1929. To be associated with No. 299 534 (1 580) and others.

PANOPHASE.—502 301. Class 8. Electrically operated sound reproducing instruments and wireless telephonic and wireless telegraphic apparatus. Ernest John Allan, trading as the Radio and Electro-Acoustic Development Co., 8, Westfield Place, Dundee; manufacturer. April 30th, 1929.

PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

317 289 J. H. WILLIS. Chronological device, particularly adapted for use in determining the local times of foreign wireless or television programmes (21/1/29.)

317 291 F. NEWTON. Electric motors for driving spinning-cans and the like. (13/6/28.)

307 022 INTERNATIONAL GENERAL ELECTRIC CO., INC. Multi-stage centrifugal compressors with intermediate cooling. (1/3/28.)

317 110 R. GRAH. Plating with chromium. (22/6/28.)

317 301 W. E. WILLIAMS. Directional aerials for transmission and reception of electro-magnetic (wireless) waves. (13/2/28.)

317 302 B. SYKES. Voltage-regulators for electric generators. (13/2/28.)

317 409 R. LOMAX, J. R. GARNER, and P. C. WALKER. Electrical fuses. (16/2/28.)

317 494 F. W. GEE and FERRANTI, LTD. Electric transformers. (17/2/28.)

317 497 A. REYROLLE AND CO., LTD., and H. LEBEN. Electric protective systems (17/3/28.)

317 498 A. REYROLLE AND CO., and H. LEBEN. Electric protective systems. (17/3/28.)

317 503 IGRANIC ELECTRIC CO., LTD., and F. J. H. CHARMAN. Radio-receiving apparatus. (18/4/28.)

317 504 GENERAL ELECTRIC CO., LTD. (DR. A. JUST). Manufacture of electric discharge devices. (18/4/28.)

290 169 LOEWE-RADIO GES. Filler device for operating multi-stage thermionic amplifiers with supply units. (6/5/27.)

317 305 BRITISH THOMSON-HOUSTON CO., LTD., and A. T. STACE. Sound-reproducing instruments. (11/5/28.)

290 299 DR. S. LOEWE. Diaphragm for loudspeakers. (13/5/27.)

317 351 EDISON SWAN ELECTRIC CO., LTD., and T. F. STENT. Thermionic valve circuits. (14/5/28.)

317 416 A. L. MOND (I. G. FARBENINDUSTRIE AKT.-GES.). Method of charging electric furnaces. (14/5/28.)

317 354 D. E. BARNETT. Electrical terminals. (14/5/28.)

290 583 H. BERTLING. Method of and apparatus for artificially illuminating objects. (14/5/27.)

317 514 J. A. CRABTREE. Electric lampholder switches. (16/5/28.)

317.422 A. REYROLLE AND CO., LTD., and B. H. LEESON. Electric meters and selective remote-control systems employing such meters. (16/5/28.)

317 423 GENERAL ELECTRIC CO., LTD., and E. H. CRIBB. Telephone or like systems with amplifiers. (16/5/28.)

317 424 J. A. COLOMBI. Slip-rings and other current-collecting devices. (16/5/28.)

317 425 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.). Strand-coating apparatus. (16/5/28.)

317 426 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.). Electro-optical image-producing systems and apparatus therefor suitable for television. (16/5/28.)

317 429 A. WEST AND CO., LTD., and A. WEST. Oil-immersed switches. (16/5/28.)

317 517 A. WEST AND CO., LTD., and A. WEST. Electrical grid resistances. (16/5/28.)

291 027 SIEMENS-SCHUCKERTWERKE AKT.-GES. Electromechanical. hammers. (24/5/27.)

317 521 STANDARD TELEPHONES AND CABLES, LTD., and E. P. G. WRIGHT. Non-numerical switching arrangements for automatic and semi-automatic telephone systems. (18/5/28.)

317 522 STANDARD TELEPHONE AND CABLES, LTD. (G. DEAKIN and L. J. J. SCHREIBER). Dial switches. (18/5/28.)

295 930 STANDARD TELEPHONES AND CABLES, LTD. Sub-harmonic electric frequency-producers. (20/8/27.)

317 523 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.). High-frequency signalling systems. (18/5/28.)

317 528 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.). Synchronising systems. (19/5/28.)

317 537 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.). Synchronising systems. (22/5/28.)

317 547 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and G. A. BURNS. Electrical signalling systems. (22/5/28.)

317 558 P. H. HULL and IMPERIAL CHEMICAL INDUSTRIES, LTD. Effecting chemical reactions in gases by means of electrical discharges. (31/5/28.)

292 122 E. PARVILLE ET CIE. Electric accumulators. (14/6/27.)

317 562 H. H. BERRY. Advertising-sign. (1/6/28.)

291 722 FELTEN UND GUILLEAUME CARLSWERK AKT.- GES. Method of impregnating high-tension electric cables. (3/6/27.)

317 566 G. W. HALE and RADIO INSTRUMENTS, LTD. Wireless receiving systems. (5/6/28.)

317 574 A. PREEN. Radio-receiving apparatus. (13/6/28.)

292 478 INTERNATIONAL GENERAL ELECTRIC CO., INC. Speed-controlling mechanisms for motor drives. (18/6/27.)

292 556 SIEMENS-SCHUCKERTWERKE AKT.-GES. Regulation of continuous-cycle absorption refrigerating-machines. (22/6/27.)

Applications for Patents.

July 26th.

23 055 F. S. ADKINS and R. W. CRABTREE AND SONS, LTD. Dynamo electric machines.

22 978 N. A. ALLEN, T. B. SCOTT and STANDARD TELEPHONES AND CABLES, LTD. Single core cable.

23 046 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Circuit breakers. (22/8/28. U.S.)

23 048 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Metal disc rectifiers. (22/8/28, U.S.)

23 080 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD. and L. M. SIMPSON. Electrical indicator or display device.

23 012 W. E. BEATTY (BELL TELEPHONE LABORATORIES, LTD.). Reproduction of sound for films. (12/9/28.)

23 044, 23 045 E. A. BITTON, H. BRANTON, H. A. STORRY, LTD. and H. G. BAWTREE-WILLIAMS. Sound recording apparatus.

23 041 BRITISH TALKING PICTURES, LTD. Luminous discharge devices. (8/8/28, U.S.)

23 013 BRITISH THOMSON-HOUSTON CO., LTD. Oil-filled h.t. cables. (26/7/28, U.S.)

23 040 J. H. BROOME. Electric totalisators.

23 025 J. H. BURTON, RAILWAY SIGNAL CO., LTD. and W. S. ROBERTS. Rotary electromagnetic mechanisms.

23 023 J. E. CLARKE and LISSEN, LTD. Thermionic valves.

22 988 FELTEN UND GUILLEAUME CARLSWERK A.G. Submarine cables. (3/10/28, Germany.)

23 082 FERRANTI, LTD. (F. M. GENTRY). Thermionic valves or relays.

23 027 G. J. A. and L. FULLER. Galvanic batteries.

23 022 H. E. HUMPHRIES and SIEMENS BROS. AND CO., LTD. Electric selectors.

22 980 J. LUCAS, LTD., S. A. MASON, E. O. TURNER and H. E. WHITEHOUSE. Magnetos for engines.

22 944 H. F. Mc LOUGHLIN and SIMPLEX CONDUITS, LTD. Electric fuses.

22 947 H. F. Mc LOUGHLIN and SIMPLEX CONDUITS, LTD. Insulators of electric fuses.

22 948 H. F. Mc LOUGHLIN and SIMPLEX CONDUITS, LTD. Electric cables and distribution boards.

23 077 N. V. PHILIPS' GLOEILAMPENFABRIEKEN. X-ray tubes. (14/9/28, Holland.)

23 052 S. PRISNER and E. WENDER. Apparatus for transferring movements of body into variations in electrical current, etc.

23 085 SIEMENS-SCHUCKERTWERKE A.G. Trunk cables. (3/8/28, Germany.)

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July 27th.

23 186 C. Arnold (Air-Way Electric Appliance Corporation). Apparatus for cleaning, disinfecting, etc.
23 142 Associated Electrical Industries, Ltd. and A. Tustin. Suspension of motors on electric vehicles.
23 143 Automatic Telephone Manufacturing Co., Ltd., T. R. Rayner and J. Smith. Telephone transmission systems.
23 110 E. A. Bitton, H. Branton, H. A. Storry, Ltd. and H. G. Bawtree-Williams. Devices for supplying current to thermionic valves from supply mains.
23 114 W. Booth. Electric switches.
23 122 F. J. Brislee and British Insulated Cables, Ltd. Insulation of electric wires, etc.
23 152 British Thomson-Houston Co., Ltd. Film supporting and driving apparatus. (27/7/28, U.S.)
23 185 Burgess Battery Co. Battery hand lamps. (1/8/28, U.S.)
23 109 C. Greenham. Electromedical appliances.
23 180 K. J. Jungholm. Electric switches, etc.
23 097, 23 098 B. E. Mace and A. G. Sutherland, Ltd. Gas, electricity, etc., meters.
23 061 23 062 J. Robinson. Electrical apparatus employing piezo-electric devices.
23 184 Siemens-Schuckertwerke A.G. Polyphase asynchronous motors. (28/7/28, Germany.)

July 29th.

23 300 Associated Electrical Industries, Ltd. and E. Y. Robinson. Vacuum tube devices.
23 304 Associated Telephone and Telegraph Co. Train control systems. (1/8/28, U.S.)
23 302 Automatic Telephone Manufacturing Co., Ltd. and L. M. Simpson. Electric totalisators.
23 189 F. Ball. Electrical testing devices.
23 276 A. C. Bamford and Chadburn's (Ship) Telegraph Co., Ltd. Apparatus for transmitting signals, etc.
23 277 A. C. Bamford and Chadburn's (Ship) Telegraph Co., Ltd. Ships' telegraphs, etc.
23 219 M. P. Favre-Bulle. Electric clock.
23 257 D. Christian, A. T. C. Moore and Siemens Bros. and Co., Ltd. Telephone systems.
23 209 C. W. Cox. Electric fuses.
23 287 S. English and Holophane, Ltd. Artificial sunlight lamps.
23 288 S. English and Holophane, Ltd. Directional street refractors.
23 191 E. E. Fournier d'Albe. Electromagnetic relays.
23 268 J. Y. Johnson (I.G. Farbenindustrie A.G.). Production of continuously burning electric arcs.
23 238 Kolster-Brandes, Ltd. Radio receiving apparatus. (28/7/28, U.S.).
23 303 N. V. Philips' Gloeilampenfabricken. Electric fuses. (14/9/28, Holland).
23 306 N. V. Philips' Gloeilampenfabricken. Electric lampholders. (7/8/28, Holland.)
23 307 N. V. Philips' Gloeilampenfabricken. Electric devices for measuring potential differences. (3/8/28, Holland.)
23 232 National Carbon Co., Inc. Chamber for electrostatic precipitation. (14/11/28, U.S.)
23 227 E. L. Peterson. Transmitting visions. (18/8/28, U.S.)
23 305 J. E. Pollak (Associated Telephone and Telegraph Co.). Telephone instruments.
23 298 Soc. Des Telephones Grammont. Artificial impedance for telephone repeaters. (24/11/28, France.)
23 237 Suddentsche Telefon Apparate und Drahtwerke A.G. Dry electric rectifiers. (8/8/28, Germany.)
23 291 Telefonaktiebolaget L. M. Ericsson. Mounting electromagnetic relays, etc. (4/8/28, Sweden.)
23 292 Telefonaktiebolaget L. M. Ericsson. Polarised call bells. (4/8/28, Sweden.)

July 30th.

23 434 J. L. Baird and Televison, Ltd. Television apparatus. (10/10/28.)
23 355 O. T. Blathy. Speed regulation of a.c. motors. (10/9/28, Hungary.)
23 404 British Thomson-Houston Co., Ltd. Anodes for electric discharge devices. (30/7/28, U.S.)
23 405 British Thomson-Houston Co., Ltd. Electric furnaces. (30/7/28, U.S.)
23 331 H. A. Chaplin and O. Fulton. Electrical transmission and reception of pictures, etc.
23 375 C. W. Denny. Electric plug and socket gauges, etc.
23 385 J. J. Dowling and K. S. G. Sommerville. Electrically recording changes in materials, etc.
23 395, 23 396 Electro Dynamic Construction Co., Ltd. and N. Pensabene. Dynamo-electric machines.
23 417 Falk, Stadelmann and Co., Ltd. (H. Mendel). Filaments for incandescent lamps.
23 415 General Railway Signal Co. Electric relays. (12/9/28, U.S.)
23 431 Siemens-Schuckertwerke A.G. Polyphase induction motors. (26/9/28, Germany.)
23 448 Siemens Schuckertwerke A.G. Arrangements for excitation of generators etc. (31/7/28, Germany.)
23 363 R. T. Smith. Wireless direction finding systems.
23 392 Westinghouse Brake and Saxby Signal Co., Ltd. Radio detectors. (27/9/28, U.S.)
23 393 Westinghouse Brake and Saxby Signal Co., Ltd. Railway traffic controlling apparatus. (12/9/28, U.S.)

July 31st.

23 568 Automatic Telephone Manufacturing Co., Ltd. and H. Jackson. Automatic switches for telephone systems, etc.
23 569 Automatic Telephone Manufacturing Co., Ltd. and C. Gillings. Telephone systems.
23 582 J. L. Baird and Television, Ltd. Television, etc., apparatus. (10/10/28.)
23 566 R. H. Barbour and Electrical Apparatus Co., Ltd. Auto transformers.
23 567 R. H. Barbour and Electrical Apparatus Co., Ltd. Induction regulators, etc.
23 498 T. E. Braumont and J. N. Waring. Electric heating.
23 500 L. E. T. Branch and K. L. Meyer. Electrical recording and reproducing apparatus.
23 550 British Thomson-Houston Co., Ltd. Automatic pressure regulators. (31/7/28, U.S.)
23 540 B. Caplan. Electric igniition of engines.
23 507 S. Frais. Electric accumulators.
23 551 International General Electric Co., Inc. Insulators for high pressure. (31/7/28, Germany.)
23 561 F. Krupp Grusonwerk A.G. Hydraulic lead cutting-off devices for lead cable presses. (15/2/29, Germany).
23 555 Landis-Gyr Soc. Anon. Electric contact mechanism. (23/8/28, Germany.)
23 530 J. E. Pollak (Associated Telephone and Telegraph Co.) Telephone systems.
23 576 Siemens and Halske A.G. Polarised relays. (2/8/28, Germany.)
23 575 Siemens-Schuckertwerke A.G. Electric purification of gases. (1/8/28, Germany.)
23 548 H. Souplis. Amusement devices employing electrically driven vehicles. (1/8/28, France.)
23 510 R. Sugden. Television, etc., systems.
23 492 Sulzer Freres Soc. Anon. Refrigerating machines. (18/10/28, Switzerland.)
23 585 Telefonaktiebolaget L. M. Ericsson. Electromagnetic relays. (4/8/28, Sweden.)
23 574 Telefunken Ges fur Drahtlose Telegraphie. Radio direction finders. (6/8/28, Germany.)

August 1st.

23 702 Automatic Telephone Manufacturing Co., Ltd, and R. Taylor. Telephone systems.
23 598 S. Brierley and C. B. Brook. Electromagnetic stop motions for looms.
23 644 British Thomson-Houston Co., Ltd. Light sensitive apparatus. (6/8/28, U.S.)
23 613 C. F. and H. Burton. Operating means for electric condensers, etc.
23 696 F. G. G. Davey and Wirless Music, Ltd. Wireless receivers.
23 700 Dictograph Telephones, Ltd., and D. A. Hickling. Switches for automatic telephone exchanges, etc.
23 699 C. L. and R. H. Dixon. Battery holders, etc.
23 703 Hermsdorf Schomburg Isolatoren Ges. Electrical insulators. (5/12/28, Germany.)
23 617 Landis and Gyr Soc. Anon. Calibration of electrical measuring instruments. (28/8/28., Switzerland.)
23 627 H. F. Murcutt. Thermionic valves.
23 665 G. Pegg. Electric switches.
23 651 Sachsenwerk Licht und Kraft Akt.-Ges. Induction motors, etc. (27/9/28, Germany.)
23 643 F. G. L. Scott and A. W. Sharman. Electric signalling.
23 669 Siemens-Schuckertwerke A.G. Electrical purification of gases. (17/4/29, Germany.)
23 668 Siemens and Halske A.G. Connection arrangement for duplex telegraphy. (2/8/28, Germany.)
23 607 J. Spencer. Method for obtaining electricity.
23 674 T. Nilsson-Stig. Electrical machines. (16/8/28, Sweden.)
23 667 Telefonaktiebolaget and L. M. Ericsson. Electron tube relays. (1/10/28, Sweden.)
23 651 Telefunken Ges fur Drahtlose Telegraphie. Stabilising piezo-electric microphone plates. (1/8/28, Germany.)

COMING EVENTS.

Friday, November 8th (to-day).

Institution of Electrical Engineers (North-Eastern Centre, Students' Section).—Armstrong College, Newcastle-on-Tyne. Lecture by Mr. B. H. Leeson on "Centrovisory Control of Power Stations." 7.15 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W. Annual general meeting and election of officers. 7.30 *p.m.*

Saturday, November 9th.

Association of Mining Electrical Engineers (Western Sub-Branch).—Paper by Mr. G. E. Hider on "The Problem of Peak Loads."

Institution of Electrical Engineers (South Midlands Students' Section).—Visit to Austin Motor Co., Ltd., Longbridge Works, Birmingham.

Monday, November 11th.

Electrical Contractors' Association (Hastings Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting. 3 *p.m.*

Institution of Electrical Engineers (Western Centre).—Bristol University, Old Fort, Bristol. Paper by Messrs. B. A. G. Churcher and A. J. King, on "The Analysis and Measurement of Noise Emitted by Machinery." 6 *p.m.*

Institute of Wireless Technology.—Engineers' Club, Coventry Street, London, W. Paper by Mr. Noel D. Cumming on "The Maintenance of a Modern Broadcast Station." 7 *p.m.*

Institution of Electrical Engineers (Meter and Instrument Section).—Savoy Place, Victoria Embankment, London, W.C.2. Discussion on "Temporary Expedients in Engineering." Opened by Mr. W. E. Highfield. 7 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-upon-Tyne. Paper by Lt.-Col. S. E. Monkhouse and Mr. L. C. Grant on "The Heating of Buildings Electrically by Means of Thermal Storage." 7 *p.m.*

Tuesday, November 12th.

Electrical Contractors' Association (Leicester Branch).—Ordinary meeting.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Sheffield Illumination Society.—Visit to General Post Office. 6.30 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—The Hotel Metropole, Leeds. Paper by Mr. E. J. Evans on "Feed Heating by Extracting Steam in Generating Stations." 7 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—The Engineers' Club, Albert Square, Manchester. Paper by Mr. R. A. Chattock on "The Modern Use of Pulverised Fuel in Power Stations." 7 *p.m.*

Electrical Contractors' Association (Bournemouth Branch).—Ordinary meeting. 7.30 *p.m.*

Institution of Electrical Engineers (Scottish Centre).—Royal Technical College, Glasgow. Opening address by the chairman, Mr. G. Morgan. 7.30 *p.m.*

Wednesday, November 13th.

Electrical Contractors' Association (Eastbourne Sub-Branch).—South Street. Ordinary meeting.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting. 5.30 *p.m.*

Institution of Electrical Engineers (Scottish Centre Students' Section).—Royal Technical College, Glasgow. Chairman's address by Mr. J. A. Cowan. 7.30 *p.m.*

Thursday, November 14th.

Institution of Electrical Engineers (North-Western Centre, Students' Section).—Engineers' Club, Albert Square, Manchester. Joint debate with the Institution of Mechanical Engineers (Graduates' Section). Motion to be that the present tendency to transfer transport from rail to road is to be deprecated.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Association for Women.—46, Kensington Court, London, W.8. At Home. 3 *p.m.*

Institution of Electrical Engineers (Dundee Sub-Centre).—University College, Dundee. Paper by Mr. A. Erskine on "The Economic Combustion of Coal." 7.30 *p.m.*

Friday, November 15th.

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. Lecture by Mr. Francis Hodgkinson on "Journal Bearing Practice." 6 *p.m.*

Electrical Development Association.—Royal Society of Arts, John Street, London, W.C. Lecture by Mr. E. E. Sharp on "Selling Time Switches." 7.30 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London, S.W.1. Lecture by Mr. W. T. Griffiths on "Nickel and its Uses in Engineering." 7.30 *p.m.*

Saturday, November 16th.

Institution of Electrical Engineers (North-Eastern Centre, Students' Section).—Visit to the coal distillation plant of the Newcastle-upon-Tyne Electric Supply Co., Ltd.

Association of Mining Electrical Engineers (South Wales Branch).—Cardiff. Paper by Mr. R. H. Morgan on "Electrical Measuring Instruments."

Paisley Association of Electrical Engineers. Visit to the Bussey Coal Distillation Co., Ltd., Glenboig, Lanarkshire. 3 *p.m.*

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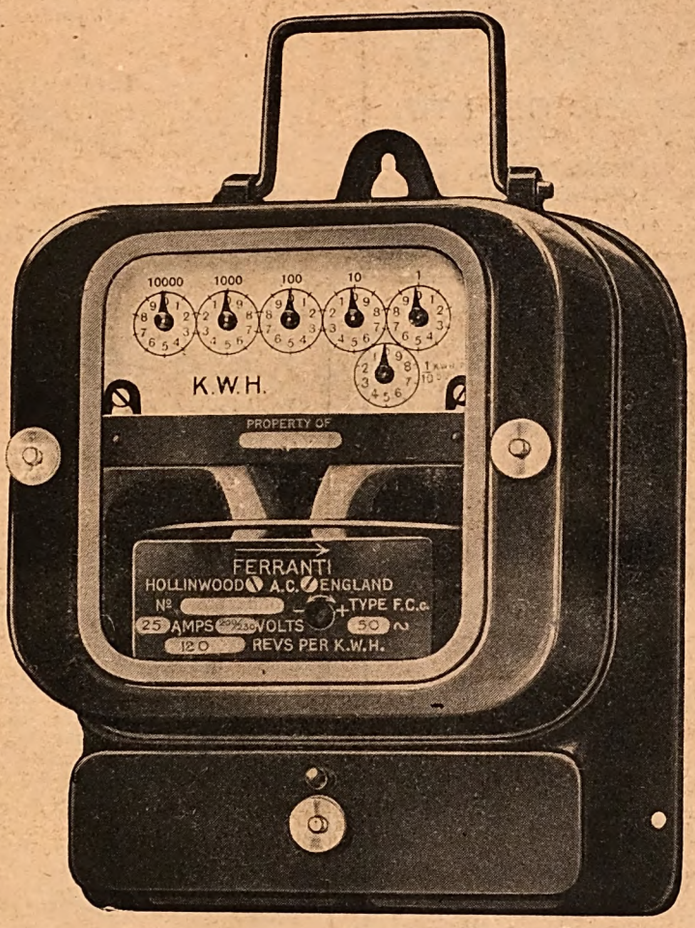

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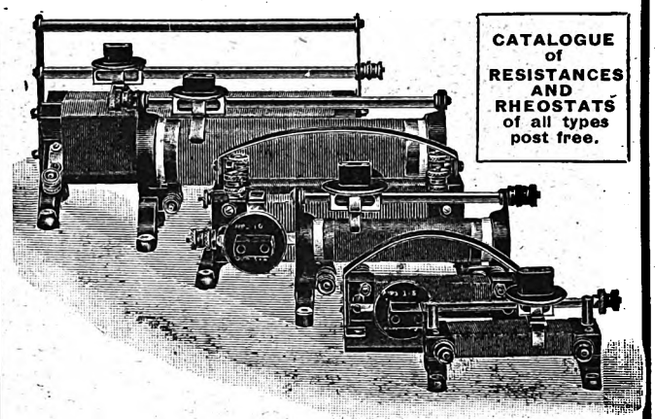

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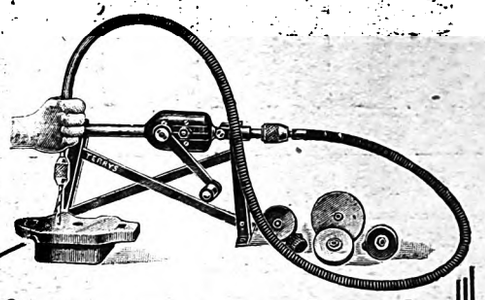

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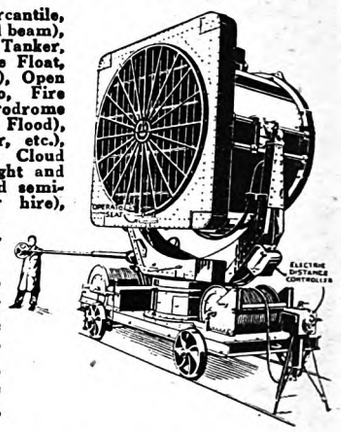

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Current Topics.

A Good Cause.

ONLY a few days remain before the result is known of the response made to Mr. HOWARD MARRYAT'S appeal for donations to put the capital fund of the Electrical Trades Benevolent Institution on a firm foundation. We therefore take this further opportunity to enlist the support of our readers in a cause which should interest every member of the industry. Those who are happily beyond contemplation of recourse to assistance from this ever willing but surprisingly needy helper of the needy could find no better way of marking appreciation of their good fortune than by providing one of the major sums now so urgently required to provide pensions for the numerous deserving cases which are known to the Institution. The others who are not so sure of what the future holds for them financially will do themselves and the E.T.B.I. a very good turn by sending along the small sum necessary for membership; by so doing they not only help to swell the funds of the Institution, but also qualify for the receipt of definite benefits if ever such assistance should be needed. It is a reflection on a great industry that its Benevolent Institution should always be appealing for funds. Let us all make some effort, no matter how small, to put it beyond the necessity to beg. One practical idea would be to pass round the E.T.B.I. collecting box at every electrical trade meeting between now and the date of the Festival Dinner. Other little ways of helping will naturally suggest themselves to those who really wish to lend their support to a very good cause.

British Electrical Production.

ALTHOUGH the monthly returns issued by the Board of Trade give a rough idea of the trend of United Kingdom trade it is obviously unwise to attempt to draw definite conclusions from such short-term records. The export of a big submarine cable order one month may, for example, give an appearance of retrogression to the export figures for the corresponding month of the following year in which no big item of cable is sent out of the country. A more balanced picture is, however, to be seen in the tables illustrating the "Economic Position in the United Kingdom" published in the "Board of Trade Journal." Taking the monthly averages for the period July-September in 1928 and 1929 these tables show an increase from 9·97 to 10·28 million insured workers employed, and an increase from 59·9 to 61·6 millions sterling in the declared value of exports. The figures relating to electrical engineering, based on the B.E.A.M.A. Index of Production show productivity percentages—taking the year 1924 as 100—of 84·1 in July-September, 1928, and 107·3 in the corresponding period this year. During the same period unemployment amongst insured workers in electrical engineering fell from 5·1 to 4·2 per cent., the lowest recorded since 1924.

An Important Survey.

ON November 28th, the British Electrical and Allied Manufacturers' Association will publish an important survey into the economic position and organisation of the British electrical industry. It represents the work of almost two years' continuous economic research into the main factors governing the growth of the industry and the development of its present predominance in export markets. It discusses in detail the modernisation of equipment in the basic industries, and shows how, through electrification, a new period of economic prosperity should take place in this country. The monograph also contains proposals advanced on behalf of the electrical industry for the expansion of production at home and the strengthening of the competitive position abroad, and, in view of the keen interest that is at present being taken in the unemployment question, these proposals have considerable significance. The picture given is that of an industry advancing steadily in strength and in pro-

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ductive capacity during the post-war decade at a time when other industries in the country have been seriously depressed.

Some Interesting Facts.

SOME interesting sidelights are thrown on electrical development in the United States by a review issued by the North American Power Co., in commemoration of its fortieth year of existence. We in this country have become so used to hearing of the extraordinary strides which have been made in electrical development in America that it is with something akin to surprise that we read that "the pace at which the use of electricity has spread in the United States has been rivalled by the growth in population, and the field for expansion remains extensive." Although the total consumption of electrical energy in America last year amounted to 88 000 000 000 kWh, an increase of 10% over the previous year, it is estimated that less than 3% of the railway mileage is electrified; less than 75% of the industrial power load is electrically generated; less than 60% of the population have their homes wired; and over 90% of the farms are without a supply altogether. We commend these figures to the after-dinner speakers whose persistent delight is to tell us how we are "lagging behind" the other industrial nations.

A Whitehall Example.

MR. GEORGE LANSBURY has declared his aim to see that all Government offices set an example to the nation in smoke abatement, and has promised that before long every office in Whitehall will be burning nothing but smokeless fuel. While we would prefer to see them using a fuel that is not only smokeless but incombustible, we do not expect miracles from the First Commissioner of Works. But this desire of Whitehall to set an example to the nation may even yet be turned to electrical advantage if Mr. LANSBURY will but inspect the lighting arrangements in Government offices. There he will find the crude old-fashioned white opal shades, low wattage carbon filament lamps, and improvised extensions with long lengths of flex festooned across the rooms in a most haphazard manner. As much of this handiwork can be viewed by bus-top passengers the introduction of proper lighting equipment would soon enable the Government to set yet another example to the nation, and at the same time increase the working efficiency in Government offices.

Electrical Trade with Canada.

IN view of the overseas trade figures referred to in the next column, it is interesting to note, according to the Royal Bank of Canada, that Canada's electrical imports from the United States are over twelve times those from Great Britain. The actual declared value of Canada's electrical imports in the twelve months ended June 30th last, from the United Kingdom and the United States, were £2 021 441 and £26 803 601 respectively. These imports included a large number of domestic appliances, radio receivers and valves, all of which we could very well have supplied from this country at competitive prices in spite of transport charges. That the position is serious goes without saying, for the tendency in time will be for Canadian users of electrical apparatus to look upon the British product as, if not altogether foreign, then certainly something which is rarely used in that country. As we pointed out in these columns two weeks ago, the story from South Africa is the same, and yet we still fail to recognise the necessity for fostering the Dominion markets, or at least nothing appears to be done to remedy the position. The Board of Trade returns, published elsewhere in this issue, tell their own story, but no matter how good the telling, it would have been all the better were the Dominions more concerned with its conclusion.

Overseas Trade in October.

A GENERAL improvement in foreign trade was made during October when compared with the previous month, exports amounting to £64 589 448, or £9 485 191 more than September, and imports £11 910 100 greater at £110 278 884. The figures for the ten months, usually a better indication of trade conditions than those of a single month, show in the case of imports an increase of £18 492 652 when compared with the same period of 1928, and in the case of exports the same comparison gives an increase of £8 733 930. Total exports amounting to £608 000 554 were, however, no less than £28 338 727 in advance of the figures for the same ten months of 1927. In the month's trading there was little progress made in shipments of manufactured goods while the increased import figures were assisted by non-ferrous metals, machinery and electrical goods.

Electrical Figures.

THE position of the electrical industry in so far as it is affected by the overseas trade figures is indicated in our abstract of the Board of Trade returns on another page. For the month of October an improvement of £380 457 was made on the export returns for the same month last year, various wires, and cables other than submarine, alone accounting for an increase of £205 836. Ten months export trading showed an advance of £747 190 when compared with the same period last year. The total amount being £15 995 778. On the import side we accepted goods and materials greater in value by £356 625 than during October, 1928, while for the ten months of this year imports of electrical apparatus, when compared with the same ten months of last year, increased by £1 433 605. The month's trading, however, still shows an excess of exports over imports, a preponderance of £370 548 being shown on the September figures. For the ten months the position is even more satisfactory, with a favourable electrical trade balance approaching £9 500 000.

Employment or Amenities?

MR. FRANK HODGES did well in his speech at the November luncheon of the Batti-Wallahs' Society to point the implications of the activities of the various "preservation" societies should their reactionary efforts find success. Few of these anti-pylonists, fearing the desecration of some beauty spot, can previously have realised that they were aggravating the unemployment problem. Mr. HODGES has clearly shown how greatly employment of the annual influx of young persons into the labour market depends upon unrestricted activity and progress in the electrical world. A concrete example was furnished this week in regard to a proposal to establish china clay works on Broad Down, Dartmoor. The objectors claimed that the works would spoil the scenery. The promoters said the scheme would provide much needed employment for about 500 men. Which is nationally more important; amenity or employment?

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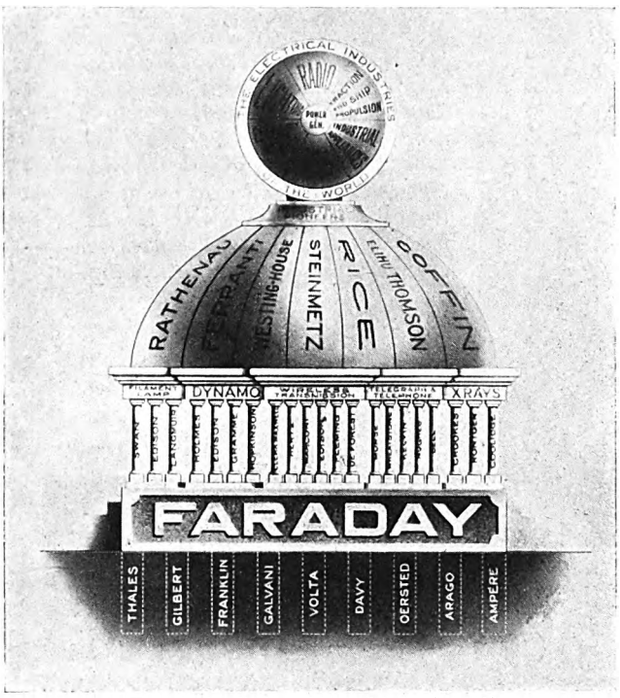
RATIONALISATION OF INDUSTRY.*

The Electrical Industry and its Potentialities—Need for Development of Domestic Consumption—Probable Quadrupling of British Electrical Turnover in Next Ten Years.

By A. P. YOUNG, O.B.E., M.I.E.E., M.I.A.E.

(*Concluded from page* 493.)

THE electrical industry is a relatively new growth studied in relation to some of the older basic industries, such as the textile, shipbuilding, coal, and steel industries, and it has been evolved almost entirely during the last 50 years. The



Mr. Young's visualisation of the great electrical edifice.

industry has grown out of a basic discovery made by Faraday nearly 100 years ago, when in the Royal Institution in London he discovered a method of producing an electric current from magnetism, which is known as the principle of electro-magnetic induction. In two years' time we shall be celebrating the centenary of this epoch-making discovery, and it is right that we should do so, because the whole of humanity is now appreciating—and will do so still more in the future—what it owes to the labours of this simple Englishman, who will go down to history as one of the greatest scientific investigators of all ages.

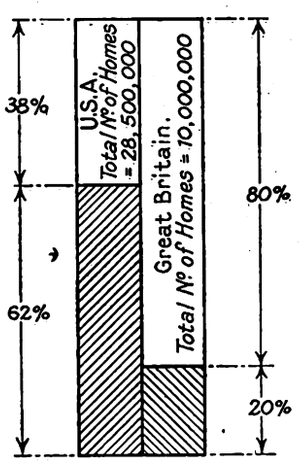


Fig. 1.—Chart showing relative progress in domestic application of electricity in Great Britain and U.S.A.

It is a striking fact that some fifty years elapsed after Faraday's discovery was given to the world, before the electrical industry which it established began to assimilate life. This fact in itself serves to show the rapid way in which industry has developed during the last century, because one of the outstanding features of industrial development at the present day is the short time lag between the making of a fundamental discovery and its application, by the engineer and industrialist, in the form of some serviceable entity, to meet human needs. This means that the activities of the electrical industry especially, will in a few years' time be concerned with the design, manufacture and installation of appliances which have not yet been evolved, so rapid has the translation of new ideas into serviceable commodities now become.

Although Faraday was one of the greatest of pioneers, and did work of fundamental importance which was of benefit, not only to the electrical industry, but to other industries—notably the steel, chemical and dyeing industries—he was but one of an army of pioneers, which by its efforts and sacrifice in the cause of science and industry, built up generation by generation the huge electrical edifice that we see around us at the present day.

We should take inspiration from the knowledge that the spirit, as I see it, behind the present rationalisation movement in industry, has always permeated the realms of pure scientific inquiry. For generations science has known no boundaries, and there has been complete freedom of scientific thought and discovery throughout the world. The material benefits which now surround us on every hand can be traced back in their origin to a relatively few scientific discoveries of fundamental importance which have been given to the world by pioneer workers in every land.

Complicating Factors.

The U.S.A. and Germany lead the world at the present time in the application of electrical energy to meet industrial and domestic needs, and one has to admit that this country is very backward in relation to such developments. The U.S.A. had a great advantage over ourselves in this respect because they began to move forward rapidly as an industrial nation just at the moment when the electrical industry started to grow and expand, and in one fell swoop they were able to pass—in the sphere of lighting, to take an example—from the old oil lamp to the electric lamp. On the other hand, we in this country had reached a high stage of industrial development by the time the electrical industry began to grow, and the complications arising therefrom, coupled with the inherent slow-moving traditions of the country, prevented such rapid progress being made with the new art.

One is happy to record, however, that this backward state of electrical development looks like being corrected during

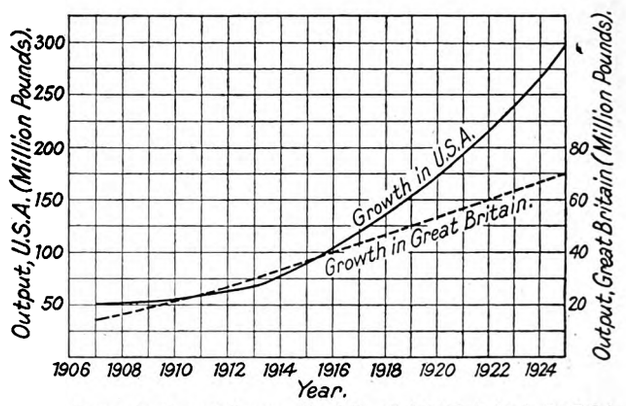


Fig. 2.—Curves showing relative growth of the electrical industry in the U.S.A. and Great Britain during the last twenty years.

the next decade, and the grid system of distribution that is being developed by the Central Electricity Board should, in the course of a few years, make electrical energy available to every home in every village, town and city throughout the land. The big expansion of the electrical industry which seems inevitable during the next ten or fifteen years will, it seems to me, come mainly from the enormous application thus effected, of electrical devices in the home, and some idea of the nature of this expansion which lies ahead of the British electrical industry, can be gauged from the diagram given in Fig. 1, which shows the relative progress already made in this country and the U.S.A. in applying electricity to the home.

At the present time nearly two-thirds of the homes in the U.S.A. are wired for electrical supply, whilst in this country only about one-fifth of the homes are in this happy condition. It is therefore true to say that the application of electricity

* From a paper read before the Rugby Engineering Society.

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in the home objective to easing the burden of the housewife and thus elevating the whole standard of home life, has hardly begun in this country, and the following figures relating to conditions already achieved in U.S.A. clearly show the wonderful work which has still to be done by the British electrical engineer.

ELECTRICITY IN THE HOMES IN U.S.A.

No. of homes	28 500 000
No. of homes wired	17 596 000
No. of homes with Flat Irons	15 300 000
,, ,, ,, ,, Radio Sets	10 000 000*
,, ,, ,, ,, Vacuum Cleaners	6 828 000
,, ,, ,, ,, Clothes Washers	5 000 000
,, ,, ,, ,, Electric Refrigerators	755 000
,, ,, ,, ,, Electric Ranges	590 000
,, ,, ,, ,, Ironers	355 000

* 25% of these are operated from the mains.

The curves given in Fig. 2 show the growth of the electrical industry in U.S.A. and Great Britain during the last twenty years, and are of very special interest in relation to the potentialities of further expansion which now confront the industry in this country.

Probable Further Growth.

Taking into account all the considerations that I have mentioned, I feel it is reasonable to assume that the rate of growth of the electrical industry in Great Britain during the ten years from 1930 to 1940 will follow closely *the law of the growth curve actually realised in U.S.A. between the years* 1915 *and* 1925. On this basis it becomes possible to predict, with some degree of accuracy, the onward march of the growth curve for Great Britain shown in Fig. 2, and this result is depicted in Fig. 3. The estimated growth there given indicates an expansion of the whole electrical industry in Great Britain of just over 3 to 1 in the period 1930 to 1940, and if this result is realised, the turnover of the electrical industry by the year 1940 will have reached the tremendous figure of £290 000 000 per annum as compared with a present turnover between £70 000 000 and £80 000 000 per annum.

This country lives by its export trade, and the portion of the export trade of the world which Great Britain is able to secure will naturally have a big influence on the growth of the whole electrical industry during the next decade. The curves

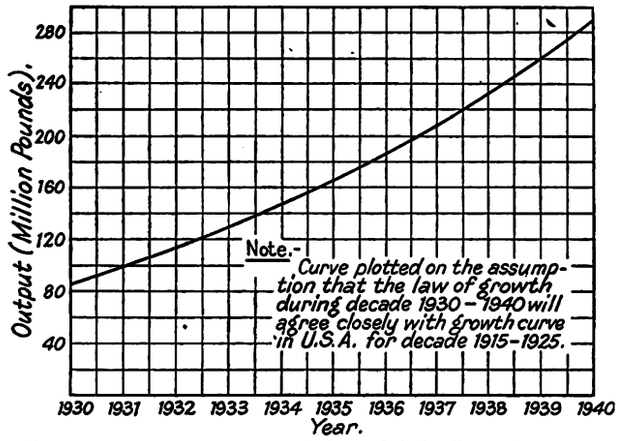

Fig. 3.—A prediction of British electrical growth during the next ten years.

given in Fig. 4 are, therefore, of interest, as they show the exports to the British Dominions in relation to the export trade of the world over the past six or seven years, and also indicate that Great Britain, over this period, was successful in securing a little more than one half of the total business which the Dominions had to place for electrical requirements.

Enormous Potentialities.

Despite the rapid growth that has taken place in the electrical industry during the past fifty years, mankind is still just about to enter the electrical age, and the development in the future of all the processes and appliances concerned with the generation, transmission and control of energy by electrical means is going to have a profound effect on the onward march of civilisation. We have just begun, so to speak, to travel the path of electrical progression, and the view is supported by considering the total output of electrical energy in the world at the time, in relation to the total consumption of energy derived from all sources. Information bearing on this question is given in a book published this year by the World Power Conference, entitled " Power Resources of the World," and the following figures are taken from this publication :—

World output of power derived from coal, oil, and water = 1 700 000 × 106 electrical units.

World output of electrical energy in 1927 = 190 000 × 106 electrical units.

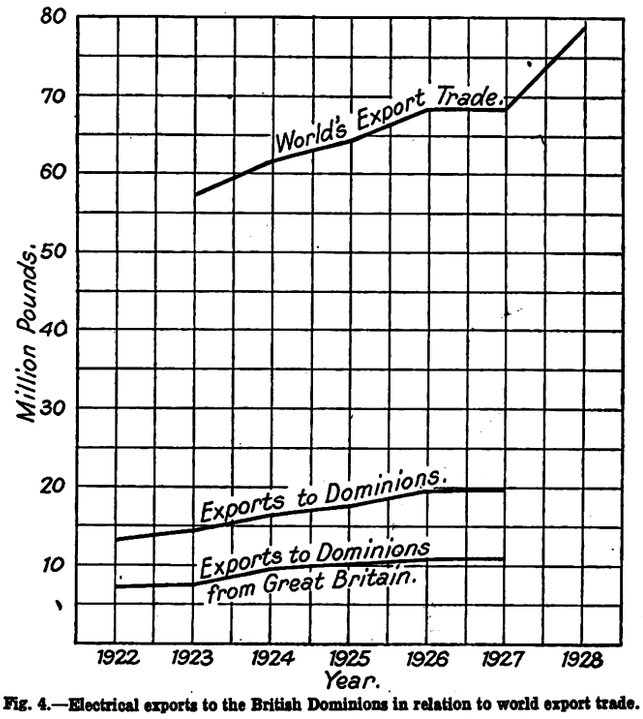

Fig. 4.—Electrical exports to the British Dominions in relation to world export trade.

These figures mean that the electrical power production during 1927 represented just over 11% of the total power production of the world. In the year 1924 the figure was approximately 9%. It is clear, therefore, that we have in the year 1929 only travelled a very little part of the journey, which must ultimately lead to the almost universal use of energy in an electrical form.

Electricity in the Iron and Steel Industry.

A special article in " World Power " for June gives some interesting information which I summarise below :—

MOTIVE POWER THROUGHOUT THE WORLD.

Country	Year	Total H.P. = H	Total Output finished Steel Tons	H.P. per ton finished Steel	H.P. derived from Electric Motors = H_1	Ratio $\frac{H_1}{H}$
Gt. Britain	1924	2 253 036	6 708 500	0·338	924 215	41%
France ..	1925	1 592 600	5 300 942	0·318	—	—
Germany ..	1926	3 817 969	11 495 600	0·332	2 848 600	75%
U.S.A. ..	1927	8 299 571	32 879 000	0·252	6 200 000	75%

To bring the British steel industry up to the standard of electrical development reached both in Germany and U.S.A. would mean increasing the H.P. derived from electric motors to the figure (75% of 2 253 036) = 1 690 000 H.P. This would represent an actual increase in H.P. of electric motors of just under 800 000, which, at the average price of 28s. per H.P. would give £1 120 000 additional business to the British electrical industry.

One of the greatest difficulties that confronts the electrical industry arises from the fact that the industry embraces such a large number of separate and distinct businesses involving the manipulation of a multiplicity of designs and innumerable materials, both metallic and non-metallic. In a modern electrical works one can see at one end of the scale, the manufacture of electrical filament lamps being carried out on intensive mass production lines by means of automatic machines that are almost uncanny in their operation, whilst at the other end of the scale, and possibly in the same works, one can see the manufacture of huge turbo-generators being undertaken, where the process of moving large masses of material, and the application of labour to it, is naturally carried out at a much slower rate—the very antithesis of mass-production.

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Whilst it must be recognised that one of the greatest needs facing the industries of this country is that of moving continually in the direction of simplification and standardisation, this need in the case of the electrical industry is of paramount importance because of the very complexity of the problem that confronts the electrical engineer at the present day.

In this respect the British electrical industry is in a worse position than either the American or the German industry, because we are suffering very largely from the mistakes made in the early days of the development of the industry in this country.

One has only to cite the enormous range of voltages and frequencies that have to be dealt with by any electrical manufacturer, and the fact that even at the present day nearly one half of the homes in Great Britain that are wired for an electrical supply are fed with direct current, further complicates the situation. When the grid scheme, now in process of evolution, has been completely developed, the unification of current, voltage, and frequency will become general, but it will take many years to bring about this condition, which, when it does arise, will benefit the whole electrical industry, because of the simplification that will thus be effected.

Progress in Standardisation.

In the realms of standardisation, the British Engineering Standards Association has done excellent work, and it behoves every one, no matter what their sphere of action may be, to give this Association every possible encouragement, because, as I have already stressed many times, standardisation and simplification must be our watchwords if we are to achieve, in the future, that progress that is well within our grasp.

I attach tremendous importance to any form of propaganda that will encourage this line of thought, and especially in our schools, colleges, and technical institutes should there be recognition of the need of inculcating an outlook on world problems that is inspired with a desire to achieve things in the simplest possible way, so as to prevent unnecessary duplication and complication of serviceable commodities. Service through simplicity might well be a guiding maxim for every industry that desires progress.

Above all should the engineer clarify his outlook on any particular problem, realising that in the future the skill of the engineer will be judged largely by his ability to utilise materials, human labour, and scientific knowledge in such a way that they can be blended in the simplest possible form to give a definite service to humanity. Expressing it in another way, the ratio of service will, ultimately, I think, be taken as a measure of engineering skill and ability, because, other things being equal, any increase in this ratio will lower the manufacturing cost and thereby the selling price, thus permitting the sphere of usefulness of the particular commodity to be greatly extended.

In conclusion, I just wish to make a brief reference to the vitally important question of research in the electrical industry. It is true to say that the industrial army marching in the cause of service advances on its research organisation, because the degree to which research is encouraged and fostered in any particular industry controls, in great measure, the rate of progression that can and will be made by that industry.

With the spirit of peace now abroad throughout the land, and the possibility of limiting armaments and navies, one cannot but reflect on the quite astonishing impetus that would be given to world progress if a statesman had the courage to deflect just the cost of a single battle-cruiser (I believe in the neighbourhood of £6 000 000 or £8 000 000) into research channels. The stimulus given to industry and the improvement in efficiency effected by such a change would in a very few years return this expenditure many times over.

So far as I can determine, the amount of money spent on electrical research in U.S.A. is something of the order of three quarters of 1 per cent. of the total turnover of the electrical industry in America. In this country, whilst it is difficult to get accurate figures, it appears that our rate of expenditure in relation to the turnover is about one-third of what it is in America. The healthy growth of the electrical industry is so important to the Empire as a whole, that it does appear that the Government, whatever its particular colour might be, would be wise to give this problem of research more consideration, and any action which it might take to lubricate the wheels of research organisations throughout the land would react not only to its own advantage, but, more important still, to the great advantage of industry, the people, and the nation.

THE PYRENEES TOUR.

Use of Electro-Chemical Works for Load-levelling Purposes.

THE informal meeting held at the Institution of Electrical Engineers on November 4th considered some of the technical features of the I.E.E. 1929 visit to Paris and the Pyrenees. The discussion was opened by Mr. R. Borlase Matthews, and Mr. J. R. Bedford was in the chair.

In his remarks on the Pyrenees section of the tour, Mr. Borlase Matthews said that possibly the most instructive part of the trip was the reason for the existence of the electro-chemical and electrolytic works that were visited. However interesting these works were in themselves, the all-important point was that they were employed as load levellers. Their very existence made the hydro-electric system a commercial success, for a load-factor of nearly 95% was obtained.

Upon inquiry into the means whereby this desirable end is attained, it was discovered that it was largely a matter of tactful organisation. Apart from the fluctuating demands of the average generating stations during winter and summer and during night and day, throughout the Pyrenees, water shortages had also to be faced twice yearly, in February and in August. To combat inconvenience on this score, the common-sense arrangement was made with various manufacturing firms whereby their consumption was regulated according to the season of the year and the time of the day. These manufacturing concerns, usually of a chemical nature, when operated in this way, were of the highest value to the power supply undertakings. In the whole of France in 1926 (from statistics recently published) it was noticeable that out of 4 562 262 000 hydro-electrically generated units sold, 611 518 000 units were utilised in chemical and electro-metallurgical works; hence this class of consumption was nowadays a very important fraction of the whole output (about 13·4%).

All the forces of the generating companies (including the Midi Railway Company) were interconnected electrically, and were controlled through a central organisation known as l'Union des Producteurs d'Electricité des Pyrenees Occidentales. A "load-dispatcher," located at Tarbes, was in telephonic communication with all the stations and works. The arrangement made with the works was that they must at all times absorb any surplus current—or do without it at times of demand elsewhere. This arbitrary ruling was borne with a good grace, and the heavy load factor previously referred to was the result. Apparently, the social effects of such a system were not serious, or it could not prevail.

The Secret of Success.

Turning to the factories which played such an important part in providing a high load factor, it was remarked that the products of those works were chiefly for artificial farm manures—i.e., for a material for which there was a seasonal demand; hence stocks had to be built up in anticipation. This meant that a constant weekly output was not of prime importance. Previous experience elsewhere had been that electro-chemical and electrolytic works were industries which must work at full output all the time. The furnaces and processes were such that once started they could not be economically varied or closed down without serious financial loss. The secret of the success of several plants in the Pyrenees lay in the fact that they had been specially designed for putting into or taking out of service at short notice, and for using loads that could be varied very considerably to conform with demand elsewhere. For example, in the case of the calcium-carbide furnaces used at Lannemezan, it was of interest to note that one of these could be put into full operation from cold in three to four days, whereas the older type furnaces took a fortnight to get properly under weigh.

Mr. Ll. B. Atkinson said he felt that the 500 miles of Midi Railway electrified without using coal was a very significant thing, and he had taken opinions of Frenchmen upon the advantages of it. He believed that the gain to the railway was small, but nationally France had very greatly benefited by obviating the purchase of foreign coal. This more than set off the cost of new plant and of impounding the waterfalls.

Major T. Rich, commenting on the 95% load factor obtained in the Pyrenees, said this was calculated on the water power available, so the term was rather misleading.

Miss Atkinson, Mrs. H. E. J. Hall, Messrs. J. R. Bedford, A. C. Brown, A. J. Cridge, R. S. Downe, A. F. Harmer, W. G. C. Jackson, W. Rawlings and E. S. Ritter also spoke.

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THE SCANDINAVIAN MARKET.

Impressions of a Recent Tour—Some Little-realised Possibilities for British Trade Expansion—German and Swedish Competition—Financial Conditions—A Recommended Trip for Commercial Travellers.

By SIR ERNEST BENN, Bt.

AFTER six strenuous weeks spent in an endeavour to see something of Scandinavia and the Baltic States, I come back to London convinced that here is a market whose possibilities are all too little realised by the British business classes as a whole.

I did not go to Scandinavia as a tourist, neither did I go as a commercial traveller; I took a middle course, and a course which in the result seems to me to have given me an exceptionally good opportunity to form impressions about these wonderful countries.

I accepted the invitation of the Economic Club of Copenhagen, of the Anglo-Norse Society, the British-Swedish Society, the British-Finnish Society, and the Anglo-Latvian Club to lecture. I was also entertained by Chambers of Commerce at Abo, Helsingfors, Riga and Copenhagen. I attended functions of several other trade associations, and in this way established a contact with commercial people, which enabled me to secure a very valuable insight into their methods and their affairs.

To begin with, all these people, from Copenhagen to Imatra, look English. You feel at home among them. You do not get that peculiar sense of the foreigner which is usually associated with travel abroad. These Northern peoples are of the same stock as ourselves; their build, their walk, their appearance look much like ours, and all that sort of thing helps, even in business.

Almost all these people speak two languages; some of them, like the Finns, speak three or four, for it is the exception to find a Finnish shopkeeper who has not got a smattering of Russian, does not speak Swedish and Finnish fluently, and who will not at the same time converse with you in English and German.

Looking at the matter as a publisher, I find in this part of the world a definite competition between German and English for supremacy as the common language, for all these people have to develop a common language. The new nationalism, that extraordinary phenomenon which has spread over Europe since the war, has thrust upon each of them the keen desire, such as we see in Ireland, to develop their own peculiar native language. Thus we get one million Estonians, three and a half million Finns, two million Latvians, six million Swedes, three million Norwegians, and three and a half million Danes, all clinging to abstruse methods of expression which they love, but which they frankly recognise as unsuitable for communication with the outside world. So that all these little peoples have thrust upon them; as it were, the necessity for speaking the language of one of the bigger races of mankind. The supremacy of English will depend upon the number of Englishmen who visit these parts, and the push of the Englishman in developing commercial relations.

There is another general consideration. All these peoples are very similar to the English in their habits. It is true they are still a long way behind the English home. They live, like most of the Continentals, in flats. But the Scandinavian flat is a good deal nearer to the English home than the German flat or the French apartment. They suffer from a climate which is similar to ours; they have our long evenings in the winter time, and they share to the full—and here I had many opportunities for observation—the Englishman's love of household gods and home comforts.

Cheap Transport of Goods.

On the practical side, trade between Great Britain and Scandinavia would seem to be easy. There are the usual difficulties of customs and passports which apply now to every part of the world; but transport is cheap. While the commercial traveller may not relish the idea of thirty-six or forty-eight hours on the North Sea, a case of goods is presumably above such considerations as sea-sickness. There are a dozen regular lines, and scores of other easy shipping communications, English, Danish, Swedish, Norwegian and Finnish ship owners, all competing for the trade. A parcel of goods can be sent from London or Hull or Newcastle to Stockholm or Helsingfors or Vyborg much more cheaply, and almost as expeditiously, as from Falkirk to Bristol.

To me, a woefully ignorant Londoner, the surprise of my tour was the entry into a succession of big, fine, highly-developed cities. It is perhaps a lamentable confession for me to make, but I did not expect to find an underground-railway at Oslo, nor was I anticipating, when I landed with some trepidation at Abo, on the rugged shores of Finland, to receive an invitation for dinner and to be told to adorn myself in a white tie and tails. The refinement and the finish of Stockholm, which equals any city that I know for the culture and the comfort of its life, was not so much of an eye-opener to me, but it must be confessed that the presence of fine motoring roads, over which I was carried in a £3 000 Hispano-Suiza car, after a ten-hour railway journey into what I had expected to be the barbaric hinterland of Finland, came to me as something of a shock.

The dozen cities which I visited each possesses miles and miles of fine shops, prominent among them florists' shops, which somehow seem to me to be rather the key to the whole situation. I have bought flowers in Bond Street, and paid through the nose for them; but Bond Street has nothing to teach the leading shopping centre in Vyborg.

Big Domestic Appliance Demand.

Everywhere I went the building trade is active. In Helsingfors alone there has been an over-building which has caused a reaction. Scandinavia, having escaped the war, never ceased building, and all these countries have been saved to a very large extent from the devastating activities of municipalities in this direction. The result is that nowhere is there any shortage of housing accommodation. The housing of the people is going rapidly up the scale; and, as might be expected, taking with it an ever-increasing demand for all the many things that go to make the better-class home.

On closer inspection I find the old story, the same degrading experience which awaits the Englishman who travels and inquires. Shops full of German goods, factories full of German machinery. I inspected several factories, printing, bookbinding, saw milling, paper making, pulp works, pottery works, electrical power stations, to name only a few. Swedish engineering, as might be expected, gets a very good show in most of the factories, but Germany holds the field.

Mr. A. H. Saastamoinen, the Finnish Minister in London, writing to "The Times" on October 31st, says that for every English traveller visiting his country, Germany sends twenty-five representatives. My observations and the figures both support this disconcerting view. Looked at in a broad way, the facts are very simple. The countries which I have named sell raw materials to us and buy their finished products from Germany. We depend upon them to a very large extent for our butter, our bacon, our eggs, and our timber. They depend upon us for next to nothing. The remedy to me is a very simple one. It is for British commercial travellers to take a trip to Scandinavia.

I crossed the Gulf of Finland in a gale, and was assisted across the rather slippery deck of the diminutive steamer which makes the daily journey, by a young Czech, who spoke the most perfect English. We struck up an acquaintance. He is the traveller for the Baltic States of a firm of jewellery manufacturers in Prague. He covers all the territory from Lapland to the Polish border, and he does the trip every three months. I gathered from him that the Finns pay their accounts on the nail, the Estonians are not quite as good, the Latvians want a little more attention from the counting house, while in Lithuania and Poland it is wise to ask for cash against delivery.

This little ship had about twenty-five passengers on board, and I questioned the captain about them. He assured me they were all commercial people, and that his passenger traffic was nearly all German.

I therefore commend a trip in this part of the world to our commercial travellers. Many of them no doubt have done the Norwegian fjords in a pleasure steamer, but the Scandinavian towns visited on business bent, will, I feel sure, disclose equal wonders of another kind.

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ECONOMIES OF ELECTRIC COOKING.

Strong Selling Points for Supply Authorities and Contractors—Big Savings Possible with Capable Operation—The Need for Educating the Public.

By H. EDWARDS.

COOKING by electricity must present one of the most desirable forms of domestic load for which the power station engineer could wish. The consumption is relatively heavy when compared with other domestic loads, such as lights, irons, toasters, vacuum cleaners, and so on (but not, of course, fires); the load is fairly steady, day by day, and in the majority of cases the peak of the demand occurs during the day, and not when the lighting load is on the power station.

From the engineer's point of view, therefore, a large increase in the use of these cookers is very desirable, and as they are most excellent devices from the users' point of view also, it is, at first sight, rather difficult to understand why their use is not much more common. The real reason for the slowness of the general public to transfer their allegiance from the ubiquitous gas range to the electric cooker seems to be very largely the question of cost. Reluctance to make a change, fear of "shocks," doubts as to efficiency, supposed difficulty of operation, and other reasons may be put forward, but there appears to be a deeply-rooted idea that cooking by electricity is only within the reach of those with long purses.

It seems to the writer (who, though an electrical engineer, has nothing to do with the design, manufacture or sale of electric cookers, or the supply of power) that his personal experience as to the cost of running one may be of assistance to those to whose interest it is to push the sales.

The Cost Question.

The convenience and cleanliness of an electric cooker can readily be demonstrated by the salesman at the showroom, but he probably has much more difficulty in persuading the inquirer (or perhaps convincing is a better word) that she (or he) need not *necessarily* have larger bills for power if the cooker is purchased. Stress is laid on "*necessarily*," since the cost of running a cooker is very obviously dependent not only on the amount of power consumed, but on the way it is handled, and the cost per unit. The latter, of course, varies a good deal in different localities, but one penny per unit, for cooking and heating, is a figure which is fairly common now, and will probably be more so in the future. This is the charge which is being considered in this instance, and it is being compared with a charge for gas of 8¾d. per therm.

The period taken into account covers two years for the gas cooker and eighteen months for the electric cooker, so that a fair average has been arrived at in each case. It should be added that, for purposes of comparison, actual consumption figures only have been taken—i.e., no question of charges for hire or purchase of either type of cooker is included. In the case of the electric cooker, however, an electric kettle is included, as this is very largely used, and is operated off the same meter and main switch.

The figures obtained show that whereas the average weekly cost of gas cooking was 20·6d., that of electric cooking is 17·5d., an average saving of threepence per week, or 3s. 3d. per quarter. In the case under consideration the cooker is being paid for on the hire-purchase system, the quarterly payments being 26s. 8d. (including the kettle referred to above), so that we have at once the cost of purchase reduced by an appreciable figure. It may, of course, be said that such a result cannot be guaranteed and cannot be taken as applying to any case. The actual figures given are certainly those obtained in one individual instance, but there appears to be no reason why results quite as good should not be obtained by anyone—provided reasonable care and intelligence is exercised in the use of the cooker.

The point is that an electric cooker is *not* inherently extravagant in operation, and, if economy is important, then it can quite as easily be practised with this type as with a gas-cooker, if not more easily. A careful cook will be careful and an extravagant one will be extravagant, whatever the article with which she is working, but there is no reason why the electric cooker should be thought incapable of cheap operation.

But reduced consumption costs do not exhaust the economies possible with these cookers. A far more important saving is effected by the greatly reduced wastage of food. All persons who have anything to do with electric cookers are aware that the loss on electrically-roasted meats is very much less than with gas-cooked joints, but much more could be made of this point, which is really a most striking fact.

It is generally accepted that with a gas-cooker the loss on a roasted joint is from 20 to 30% of the raw weight; now with the electric oven this loss is in the order of 10%. This is the figure usually taken, but in the writer's experience it is rather on the high side. Tests on 10 joints (lamb, veal, pork and beef) showed an average wastage of 6·9% only. Taking, however, figures of 10 and 25% as average losses, the balance in favour of electric cookers is seen to be very striking indeed.

To put the matter in a more concrete form: take a 4-lb. joint at 1s. 6d. a pound, total cost 6s., or 72 pence.

	s.	d.
Loss when gas-cooked, 25%, equals ..	1	6
Loss when electrically-cooked, 10% ..	0	7½ (say)
Saving by cooking electrically	0	10½

Since some people prefer joints roasted longer than others, and since some meats (as pork) waste more than very lean joints, it will be obvious that this figure must not be taken as applying to *any* four-pound joint, cooked by *any* cook; it is, however, an average figure, and is, one would think, sufficiently convincing.

Most families have at least one joint per week, so it is safe to say that in the majority of cases from sixpence to one shilling is saved each week on roasted meats alone. In the writer's case it was found that a joint of a given size provided one extra meal (for two persons) when cooked in the electric oven, or, conversely, a smaller joint was large enough to give the same number of meals as of the gas-cooked joint.

Here, then, we have a reduction in the net cost of making the change to electric cooking from gas, of from 6s. 6d. to 13s. a quarter on food, plus the reduction in running costs; so that, in the present case, the quarterly cost of hire-purchase has been reduced by at least one-half, due to savings effected.

These results have not been obtained by experts in the use of electric cookers, or by any special means, but simply by a careful and capable cook, using the range with reasonable intelligence and exercising economy for which, as already stated, many opportunities are provided by these cookers. There is no reason at all why similar results should not be within the reach of great numbers of other users. (It might further be added that a servant has on many occasions been left to use the cooker in question, for all purposes, from boiling water to roasting a joint, and has been able to operate it quite successfully; this shows that these ranges are not difficult to operate, a contention which is sometimes put forward.)

While the price of a fair-sized cooker is admittedly rather high, many local authorities and supply companies have systems of hire-purchase, or hire, which frequently include terms which are really very favourable. For instance, one large company which operates in the Midlands charges, for a cooker of the size referred to in this article, 9s. 6d. a quarter for hire, and 30s. 8d. a quarter for three years for hire-purchase. From the figures given above it will be seen that the whole of the hire charge can be saved, and, say, one-third or more of the hire-purchase cost, so that the user really has a good bargain.

Points to Stress.

As regards other points which can truthfully be stressed in support of electric cooking, mention may just be made of cleanliness, absence of smell, no danger from leakage of gas due to taps being left on, cool kitchen (since so little heat escapes) and saving of decorations due to absence of fumes.

These points are, of course, obvious to anyone who thinks, but it is not so apparent why they are not brought more to the notice of the public.

In conclusion, the writer would suggest that much benefit might accrue to makers and retailers, as well as to supply companies, if an energetic advertising campaign were carried out, covering not only the technical papers, which are, of course outside the range of reading matter of the general public, but particularly the many magazines for the home (and especially for women), as this would act as a counterblast to the many advertisements of coal, gas and oil-cookers which appear in these periodicals, and would go a long way towards educating the people with regard to the benefits of electric cooking.

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BOOK-KEEPING FOR CONTRACTORS—I.

Many Insolvencies due to Failure to Keep Proper Books—Vital Questions which the Books should Answer—The Only Reliable Business Chart.

By S. HOWARD WITHBY, F.C.I.

A FEW years ago the electrical contractor combining his engineering work with shopkeeping considered the keeping of a proper set of account books more or less a waste of time. If he desired to ascertain his financial position he would simply refer to his bank pass book, and after making what he considered an adequate allowance for his capital outlay in the form of business premises, motors, plant, machines, apparatus, instruments, and tools, etc., he would be able to determine to his satisfaction not only his position in relation to the business and to the outside world, but also the amount of profit made.

However reliable such methods may have been at one time, they are no longer available. Side by side with enormous developments in the world of engineering and equally great demands for electrical energy, a great expansion of the world's banking and commercial credit systems has taken place during recent years, necessitating the adoption of suitable book-keeping methods on the part of the electrical contractor anxious to keep a proper grip on his business. At the present time competition in both standard products and those of special design is so keen that cuts in prices and estimates, although essential to the maintenance of turnover, often result in grossly inadequate margins of profit, and unless the electrician is able to base contract prices on a reliable foundation, there is always the danger of undertaking unprofitable work.

That many contractors still think fit to neglect the book-keeping and accountancy side of the business can be proved by an examination of the bankruptcy files for the past ten years. Instead of being due to any inherent weakness of the individual concerns, a large proportion of insolvencies, deeds of assignment, and liquidations since the cessation of hostilities, is the direct consequence of failure to keep proper books.

It is quite possible for the contractor to possess a substantial bank balance and at the same time be hopelessly insolvent. Money may have been borrowed from friends to such an extent that the total present value of all the assets employed for profit-earning purposes may be much less than the total liabilities incurred in conducting the business as a whole. He may be actually sustaining a net loss each vear and withdrawing money from capital account instead of from revenue or income, but unless all the facts relating to the business have been recorded in a systematic and business-like manner, the contractor will be unable to avoid disaster.

As a matter of fact the need for a good system of book-keeping is of a three-fold nature, that is to say it is commercial, personal, and legal. It is a commercial necessity because the continued success of the business will depend to a very great extent on the accuracy of the records of pecuniary and trading transactions, and because a periodical tabulation of the figures will enable the electrical contractor to detect errors and irregularities and to avoid excesses before it is too late. It is a personal need, if only for the reason that in his capacity of financial commander the contractor must have a sufficient grip on the business to avoid the many rocks and shoals that surround him in the course of the daily routine, while the keeping of accurate accounts and the possibility of determining the exact state of his financial affairs at any time must always be a source of personal satisfaction. Moreover, no electrical contractor desires to pay more income-tax than his fair share, but in order to secure the maximum relief from taxation it will be necessary to produce accounts that will enable the taxable profit to be readily ascertained.

Key Information.

Now some of the questions frequently asked by the average busy contractor relative to his business are as follows :—

(1) What was the total of my sales of electrical goods last month (or any other period) ?

(2) How much is owing to me at present by debtors, and is too much capital being locked up in the form of book debts ?

(3) Is a sufficient internal check being exercised on all equipment, accessories, and other stores, and if not, what methods of control and supervision are called for ?

(4) What did my purchases amount to last month (or any other period) and under what headings did they fall ?

(5) Am I realising an adequate amount of profit, or have any contracts been carried out at a loss ?

(6) What are the sources of all my profits, and the cause or causes of my losses ?

(7) How much do I owe at the present time to creditors and trade suppliers, and am I taking full advantage of discounts allowed for the prompt settlement of accounts ?

(8) Of what do my management and working expenses consist, and under what headings could economies be safely effected ?

(9) In estimating the total cost of any particular job, am I able to determine the departmental, distributive, and other indirect charges with accuracy, and if not what improvements should be made in my system of costing ?

(10) Does the percentage of net profit in relation to the turnover and to the invested capital compare favourably with previous years or periods, and should any class of work be developed or suppressed ?

(11) What is the present value of all my assets, and the total of all the liabilities, and has proper provision been made for the depreciation of wasting assets ?

(12) What is the amount of my real capital, or the extent of the deficiency ?

Importance of Verification.

To be able correctly and readily to answer the above and other equally important questions, the book-keeping work will have to be divided into separate compartments, as it were, by keeping a number of subsidiary books, or books of original entry, as they are called, in addition to the ledgers. Moreover, in view of the fact that a balance sheet will have to be prepared exhibiting a true and correct view of the contractor's financial and trade position, it will be necessary to institute a system that will enable the clerical accuracy of the work to be verified, and in this connection the only satisfactory system of book-keeping is that known as double-entry.

The need for adopting double-entry methods arises from the fact that every business transaction has two sides, viz., a receiving side and a giving side. For example, when an electrical contractor sells a quantity of insulating material to a customer on credit, his stock has been reduced and his book debts have been increased, and it would obviously not be correct to record only one of these facts.

To give effect to such a transaction the goods or stock account should be credited with the value going out of that account, while the personal account of the customer should be debited with the value coming into that account, these two entries constituting the necessary double-entry.

Sales transacted on a cash basis have the effect of reducing the asset stock and increasing to a corresponding extent the asset cash, so that all cash sales should be credited to the goods or stock account, and debited to the cash or banking account, and the same principles will apply to every conceivable business transaction, each entry made on the left hand or debit side of one book or account having a corresponding entry on the right-hand or credit side of another book or account. The application of this principle will enable the accuracy of the contractor's set of books to be proved by preparing a list of all the debit and credit balances the totals of which should exactly agree with each other, and from the figures shown in this trial balance it will be comparatively easy to draw up a periodical trading and profit and loss account showing the gross profit realised and the net profit made or net loss sustained, and also a balance sheet indicating the amount by which the assets exceed the liabilities.

The electrical contractor should, therefore, look upon his account-books as constituting his only reliable business chart, and in these articles it is proposed to explain both the principles and the special features of electrical contractors' accounts by ignoring the theory of the subject and the use of technical terms, and by concentrating on those practical requirements experienced in the conduct of the financial side of the business. The next instalment will indicate the particular books which experience has proved necessary in the case of the electrical contractor, and the special purpose and value of each.

(To be continued.)

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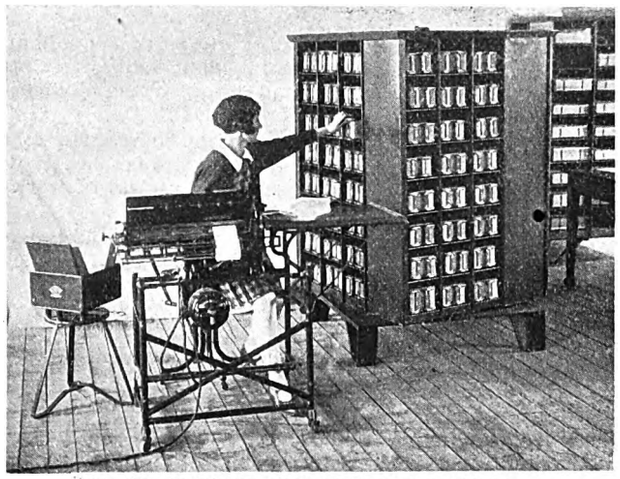
ELECTRICAL ACCOUNTING SYSTEMS.

Some Advantages of the Loose-leaf Method—Saving Time and Space with a Novel Machine Posting Equipment—Special Rulings for Electrical Purposes.

DURING the past few years the changes which have taken place in connection with works and office administration have been most marked, especially as regards the mechanisation of office routine work.

An efficient but simple ledger system is essential in these days to successful book-keeping. Bound ledgers, in addition



The "Double-Fast" machine posting equipment in use.

to their bulk, have other disadvantages, particularly as regards the allocation of space for separate accounts. Even with the utmost care and judgment, such allocation must necessarily become a matter of guesswork, whereas in the case of loose-leaf books, one sheet may be allotted to each account and others added from time to time when required. The loose-leaf ledger automatically expands, adapting itself to business growth. When a book becomes too bulky it may easily be divided into two volumes without in any way disturbing the accounts. Order and general arrangement are simplified, and may be altered at will, while several clerks can work at the same book at the same time.

Machine Accounting.

With regard to machine accounting, one great disadvantage of the system of loose cards contained in trays and trolleys is that it is just a little too convenient for a clerk to remove a particular account required for examination—and then to replace it in the tray in the wrong order.

This disadvantage has been overcome, in a very neat contrivance marketed by Kalamazoo (Sales), Ltd., of Northfield, Birmingham, and demonstrated the other day to a representative of THE ELECTRICIAN. The "Double-Fast" ledger, as it is called, is seen in the accompanying photograph fixed to a tripod on the right-hand side of the operator.

For posting, the ledger is inserted in a release box, which also acts as a rack, and when in this position the pages may be removed as required. When the operator has finished with the accounts the binder is released by pushing a lever, whereupon it is automatically locked. Individual sheets cannot be removed except when the ledger is fixed in position in the release box. The mechanism is simple and reliable, and is guaranteed for seven years. As may be seen the operator has within arm's length a revolving filing cabinet, which, in the example shown, has a capacity of 96 binders—or some 50 000 accounts. Every account is within easy reach of the operator while seated at the machine, and the floor space occupied by the equipment is only just over 1 sq. yd.

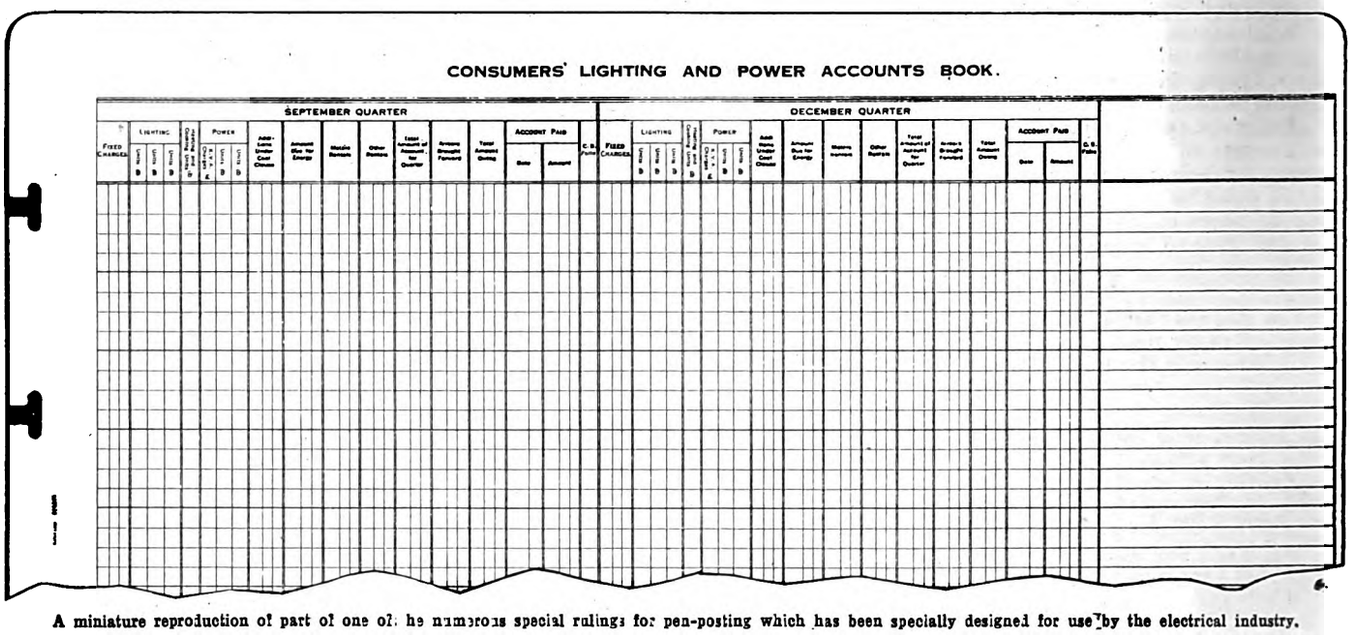
An installation of similar capacity, if card equipment were used, would require about 40 trolleys and trays occupying about 120 sq. ft. of floor space, and the interruption in the work and the time taken in changing from, say, the first tray in the rank, to the last, is bound to affect output.

Suitable Rulings.

The importance of accurate and convenient rulings cannot be over-estimated. We have in front of us a representative selection of the numerous rulings for consumers' lighting and power accounts, meter test sheets, maintenance and distribution cost records, assisted wiring agreement summaries, made at the Kalamazoo works. Accuracy of ruling is guaranteed. The firm's library consists of some 33 000 odd specimen rulings for pen and machine posting, and there is a special section devoted to the requirements of electricity undertakings, many of which employ the firm's products. These specimens are added to from time to time to suit the particular requirements of individual undertakings. There is also an advisory department for the benefit of potential customers.

A special process is employed in the rulings, which enables lines, column rules, and wording to be reproduced simultaneously, giving a bold and distinctive style, and complete accuracy. The sheets are not machine ruled, and so there is no necessity for continual adjustments, re-startings and separate machine feedings, which tend to increase the factor of error, and add greatly to the cost of production.

Several hundred originals of standard patterns applicable to many kinds of general work in electrical manufacturing, contracting, and electricity supply offices are available.



A miniature reproduction of part of one of the numerous special rulings for pen-posting which has been specially designed for use by the electrical industry.

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ELECTRICAL DEVELOPMENT AND THE LABOUR MARKET.

Mr. Frank Hodges on the Effect of Obstructionist Propaganda on Unemployment—The Central Electricity Board's Reply to Yorkshire Coal Owners—Imminent Solution of the Sulphur Fume Problem.

OVER 160 members of the Batti-Wallahs' Society and their guests were present at a luncheon at the Hotel Cecil, London, on November 7th, Mr. H. L. Howard, the president, in the chair.

Mr. FRANK HODGES, who was the guest of honour, first referred to the present crisis in the coal industry, which he regarded as one of the periodical crises which come with the regularity of the monsoon. He hoped that the larger national interests would receive full consideration in the discussions of coal industry problems.

Bright Electrical Prospects.

Dealing with the electrical industry, Mr. Hodges said it was undoubtedly the most remarkable of the present industrial epoch. By its rapid growth, and its quick adaptation to changes in technique, it had expanded far beyond its original horizon in a period of time which could only be regarded as phenomenal. The future also promised further indefinite expansion. This great edifice had not been evolved without difficulty, but the youthfulness and inherent vigour of the industry had swept aside most of the obstacles.

Some idea of the industry's growth could be gained from an examination of the Electricity Commissioners' statistics, which showed that British electricity supply undertakings generated 4 250 000 000 units in 1920-21, a figure which rose to about 8 500 000 000 units in 1927-28. This rate of increase, only equalled by the motor-car industry, had been accompanied by an extraordinary growth in technical efficiency. It not only expanded, but it had expanded with a purpose, because that progress had beneath it a vast well of technical knowledge.

While output had increased by 100%, the industry's consumption of coal only rose by 57%, which showed that the problems of the boiler-house and the steam turbine had been satisfactorily tackled.

This growth in output was accompanied by a reduction in production costs, and this was the only kind of expansion possible in a healthy industry. In this respect the electrical industry complied with some of the fundamental principles of economical development.

Mr. Frank Hodges, whose speech at the Batti-Wallahs' November lunch is reported on this page.

The coal trade, Mr. Hodges continued, was under the ill-founded impression that the growing use of electricity necessarily meant a diminution in the use of coal. Actually the home consumption of coal was the same to-day as it was in 1913, and it was in the export coal trade that the decline had taken place.

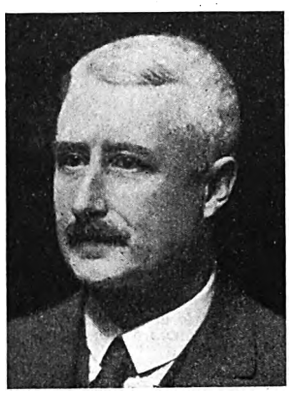
The growth of electricity had not decreased the use of coal by a single ton. On the other hand, it had stimulated the development of various kinds of process work which created a further demand for coal for steam-raising purposes.

The Yorkshire Collieries.

Referring to recent advertisements by a group of Yorkshire collieries, the tendency of which was against the operation of the national "grid" in that part of the country, Mr. Hodges said that if the grouped collieries could provide, on their low-grade fuels, electricity at a cheaper price than that at which the Central Electricity Board could give them a supply, the Board would not only approve their activity, but would take all their surplus output.

Mr. Hodges then considered the influence of electrical growth on our common social problems, the most formidable of which was unemployment. Each year some 400 000 young persons left school and became employable. These people could not find employment in industries that were in a contracting condition.

The two great expanding industries were those dealing with the production and use of electricity and motor-cars, and these between them absorbed a considerable proportion of this yearly addition to the labour market. If, therefore, any attempt, deliberate or otherwise, were made to obstruct the development of these industries it would undoubtedly result in closing up avenues of employment for our young people.



Mr. V. Watlington, who will address the Batti-Wallahs' Society at its December luncheon meeting.

Quite unwittingly, no doubt, certain societies existing for the preservation of rural amenities were working in this direction, as success on their part would restrict and hamper the natural expansion of the electrical industry. Such people should realise that electrical development was inevitable, and should use their influence not only to see that the work was done with the minimum interference with rural amenities, but also that such considerations should be compatible with sound economic principles.

Referring to the objections which were being made against certain proposed new power stations, Mr. Hodges said that, though there might be a belief abroad that our technicians were at the end of their resources when dealing with grit and sulphur, he could never be persuaded that our electrical and chemical experts could not effectively deal with these incidental problems. Even now he did not hesitate to say that these questions had been tackled sufficiently for us to know that they could, and would, be solved.

"National Perspective."

With regard to the objections against transmission lines, Mr. Hodges said that though pylons—to use the classic term—were not gossamer films floating over the downs, they were positively artistic in comparison with the bungalow towns and other disfigurements already there. The objections were, he thought, lacking in national perspective. If there was a beauty spot which could be preserved, the Central Electricity Board would go to any amount of trouble to avoid it, if possible. Unhindered progress with these electrical schemes would give the country what it most needed: creative work with results in the future and a partial solution of the unemployment problem now.

Those who wanted to see this country go ahead should give credit to the responsible authorities for doing everything possible to preserve rural amenities that was consistent with continuous progress. If electricity was allowed to develop along these lines, progress in the future would be even faster than it had been in the last twenty years.

Mr. WILLIAM MCCLELLAND, whose election to the vice-presidency of the Society was announced during the proceedings, moved a vote of thanks to Mr. Hodges. It was, he said, the plain duty of everyone to preserve the beauties of the countryside in a constitutional manner, but when a certain course was determined by means of arbitration we should all stand by that decision, and let the Central Electricity Board get on with its work.

MR. M. WHITGIFT, the honorary secretary, announced that the Society's next luncheon will be held at the Hotel Cecil, London, on December 5th, when Mr. Victor Watlington, managing director of the English Electric Co., will deliver an address.

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ELECTRIC WARMING.*

Advantages of the Continuous System—Leaving the Installation on Automatic Temperature Control—Existing Types of Equipment Compared.

By R. GRIERSON, A.M.I.E.E., A.M.I.Mech.E.

VERY briefly stated, the advantages of a well-designed, modern, continuous electric warming system are: its entire invisibility in the decorated room; its adjustable automatic temperature control; its low operating temperature, and its perfect reproduction of the atmospheric conditions of the most desirable days of early summer, e.g., an evenly distributed warmth combined with a delightful feeling of fresh air, and all this in return for no labour or action on the part of the owner other than drawing a cheque for the bill.

An example of "Dulrae" panels applied to an existing ceiling. Various methods of decorative treatment may be applied if desired.

When people tell you electricity is expensive, reply at once with a question regarding the price at which current is available for continuous electric warming. Many people have installed electric fires with current at 2d. per unit, or 6d. per hour for a 3 kW fire. The ill-advised electrical enthusiasts who are responsible for these early installations for any purpose other than for intermittent heating are really the electrical industry's worst enemies.

At present 99% of the population have been educated to switch off electrical appliances when they are not actually required. In future we must remove the possibility of switching off continuous heating systems from the immediate locality of the user, and educate him to leave the installation on automatic temperature control. By this means he will obtain more comfortable conditions and a lower bill for energy.

Lack of Vision.

I cannot refrain from commenting on the lack of vision exhibited by the majority of supply authorities in failing to grasp the advantage which the continuous electric warming load offers when it is operated by automatic temperature control. Occupants of a room emit heat which standard authorities value at 350 and 400 B.Th.U. per hour per person, e.g., slightly more than one-tenth of a kWh per person. Living rooms, offices, etc., are occupied during the day, and also records show that the coldest period of the twenty-four hours occurs during the night. Hence the maximum load *must* occur during the night when the generating plant is running light. Surely such a load is entitled to a better rate than an electric fire load which is principally switched on during the cold and foggy days—when the load is heaviest. Yet in the majority of districts one heating rate is quoted for all types of equipment, and this is not infrequently a prohibitive rate for continuous, thermostatically controlled equipment.

One or two supply authorities have recognised the advantages of the continuous, thermostatically controlled type of heating load, and are offering a rate of ¾d. per unit between 9 a.m. and 7 p.m. and ½d. for the remainder of the period.

It is the price per unit which prospective consumers concentrate on—the cost of inattention of forgetful employees, children, and friends.

At this stage I want to fix attention on one vital difference between electrical and hot water heating. In the latter system, the maximum temperature that pipes, radiators, etc., can attain is fixed by the temperature in the flow pipe. Cover up your pipe or radiator with a blanket, and little or no heat is emitted and the water leaves the pipe or radiator at the same temperature as it entered.

With electrical equipment, however, the result is very different, because energy is being continuously supplied to the apparatus and a steady temperature is only attained when the heat loss balances the heat input.

Herein lies the danger of unguarded types of non-luminous heaters, which are within easy reach of floor level, e.g., the user may unwittingly restrict the heat loss by throwing over the heating equipment, either accidentally or intentionally, a blanket, coat, or other object. When I say intentionally, it may be with an idea of airing or drying the article.

Electrical devices have no final temperature, and the temperature may continue to rise under the conditions named until the ignition point of clothing, etc., is reached.

Excessive temperature cutouts may be employed, but they increase the cost, introduce unnecessary complications, and are apt to prove unreliable.

Available Types Surveyed.

Let us now make a very brief survey of the various types of equipment available, and note shortly the advantages and disadvantages of each:—

ELECTRIC FIRES.—Useful psychological and decorative effect; simple, convenient, and cheap in the plainer forms; quick response for intermittent heating; elements burn out and flexible conductors fail and require to be replaced from time to time. Temperature gradient very severe, e.g., temperature falls rapidly as distance from fire is increased, and heat shadows very marked. Excessively high temperature surfaces and thus liable to "burn" the air. Heavy loading in relation to cube of space to be warmed. Must inevitably cause heavy maximum loads on the mains. Chiefly regarded as boosters or intermittent heaters. Unsuitable for thermostatic control as effect of radiator switching on and off periodically would be a source of annoyance.

RESISTANCE WIRE CONVECTORS comprise resistance wires wound on suitable supports and enclosed in perforated sheet steel cases. Few advantages, except for the purpose of circulating warm air with all its objectionable features, and possibly also low first cost. Temperature of active parts is high and hence "air burning" is probable. Marked dusting will occur; life fairly good. Usually difficult to clean and also to treat in a decorative scheme. Occupies useful space.

ELECTRICALLY HEATED HOT WATER HEATERS.—Practically all the disadvantages of the ordinary hot-water radiator or convector, e.g., occupy floor space, soil decorations, and unsightly. Will freeze and crack if left out of use in exposed situations or even in ordinary rooms during periods such as last winter. Advantages are that no labour is involved and no boiler and pipes are required. Much too heavy to be portable, although admittedly transportable. Frequently emit noise for a period after switching on, and are, therefore, not very suitable for thermostatic control. Require a certain amount of attention in checking water levels.

PIPE HEATERS.—These consist of 2-in. pipes supplied and fixed in convenient lengths and are warmed by means of wires enclosed in the pipes. Disadvantages are—floor space occupied; high operating temperature, 180/215 deg. F., and hence "cooked" air and fire risk if heat emission is restricted. Advantages include cheapness and facility of application and low temperature grade. It is interesting to note that although we condemned steam heating pipes many years ago, chiefly on account of the high temperature surfaces, practically the same temperatures are in use to-day in this form of heater. The radiating surface is only 0·62 ft. super per lineal foot and little if more than 33⅓% or 0·2 ft. super can have a useful effect in the room.

PLATE HEATERS.—A special form of panel having relatively small surfaces and operating at comparatively high temperatures: Composed of a ceramic material having a glazed sur-

* From a paper read before the Institution of Heating and Ventilating Engineers on November 6th.

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face. The disadvantages include the difficulty of incorporating and concealing the panels either in the structure or in the decorative scheme, due to the high operating temperature and the glazed surface; the high temperature must inevitably cause excessive convection and dusting effects and a steep temperature grade is inevitable. The advantages include small dimensions due to the high loading, easy cleaning, portability and practical indestructibility.

THERMAL STORAGE SYSTEMS.—These incorporate the principal parts of a central hot-water system, e.g., pipes and radiators or panels, and only differ in the fact that large electrically heated and heavily insulated water cylinders replace the boilers. The capital costs involved and space occupied are considerable, but, of course, labour is reduced to the vanishing point. The *raison d'être* for the introduction of this equipment is the low rates offered by supply authorities for current taken during the night, the elimination of fuel storage space and stock construction, and also the reduction in the labour costs. The heaters may be operated at either 6 000 or at 400 V, depending on whether the electrode or the immersion heater system is adopted. A notable example of this system may be seen in the new offices of the Underground Co. Rates as low as 0·25d. per unit have been offered for this system for current taken between the hours of 10 p.m. and 8 a.m., e.g., 10 hours per day active and 14 hours storage.

DULRAE PANEL SYSTEM.—This is the system with which I have been intimately connected during the past few years. The principal advantages include ease of incorporation in the structure, and, therefore, invisibility; low temperature grade; low operating temperature; perfect atmospheric conditions; elimination of labour and maintenance cost; nothing to freeze, ignite, or short-circuit; no floor space occupied; perfect automatic temperature control and low operating costs. The disadvantages—well, I have yet to learn of any, except, possibly, a slightly higher initial cost.

The cheapest and simplest form of construction is the embedded type, e.g., insulated conductors having a comparatively high resistance embedded in plaster which is carried on a cork slab and secured to cement asbestos backboards. Standard sizes are 6 ft. by 2 ft.; 4 ft. by 3 ft.; and 3 ft. by 1 ft., all being approximately 1½ in. thick. The 3 ft. by 1 ft. for use, four in series, on 200/250 V systems, has been found specially useful for fixing between the floor joists and also for situations in which long narrow strips of warmth are desirable.

To meet specifications calling for a more mechanical type of element, metal tubes fitted into headder boxes are also provided, naked conductors being employed, which are insulated from the tubes by means of beads or glass tubes. This type may be safely buried in concrete floors. For wall fixing hairpin type tubes are employed, the headder box being fixed behind the skirting.

A New Type.

Another type in course of development embodies a ⅜ in. thick smooth plaster board incorporating the element. This is intended for direct fixing to existing ceilings where the projection of the standard type might be considered an objection. The cork insulation is fitted between the floor joists.

All standard panels are designed for a maximum surface temperature of 120/125 deg. F., when fixed horizontally on a ceiling and operated in still air. Under automatic temperature control, the temperature, providing adequate surface is installed in relation to the heat loss, averages 85/90 deg. F. even on cold days. Loading averages 40 W per sq. ft. of active surface, or 400 W for the standard 6 ft. by 2 ft. or 4 ft. by 3 ft. standard panel.

These low temperatures involve extended surfaces which are inevitably more costly than small high temperature sources of heat, but records clearly prove that such initial costs are quickly offset by the lower operating costs. Take a room which costs £25 to equip and is loaded to 2 400 W. The probable consumption is at the rate of 1 750 kWh installed, or 4 200 kWh at 0·6d. per unit, this is £10 10s. per year. With any other system it would probably be £15 per year.

In new buildings, and where possible in existing buildings, it is intended that panels should be sunk into the ceiling, and that the finished surface of the ceiling should be absolutely flat. In this way, convection currents and dusting are eliminated. Where this procedure is not practicable, panels are applied to the ceilings and project below the finished surface, but there is always a risk that small convection currents will cause dusting and slight discoloration in the immediate vicinity of the panels in the course of time. However, the cost of an annual coat of whitewash is not very serious, and a decorative moulding, fixed in the angle formed between the edge of the panel and the ceiling is very effective.

Flexibility of Control.

The permutations and combinations of control methods are innumerable. To mention only a few:—

(*a*) Switching of individual panels in sections of 400 W. (*b*) Series/parallel switching in groups of 2, 4, or 6. (*c*) Thermostatic control of all panels in one room. (*d*) Thermostatic control of the main supply and individual switching of room panels. (*e*) Several panels switched on permanently and the remainder controlled by thermostats.

The best method is, of course, thermostatic control of each room. At first it was thought desirable separately to switch panels adjacent to windows, but whether or not the result is due to the opacity of the glass to low temperature heat rays, the fact remains that in my own office, containing two large windows facing north, no draughts are traceable even in severe weather, with all panels on automatic temperature control. A further objection to independent switching of panels adjacent to windows is that the daily consumption of energy in an ordinary room is frequently less than the loading of one panel, e.g., 0·4 units/hour or 9/6 units for 24 hours.

On direct current circuits, solenoid operated mercury tubes are provided, the operating coils of which are switched by the thermostat. This is due to the fact that the neatest and most convenient form of thermostat available will only deal with very small continuous currents, e.g., from half to one ampere on direct-current circuit.

In figuring on automatic control, care has to be taken in large rooms to see that the load switched has a reasonable relation to the mains of the supply authority, e.g., it would probably be impracticable to switch blocks of, say, 20 kW, off and on at ten or twenty minute intervals without a flicker in the lights being noticeable. The capacity of the standard thermostat is from 10 to 12 A at 230/240 V, e.g., from 2 300 to 2 900 W. Where larger loads are required to be switched, additional thermostats are required, or one thermostat can be arranged to control the coil of a contactor switch, or parts of the panel may be switch-controlled.

Where the supply authority has a pronounced peak load occurring regularly, say, between the hours of 4 p.m. and 5.30 p.m., it would be possible, due to the heat storage of the building, entirely to switch off the whole installation, or alternatively, on a.c. currents to switch in a choke to limit the total load to a predetermined limit between the hours named.

The coke or oil-fired boiler has one advantage over the electric method—it is always possible to force the boiler and thereby temporarily to increase the normal power of the installation at the expense of slightly lowered efficiency. Once an electric system is fixed and connected to a constant pressure system, the maximum heat emission is fixed. Therefore, it is essential to decide at the outset whether the electric system is to be boosted by electric or coal fires during spells of very severe weather or where abnormal heat is required, or whether the electric system is to take care of all possibilities.

Normally we figure on a 30 deg. rise for staircases, landings, halls and vestibules, and 40 deg. for living rooms, offices, bed rooms and bathrooms unless otherwise directed.

In the house of the future, much greater care will be taken in regard to heat insulation, and in all probability, gale-type windows and cork-lined walls, floors and ceilings will be a feature.

For a temperature rise of 30 deg. F., we find that the watts per cu. ft. calculated by the ordinary methods average 0·63 or, say, 22 superficial feet of panel per thousand cu. ft. of space, e.g., the surface required is approximately 2·25% of the cube. For a 40 deg. rise the rating is approximately 0·84 W per cu. ft., 30 sq. ft. per thousand cu. ft. of space, or 3% of the cube.

All these figures are based on continuous use of panel surface, e.g., the structure is prevented from getting cold, which is quite a different proposition from warming it up. A further point for consideration is the temperature maintained in adjoining rooms, especially in office blocks, if tenants pay for their own current on separate meters.

The essential fact in locating panel surface is that it must be fixed where it is equally exposed to all the occupants of the room. The part where this condition is most efficiently complied with is in the ceiling.

(*To be concluded.*)

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Overhead Lines or Underground Cables?"

[To the Editor.]

Sir,—I hope readers will not be misled by the extraordinary article which appears in your issue of November 8th, on "Overhead Lines or Underground Cables." An article of at least similar length would be required to deal with the errors, but the following must, at the moment, suffice. The authors (Col. Crompton and Dr. Ekstroem) have underestimated the cost of laying 33 kV cables, and the costs and claims incidental to cutting trenches across farm land. It must not be thought that the wayleaves will be any less expensive for this trench than for an overhead line, indeed, my experience leads me to suggest that it would be very much greater. Moreover, the claims from farmers for damage done during the operation of laying would be very heavy indeed. There are difficulties, not mentioned, as to field drains and crops which will be injured; boggy land, small boulders, tree roots, etc., not shown on the field where the machine is illustrated.

There is no reason to suggest that a shorter route could be taken by underground cable than by an overhead line across country, in fact, the reverse is undoubtedly the case in England. It is not necessary to take high pressure overhead lines along hedgerows to-day, as we can give spans of 200/300 yards quite easily.

I do not think that any engineer would suggest that the capital cost of an underground 33 kV line could be anything less than twice that of a reasonable overhead line. The annual working cost table also is as distorted as the capital cost table.

All I ask at the moment is that your readers should be cautious in accepting the figures, especially as the scheme involves the use of an expensive machine, for which surely some allowance will have to be made.

I conclude by asking Col. Crompton and Dr. Ekstroem to show us the machine at work, and to produce detailed costs of work done, and claims, in England across average farm land.—I am, etc.,

W. Fennell.

Northwich, Ches.
November 9th.

Electric Cooking is Cheap.

[To the Editor.]

Sir,—I have been interested to see in the October 18th number of The Electrician an article dealing with the cooker competition at the Brighton Electrical Exhibition.

The matter of cooking costs is one in which I have taken considerable interest, as, when I installed an electric cooker, it was with considerable doubts as to the wisdom of this course. Consequently I took very careful tests (and am still taking them) on a meter which reads the cooker consumption only. The figures obtained have been of great interest and have proved to my satisfaction that the supposed high cost of electric cooking is really a fallacy.—I am, etc.,

"Elcook."

October 21st.

"Our House in Order."

[To the Editor.]

Sir,—I notice in the symposium of electrical installation contractors' views, under the heading of "Our House in Order," in your issue of November 1st, that there is a reference in the contribution by Mr. Morris to a fire which was started in a house where it was found that "in several cases the tubes were lying on the gas pipes and the leaking electricity for want of a better earth than the tubing of its own system, which from the foregoing remarks will be seen to have no continuity to earth, 'went for' its deadly rival the gas pipe."

The question of clearance between electrical wiring conduits and gas pipes is a matter of considerable importance. During the erection of a house in which I was interested, I found, in the course of a visit of inspection, that the workman putting in the gas pipes had laid them on top of the electric lighting conduits at several points, the electric light contractor having put his equipment first in position.

I asked the gas man whether he had any instructions or regulations directing him as to the safeguards he had to take in running gas pipes near electric lighting wires and conduits, and he assured me he had no special instructions, and appeared to be surprised that any were necessary. Of course, I had matters put right, but if I had not been present when the carcase of the building was exposed with the flooring not completed, the dangerous conditions would have been hidden. I wrote to the gas company pointing out the dangers, but beyond an acknowledgment heard nothing further about the matter. It seems to me that in a matter of this kind, where there are two potentially dangerous commodities, there should be an agreed procedure between the various undertakers as to the precautions to be taken by the second-comer.

In case there should be criticism that gas is not needed where electricity is available, I would point out that when the local company charges 8d. per unit for lighting and 3d. for heating, an all-electric house is out of the question for people of moderate means, such as electrical engineers.—I am, etc.,

November 8th. S. C. B.

"Advertising for Electrical Contractors."

[To the Editor.]

Sir,—With reference to the letter in your last issue from Mr. D. Winton Thorpe, in reply to my very mild criticism of a page of his booklet, I am quite in sympathy with the idea that is in Mr. Thorpe's mind, that we should guide the public towards securing safe electrical installations. All that I suggest is that it is not advisable to do this by telling people that electricity is "treacherous." It is quite possible to choose some other way; for instance, we might talk about "that blown fuse," and suggest that this can be avoided, with all the trouble it brings, by having electricity installed by the advertiser. "Fit and forget," in fact.

The booklet referred to, a copy of which Mr. Thorpe has kindly sent on to me, is certainly a very good piece of work, and, taken as a whole, will make for electrical development. In fact I consider that every undertaking or firm who by propaganda or in any other way increase their business, are doing a service to the whole electrical industry, and advancing the cause of electrical development. The object of my Association is to assist all such firms and undertakings, and when we ask the industry to help the Association, we are really asking those in the industry to help themselves, as the Association, not being allowed to make a profit, devotes the whole of its expenditure to increasing the use of electricity, and the industry, as a whole, therefore benefits.—I am, etc.,

W. A. Vignoles,
Director and Secretary.
British Electrical Development Association.

London.
November 4th.

"Concrete Pole Designs and Costs."

[To the Editor.]

Sir,—In answer to Mr. Fennell's remarks in your issue of October 4th, may I point out that wood poles commonly used in this country are not restricted to short-span construction. On the other hand, short-spans range from 50 to 450 ft., depending on what part of the world we are in, and on whether we are considering steel structural or wood pole construction. The engineers of the C.E.B. would certainly consider a 450-ft. span quite short, and, the wood "A" frame or structure for equal loading and similar conditions cannot be considered as 900-ft. *normal* span, common to the steel construction of the "grid." Steel is inherently intended for long spans, closely followed by reinforced concrete, and lastly by wood; also, due to their relative durability and variability, etc., for spans best suiting each material, the pole *line* is the more generally correct basis of comparison.

Mr. Fennell says: "Mr. Taylor has introduced so many variables into his comparisons . . . that in the absence of full details there would be great possibility of undiscovered error." These words tend to show that Mr. Fennell does not understand what he has read. The figures of initial first costs are plainly given, the total annual costs are just as clearly explained in terms of three different and independent depreciation annuities for a wide practical range under A, B and C, any of which may be taken; and, finally, the relative grand total costs are a multiple of the respective years of life, any one of which may be taken. This process can easily be checked backwards.

Mr. Fennel also stated: " . . . all light ferro-concrete work in which any is subject to tension and vibration is open to

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suspicion. . . ." He should know that the basis of every pole design is tension stress, and a pole is wrongly designed, made, and/or installed if it is open to suspicion due to being subject to tension. A light pole is very flexible and easily and safely withstands all the vibration its proper and usual installation subjects it to.

In the same paragraph he says: " . . . I, for one, sympathise with the Electricity Commissioners in their insistence upon a higher factor of safety than for steel structures if the strength of the filling is taken into consideration in the calculations." From these words we are to understand that because the strength of the " filling " is added to the strength of the steel, a higher factor of safety should be used for strengthened, supported and totally protected steel than for steel minus these advantages. The factor of safety of one material is distinct from the other. Steel may be subjected to a working stress of 17 000 lb./sq. in., while tension stress in concrete is kept below 250 lb./sq. in.; moreover, the ratio of Es/Ec is as high as 15 times. The consistency of steel strength is excellent, but concrete is most inconsistent, and, increasing the factor of safety of the steel has no practical effect on the concrete strength. As one illustration: a plurality of materials form part of electrical machinery, but a strong material is not expected to help a relatively weaker—each material must take care of itself and be sufficiently strong in itself to meet the requirements of practice. Why not the concrete? It is wrong to say that the ratio $2\,600/750=3{\cdot}5$ is constant. This is decidedly so in the case of hollow-type poles of general makes.

Mr. Fennell stated further: " I do know that of all the methods of construction ferro-concrete is the least adaptable to local conditions, and the most doubtful as to its cost basis and construction details." If these words came from one with practical experience of this construction the words would tend to condemn reinforced concrete pole construction. It may be taken that Mr. Fennell would accept a pole construction showing on paper the steel-member dimensions marked on each panel or the frame (this being the usual information given to purchasers, and rarely, if ever, checked by calculations), yet he is openly hostile to top dimensions plus total material quantities for a pole (quantitites he should be able to check), which are more than he would get or expect when purchasing a wood pole, which may be as variable and uncertain in strength as concrete. These relations represent common purchasing methods, and tend to indicate the personal " factor of ignorance " and prejudice.

If Mr. Fennell had properly understood the design basis he would have found that the tension allowed by the Electricity Commissioners was purposely made greater, a surplus overhead clearance allowed for, and no more than twice the strength allowed for the two-pole frames. Ordinarily, the the tension should be that specified in the B.S. Spec. No. 125, the length of pole reduced, and the strength of two poles taken as four or five times that of one pole. As for wood poles, the writer uses double the pole strength and not $(5\pi d3/32)/(\pi d\ 3/32)$.

When one speaks of a construction, it is only just and proper to scope the world for its usefulness, and penetrate and extend beyond jungles and forests and swamps, journey across prairies and veldts, pass into icebound regions where blizzards are common, and soar upwards on to the roof of the world. Into all these, sometimes unwillingly, the writer has penetrated to practise and further electrical progress. Is it not proper that these conditions should be dealt with in addition to those of Mid-Cheshire?

Since 1904 the writer has been constructing " long span " wood pole and frame and structure lines. In those days, and in some countries, the factor of safety was what we made it, and the factor of experience (not " factor of ignorance ") was the only true guide for the lines which have more than justified reliability. As already explained, the " long span " may mean any length from 200 to 2 000 ft., depending on the country, location, one's experience, and whether we are dealing with wood props for a colliery or rural line, or a national " grid " steel structures. A rural line along a tortuous road, or a colliery using wood props for secondary supply, would call a 200-ft. span quite long.

Mr. Fennell continued his criticism by saying: " Mr. Taylor should be more cautious in his claims." He then repeated himself by saying the reader should " . . . be very cautious when accepting a statement made in advance of even experimental construction." There is no need to go any further into this point other than say it may tend to ease the mind of Mr. Fennell, if I also point out that all I ask him to do is accept my proposition. He will then be shown a national " grid " (equal to the main transmission " grid " of this country) reinforced concrete pole line of the identical design and construction under dispute, but of the " H " type. Moreover, when the proposition has been accepted, there are other surprises in store to satisfy " factor of ignorance."

On the above expression, which Mr. Fennell has coined from the factor of safety, will he now tell your readers that his views on the subject of reinforced-concrete pole design and construction and the operation of such pole lines are not based on actual practical experience? I would here venture to inform him that before he started this criticism, he unknowingly had, and no doubt still has, almost under his nose, a view of the reinforced concrete pole construction under discussion, and that this line has already more than proved the guaranteed strength *in situ* under very trying climatic conditions.

As a final note to Mr. Fennell's criticism, I would like to say that whether or not I have " anything up my sleeve " (as a Cabinet Minister recently put it) is neither here nor there, and no more so than why white ants have boycotted Mid-Cheshire. The fact remains that the " air of mystery " is of Mr. Fennell's own making and understanding; and, this being so, I have no desire to add to his mystification.—I am, etc.,

WILLIAM T. TAYLOR.

London.
October 5th.

Funds for the E.T.B.I.

[TO THE EDITOR.]

SIR,—You will be glad to hear that in response to my appeal on behalf of the Electrical Trades Benevolent Institution, donations of £500 or over have been made by:—

Sir Hugo Hirst (for the G.E.C.); Mr. Frankenburg (Greengate and Irwell Cable Co.); Messrs. Merz and McClellan; Mr. J. A. Crabtree; Sir George Sutton; Mr. Dane Sinclair; and Sir T. O. Callender, and other large cheques have been received. In addition, a very great number of regular subscribers have kindly increased their subscription.

We now require some £7 000 to enable the Institution to face the new year in security, with a capital fund of £50 000. I shall be very glad to hear from any of your readers willing to assist in making up this sum. Any contributions from 5s. upwards will be most gratefully received.

The Festival Dinner and Dance will be held at the Savoy Hotel on November 26th. The tickets are 25s. each, from the secretary, Capt. Keeping, 9, Southampton Street, Holborn, W.C. I hope that as many of your readers as possibly can will accept this opportunity of giving themselves and their ladies a first-class treat, and of helping the E.T.B.I. at the same time.—I am, etc.,

H. MARRYAT.

London, E.C.1.
November 12th.

POINTS OF VIEW.

We have in the short wireless wave a new problem of extra ordinary penetrating power. Nobody knows as yet where its limitations are or what it is destined to reveal. We are like a blind man who has just acquired the use of his fingers, and is feeling about in the dark.—*Mr. E. E. Fournier d'Albe.*

* * *

About three years ago we supplied 200 [gas] cookers for a new housing scheme. I can venture to say that not more than half of these cookers have ever been used inside for any other purpose than storing pit clothes or keeping rabbits.—*Mr. W. V. Marshall.*

* * *

It is wrong to say that a woman cannot adapt herself to a mechanical career, nor is it correct to say that she has no inventive turn of mind.—*Miss C. Haslett.*

The eighth annual ball organised by the staff of the South Wales Electrical Power Distribution Co. in aid of the Pontypridd Hospital was held recently, over 300 persons being present. Mr. Robert Roper, resident engineer of the company, was chairman of the organising committee.

Mr. H. Evans, of the St. Helen's Cable Co., Slough, and his partner have survived the first round of the foursomes competition of the Slough Estate Golfing Society, and they are strongly fancied for the trophy.

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CONTRACTING EPISODES.

Leaves from the Notebook of an Old Electrical Engineer.

By "ELCON."

MY earliest experience of matters electrical, was when my employers obtained a concession to light a certain small market town. Producer gas plant, with one dynamo and a battery, sufficed to supply their own works and a limited 100 V, d.c. network.

The gear, with the exception of the battery, was put in by our own men, but for the battery an "expert" was called in, and I was turned over to assist him. His well dressed and cleanly appearance won my juvenile admiration, while his "air" as he got on with the job, cigarette in mouth, largely decided for me that electrics were a nicer job than grubbing about on greasy, oily engines and sooty old boilers.

The battery being duly erected and the plant ready for running, the "expert" decided to get his acid mixed overnight for filling up on the following morning. A nice, big, old galvanised iron tank originally used as a cattle water trough being available, was duly commandeered, the acid mixed and left to cool off.

On our arrival next morning we hadn't got any acid, but we had one of the finest sieves you could wish for.

* * *

While on the subject of batteries, I recall the case of a fine yacht calling in at one of the Scottish ports for overhaul. This yacht was equipped with two dynamos and two Edison alkaline batteries, any combination of which could be used as required. The batteries were carefully taken ashore, washed out, and refilled with sulphuric acid !

* * *

At another shipyard, the foreman electrician sent four labourers to fetch from the stores to the ship a new armature to replace one that had been damaged. One of the hands returned to say there was no hand cart available, and that it was too heavy to be carried. The reply to this was: "What the —— ——, ain't the —— thing round, can't you —— well roll it down here." And they did: and they got another armature: *and* they got another foreman.

* * *

One firm I was with supplied two enclosed arc lamps for use in series outside a shop in an adjacent town. The local contractor—a real kerbstoner—to whom they were supplied, came back to say there was something wrong with them. A visit to the job revealed that our packer had sent all negative carbons, and the local man, to make these fit the larger positive grips, had carefully wrapped them with black tape.

* * *

A certain firm had the task of stripping down a large multipolar motor and the replacing of some damaged field coils. The pole tips were of the type where the overhang is unequal, and when reassembling, the mechanic getting some reversed, found he could not get the last in place. The remedy, to him, was easy. A hack saw soon got rid of the offending surplus.

* * *

Another brilliant boy was sent to a job to join up a small direct-coupled steam set in connection with a small yacht installation with battery. When run up, the polarity was found to be opposite to the terminal marking, so a telegram was sent to headquarters asking for an engine to be sent running the opposite way.

* * *

One mains job I was working on was supervised by an engineer doing similar duty in another town some 50 miles distant. When making a preliminary test it was found that the cores of a three-core feeder had been crossed. As the boxes had been compounded in, it was decided to take advantage of the engineer's absence to open the cable just outside the box and make a further cross to bring matters right. This was done, tests completed, and no one was the wiser.

* * *

In a certain not so small town, a gasfitter undertook the wiring of a small house, some 8 points. In the cellar all appeared to be in order, two mains hanging down from a d.p. switch with fuses as required. The test proving satisfactory, connection was made, and a look round the house taken to see that all was O.K. Not a single light would glow, and later investigation showed that the whole of the lights and switches were in series. Mr. Gasfitter had started from the one main and gone on round the house and arrived at the starting point with the other end.

A job that came my way, was to change over the lighting of a small hotel (some 300 lights) from a private 100 V plant to the company's mains at 240 V. The novelty in this job was to be found in the fact that every light came back separately to a "dis" board, and was wired with 7/20 or 7/16 cable, enough copper being on the premises to start another Golconda, I learned from the original proprietor, then retired, that he had employed two electricians direct, and had paid for the material as used and ordered by them. Some commission raked off, worth handling, would no doubt be the solution.

* * *

A little job that came my way in the early days was the wiring of three ceiling roses with one switch at the back of a small shop window. The casing and capping was run and the wood blocks in place exhibited 4 and 4 and 2 wire ends, respectively, when the local resident engineer dropped in. I was promptly asked what the deuce I thought I was doing with all those wires in the blocks, and was rather at a loss to know what the rumpus was all about. Finally, I was ordered to make T-joints at each point. My explanation about looping in carried no weight, and I was told it would not work my way. After he had left, the job was promptly finished, and as we did our own meter work, mains connecting, etc., the light was got going before he returned an hour or so later. As I could not refrain from telling him I had not carried out his instructions, but had left things as they were, I landed myself with the job of stripping down a point to show him, and was then told: "Well, anyway, it is shoddy work, and don't do it again."

* * *

A certain town some years ago possessed a single-phase alternating current system, and motors were an almost unheard-of thing. A certain wiring contractor, receiving an order to fit a motor to run a hoist and chaff cutting machine, proceeded by installing the motor on the second floor and placed it close to double doors opening on to the street. As the motor was belted to a line of shafting through the medium of a loose pulley, and was secured to somewhat aged floor boards by coach screws, the reader will not be surprised to hear it was returned to the makers, it having been found insufficiently strong to withstand the fall to the roadway below when the belt was shifted over.

* * *

A curious little 25 V private installation I once had to overhaul before connecting to the Corporation 230 V supply, had been installed by an amateur. Said amateur had evidently carefully perused that type of instruction book which depicts a long run of wire taken to the far side of a square to equalise the drop on the respective leads, and had religiously followed it out. The method of protecting the wiring where it dropped from the wood casings running along the top of the floor joists to the underside of the ceiling below was decidedly unusual. The wires were bared and churchwarden pipe stems threaded over the conductors, the ends of the stems terminating respectively in the casing and ceiling rose. The insulation of the whole was so good that it could have been accepted as it stood, had not the odd position chosen for the fuse distribution boards prevented this being done. These boards, two of them, were placed under the floor boards, and were accessible only after the piano, carpet, etc., had been moved. This arrangement did not, however, matter much, as the dynamo and engine could never have raised energy enough to blow the fuses fitted.

* * *

A kit of tools one of our hands carried consisted of an old razor, a screwdriver, and a pair of dentist's forceps (a jolly handy tool, too !); anything else he required he borrowed or acquired. Referring to tool kits, I once, for a bet, completely wired (casing and capping surface work) a small shop with no other tools than a bradawl and pocket knife. This arose out of an old timer's remark: "You can always tell a good workman by the rotten lot of tools he totes around."

* * *

The meter reader visiting the small shop of Mr. "A," one foggy day, observed lights burning in the next door shop of Mr. "B," and as "B" was not on his list of calls, went in to make inquiries. "B" informed him he had had the lighting in his shop window some six or seven months and that So-and-So had carried out the job. After finding that So-and-So had joined up "B" to "A's" wiring, it was easy to get "A" to agree to the idea of "B" paying part of the bill, though "B" was not so easy to convert to the plan.

(To be continued.)

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ELECTRICAL WINDOWS & CHRISTMAS TRADE.

Ideas for the Contractor—Getting away from the "Chimney Incident"—Some Interesting American and Canadian Examples.

By ERNEST A. DENCH.

ARE you one of those electrical retailers who are "sick and tired" of re-hashing Santa Claus and the chimney incident? If so, your courageous desire to deviate from the conventional gift window display will receive moral support from what other dealers did last season.

It's the easiest thing to deck out a window with a synthetic fireplace, a cardboard Santa cut-out, and his over-filled pack pouring its contents on the floor. It is, in fact, the lazy man's way of tackling Christmas as a merchandising event.

But the man with ideas, or the man who is open-minded about adapting the ideas of other far-sighted dealers to his own requirements, will glory in the scope of this subject. He will, nevertheless, "clip its wings" if his thinking apparatus does by chance become too far removed from sound practice.

This is not to put Santa "on the shelf." There is still plenty of vigour in the genial old chap, but like the good actor he is, he should be given a new merchandising act every December, to invest him with freshness.

The following display highlights should enable you to develop complete displays in ways that recommend themselves to you.

Kerr's, of Coldwater, Michigan, attached a lifesize cutout of Santa Claus alongside an electrical washer. With each revolution of the machine, the figure jumped up and down.

The California Oregon Power Co. brought "The Spirit of St. Nicholas" up to date by laying out the window as an aerodrome landing field. A toy aeroplane, named "The Spirit of St. Nicholas," was about to make a flight. Pilot Santa (a costumed doll) was in charge. A tiny cone indicated the direction of the wind; the latter coming from an electric fan hidden in one corner. While the landing field had been cleared of snow, the wintry mantle was scooped up around the sides, ploughing through which were four small Santas, each drawing his own sled piled with electrical gifts, unwrapped.

The Miami Electric Co., of Indiana, were responsible for the precedent of Santa making a midnight call upon a modern farm dwelling. The painted back scene was of the exterior of a farmhouse; the interior well lighted. Staggering under his load along the carriage drive was Santa, bearing a lighted lantern. His sleigh, parked nearby, disclosed a radio set. The window sold both the idea of farm lighting equipment and appliance gifts.

Freeport, Illinois, has no use for the orthodox "Christmas Opening." Instead, a "Mother Goose Comes to Town" pageant is held; each co-operating store rallying with a visualised nursery rhyme playlet in its "opening" display. No two nursery rhymes are alike; each retailer agreeing to take a certain subject and work it out for himself.

The Boyington Electric Shop chose "To bed, to bed, you sleepy head," the main item being a miniature house, all the rooms in which were furnished and wired. The furnishings included tiny replicas of an electric washer, vacuum cleaner, lighting fixtures, a radio set, a lighted Christmas tree, and cooking devices. Doll children in the nursery were being put to bed by their mother, a larger doll.

Chernin Brothers, of Glace Bay, Nova Scotia, had a clever two-in-one display. Toy electric railways circled the countryside, with cotton wool, mica snow, and tiny spruce trees on the floor, including a frozen lake (silvered glass). The cotton wool snow covered hidden boxes, the repositories of small appliance gifts. The red curtained background bore a large Santa Claus cut-out, which was made to perform a periodic set of motions.

The Knoxville Power and Light Co. gave to a display of electric trains a novel twist by a "Touch the Spot" device. By touching the small mirror-like disc on the window glass, the spectator illuminated the darkened window and set the toy railway in motion, or stopped it as well.

Ideas noted in use by other retail trades with electrical appliance gift application were "The Shadow of Santa," and "Open the Gates of Goodwill Castle." The first involved a black cloth background, against which was affixed a white silhouette cut-out of Santa Claus. His footprints—cardboard soles embedded in the mica snow floor—suggested that he had just passed. Plenty of gifts were on show, backed up by the sign, "The Shadow of Santa. Come Inside for the Gift Reality."

"Open the Gates of Goodwill Castle" required a painted back curtain of a medieval castle exterior, showing the moat and fortified gates and turrets, or the battlements constructed with appliance cartons. The floor area was devoted to electrical gifts, accompanied by a forceful piece of copy, such as "Again Comes the Opportunity to Open the Gates of Goodwill Castle. Our store is an inviting gateway to goodwill-increasing gifts."

One of the window displays which has been specially designed by the E.D.A. in connection with the December Selling Campaign. Other windows intended for use during December will be published next week.

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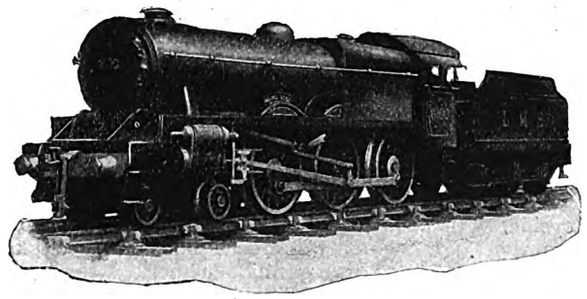
ELECTRICAL GIFTS FOR CHRISTMAS.

Electrical Appliances and Novelties for Promoting Christmas Trade—Suggestions from Manufacturers.

THIS month sees the start of the additional trading always associated with the Christmas festivities, and this year more than ever public attention is being directed torwards those small and large domestic appliances which lend themselves to the spirit of giving electrically. During the current month the special E.D.A. window display is serving as a



The electrically driven model of the "Royal Scot" by Bassett Lowke, Ltd.

reminder to the public that presents will soon need to be purchased, while the December window displays are equally convincing that the best gifts are those which are useful, labour-saving and at the same time inexpensive. To assist contractors in the matter of stocks and items with which to dress their windows we give below details and illustrations of a number of suggestions received from manufacturers, and though for reasons of space it has not been possible to cover the whole field suitable as electrical gifts, many of the appliances described will be new to the electrical contracting industry.

Electric fires are always a welcome present at Christmas, and some popular models are produced by BELLING AND Co., of Bridge Works, Southbury Road, Enfield. The company's "projector fire," which is rated at 1 kW, is suitable for heating rooms sized about 12 ft. by 10 ft. by 9 ft. The 2 kW size is recommended for rooms up to 16 ft. by 14 ft. by 9 ft. Hotplates are another idea for Christmas and the Belling plate, economical to run, would make a pleasant and unobtrusive addition to any sideboard. The finishes available are polished copper and nickel plate.

Among the large number of portable wireless sets on sale this season, some of which are described later in this article, may be mentioned the "Chakophone Warwick" portable four, manufactured by THE EAGLE ENGINEERING CO., LTD., of Eagle Works, Warwick. Its particular features include low first cost, light weight (approximately 20 lb.), solid black walnut case and low battery consumption. The cost of h.t. maintenance is stated to average 7s. 6d. every four months. A pentode valve is included in the circuit.

J. DYSON AND CO., LTD., St. Stephens House, 2, Coleman Street, London, E.C.2, suggest their 3-valve screened grid receiver, and also their 4-valve portable screened grid set, which is offered in an attractive oak cabinet. Eliminators are useful presents in these days of all-mains operation, and with the new regional stations wave-traps also may in some cases make very useful presents. We give below tabulated details of some of the Dyson products.

The Model D.H. "Godwinex" h.t. eliminator for d.c. mains has 3 positive tappings, with a maximum current output of 20 mA at 150 V. The Model D.P. eliminator, also for d.c. mains, has a maximum output of 50 mA at 200 V and 4 positive tappings. The Model A.H. eliminator is an a.c. type with 3 positive tappings with a maximum output of 15 mA at 150 V. Another a.c. unit is Model A.H.W., with an output of 15 mA at 130 V. Other a.c. eliminators have outputs of 30 mA at 160 V. The Godwinex "all-mains" unit for a.c. mains has 4 h.t. positive tappings. There are five negative grid bias tappings up to 25 V and low tension variable for 3, 4 and 6 V valves. The maximum h.t. output is 50 mA at 200 V, and the maximum l.t. output 1 A.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway London, W.C.2, appears to be fully alive to the opportunities afforded by the seasonal demand, and states that its whole resources are directed as much to co-operation with the trader as to the pleasure and content of his patrons. The wide range of "Magnet" appliances now covers almost every form of utility in the home, and also includes items of more personal interest than ordinary domestic apparatus. For the home there are vacuum cleaners, electric irons, toasters, kettles from 2 to 6 pints capacity in copper or nickel plate finish; for the kitchen are offered the "Minor" cooker—which is particularly suitable for flats, bungalows and small households of three or four persons—boiling plates, warming plates and neat copper saucepans which have also their use in the nursery or sick room. For the boudoir or dressing room there are electric hair-driers and curling irons, massage vibrators, electric shaving pots and reflected-light shaving mirrors. There are also many attractive designs of electric fires from the portable type of pedestal heater which can be operated from the lighting circuit, to those of higher loading. In all of these may be found interesting features of design and a selection of finishes to enable a fire to be chosen to harmonise with any ordinary scheme of interior decoration. Other attractive presents are the gramophone motor attachment, and sewing machine motors. The Osram Music Magnet Kit is another present of the kind which should ensure gratitude from the most ungrateful.

When fires are chosen for Christmas gifts buyers will be well advised to turn to the range offered by THE JACKSON ELECTRIC STOVE CO., LTD., of 143, Sloane Street, London, S.W.1. These are fitted with reflector elements of the "plug-in" type. The reflector is designed to give the maximum radiant heat and is, we are informed, manufactured by the use of special dead-accurate presses and tools, ensuring that no variation is possible in the relative positions of elements and reflectors. The heat generated is diffused by the curvature of the fire front and reflectors, thus giving a very wide distribution. Attention should be paid to the fact that the makers have practically overcome discolouration by heat of the delicate oxydised finishes on these models by the arrangement of the reflector and the reflector housing. The majority of the fires are constructed in sheet metal, making them light and portable, but among the new season's models is a range of cast fires which, although hardly portable, are most attractive. The reflectors are made in a special alloy and the standard finish is highly polished nickel plate. Chromium plated reflectors can be supplied at an extra cost. Carrying handles are provided on all portable models. Special attention is called to the new "Fabric" finish models. The majority of these fires can be obtained in this finish in four colours :—Chinese grey, bronze, red and blue. This finish is "non-metal" and is a pleasant contrast to those fires finished only in brass and copper tints. All wiring on the fires is carried out in solid rod. Porcelain insulators and foot press switches are used so that the fires are satisfactory in damp climates. All models have one bar connected direct to the main to comply with wiring regulations and are complete with 6 ft. heavily insulated flexible. The reflectors are not lacquered and as it is an easy matter to remove the element, the reflector is easily cleaned with a little plate powder. The (750 watt) element is of the "plug-in" type so that where changes of voltage are necessary this can be done in a few seconds without the use of tools. The spiral is wound helically to fireclay formers, which are built up in sections to prevent fracture under heat, and this can be replaced, if required, in a few minutes without the necessity to purchase a complete element. The formers are held together with a rod of special alloy to withstand the heat generated, and the pins and sockets, are of special metal.

Many of the Jackson fires have been recently described. Among other models is the "Atom" heater, which is claimed to be better than a bowl fire. It will rapidly heat a small room, and can also be used for preparing tea, toast, eggs, meat, potatoes, puddings, vegetables, toasted tea cakes, etc. The supports for this adaptable heater are so constructed that it can be made to stand nearly upright, for heating the room, or be moved into a horizontal position for supporting a kettle or saucepan. The loading is 750 W, the element is of the plug-in type and the finishes available are ebonite black, or blue, bronze, grey or red "Chinese Fabric." A chromium plated reflector can be supplied as an extra.

(*Continued on page* 608)

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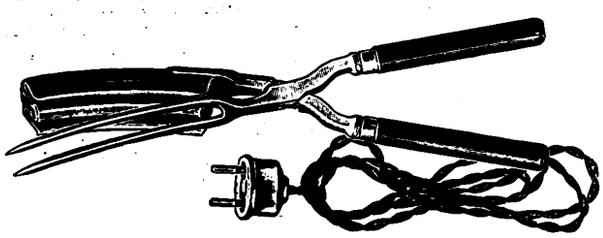
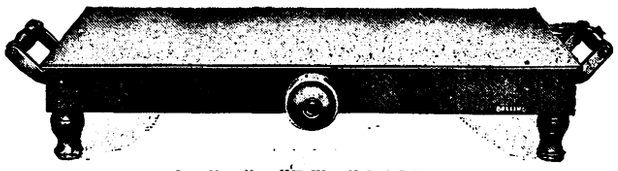
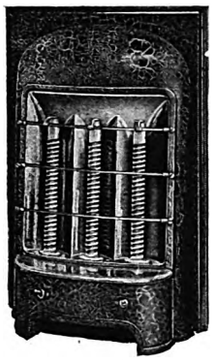
SUGGESTIONS FOR ELECTRICAL GIFTS.



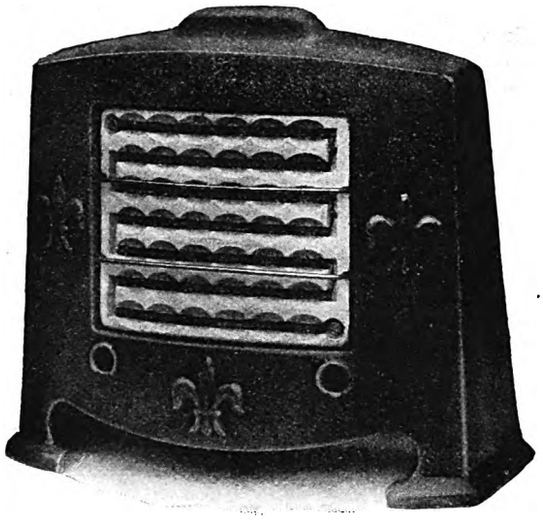
Hair curlers by the Electric Heating Co.



An attractive "Belling" hotplate.

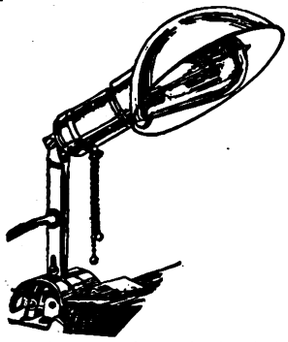


An inexpensive "Jackson" fire.

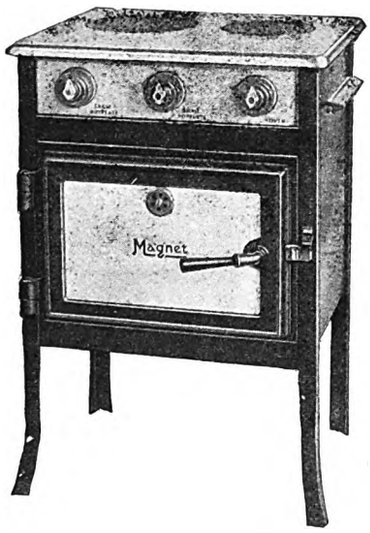


One of the new fires of Electrical Utilities Ltd.

A "Magnet" electric toaster.

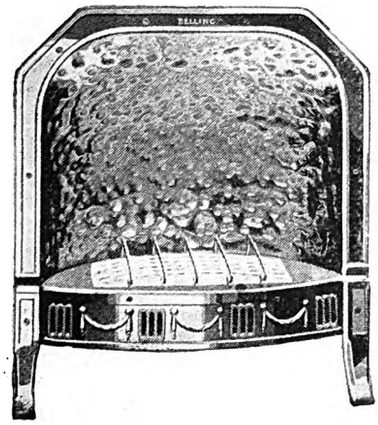


A useful accessory by Benjamin Electric Ltd.

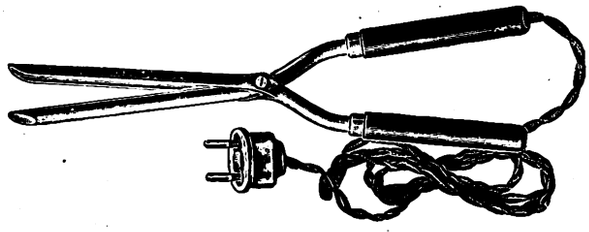


Another suggestion by The General Electric Co., Ltd.

A new G.E.C. standard.



One of the "Belling" fires.



Another set of curlers by the Electric Heating Co.

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One of the latest electrical appliances in the domestic field is the health motor, and it is quite possible that in some instances such motors might be chosen for Christmas gifts—they would certainly be a novelty, though where presents for acquaintances are concerned one can foresee that caution is necessary, owing to the health motor being considered a specific for obesity as well as a form of bracing exercise for the already healthy. The particular feature of the "Thor" health exerciser, which is marketed by the Thor Department of THE EDISON SWAN ELECTRIC CO., LTD (1a, Newman Street, London, W.1.), is that it is designed normally for fixing to a door, instead of to a heavy-weight table or a special bracket. Behind this part of the design is the idea that few tables to be found in bedrooms are suitable for clamping between the jaws of a vice. A door, however, is universally available, and the health exerciser will see to it that the user does not get a cold through a possible draught. If, however, for the sake of privacy or any other reason the door method is considered unsuitable, two other devices, known respectively as the wall base and the window bracket, can be utilised. The wall mounting bracket is made in two parts, one to be attached permanently to the appliance and the other for securing permanently to some suitably solid part of the house's framework. The first part fits into the second, where it is held in position by a thumb screw. The exerciser can thus be removed from its mounting base when it is not in use. The window bracket is made to hook over the window sill outside the window. It must be mounted at the extreme end of the window—not near the centre. When the bracket is in position the sash is lowered on to it, and the clamping screw tightened. To change the fixture it is only necessary to remove the two screws which secure the door bracket to the exerciser and substitute the base or bracket to be used, fastening them with the same two screws and making certain that the latter are screwed well home.

A two-piece adaptor is provided, enabling the motor to be run from either a lamp socket or a wall plug. The model of the Thor exerciser which our representative examined in the showrooms was of a green colour—no doubt a future development will be a range of tones to enable the motor to harmonise with the room.

A New Vacuum Cleaner.

Another new Thor appliance is a vacuum cleaner, which is reasonably priced, of the upright, self-contained type. It has a sweeping nozzle 13½ in. wide, a bristle brush inside the nozzle and a large swivel-castor designed to make the machine feel light and be easy to handle. There is a very complete set of attachments including brush, extension arms, and nozzles and adaptors for stairs, walls, upholstery, curtains, etc. A rubber tube for blowing dust out of radiators, pianos, etc., is provided. Among other constructional features are the placing of the bag on the right side of the cleaner, to keep it away from the operator, and a spring which holds the handle upright when not in use, together with a convenient device for locking the handle in any desired position.

"Thor" washing machines are already well known. The latest addition to the range is the "Thor Agitator No. 1." a combined washer, wringer and ironer. It has a "life-time tub," finished inside and out in oven-baked porcelain enamel, a full-width top opening, and a rubber-guarded lid—a round guard of wear-proof rubber encircling the top of the tub where the cover fits in; vibration is thus eliminated and water cannot splash through. The rotary ironer is stated to heat as quickly as an ordinary flat iron; it has an ironing surface equivalent to that of ten ordinary irons, and, it is stated, will do the same amount of work in one-third of the time. The user merely lifts off the wringer of her Thor washer and places the ironer in position.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, London, N.17, suggest their Dim-a-Lamp as a very suitable Christmas gift. This fitment consists of a compact and indestructible rheostat manipulated by chains to reduce the normal current through the lamp filament. It has five positions, each corresponding to a given amount of light. Beginning with "full-on" the successive steps are "one-half light," "one-fourth light," "just visible," and "out." The advantages of the Dim-a-Lamp to users in the home is obvious; the makers lay stress on the pleasant ease with which groping in the dark may be avoided, and, alternatively, the saving of energy as compared with having a lamp burning at full brightness—but to us it seems that a more striking virtue of such regulation is its value in children's nurseries, where by simply pulling a chain all the trouble of nightlights is avoided. The term Dim-a-Lamp is used by the makers to designate a complete lamp provided with the regulating attachment—several models are offered, including shaving lights and portable lamps for hanging from the upper rail of a bed. The Dim-a-Lite adaptor is a combined plug and socket which can be interposed between any electric lamp and its ordinary socket, thus giving the five-way regulator.

Another Labour-Saving Device.

There are many who are sure to appreciate wash boilers at Christmas and those looking for a well-appearing though solidly constructed type, may be interested in the "Arora" shock proof boiler made by THE ARORA CO., of Loughborough. This boiler is constructed on the lines of those heated by gas. There is an inner boiler of 10 gallons, having four heating tubes in the sump, with removable perforated cover, all of copper, tinned after making. The top lid is recessed to prevent dripping, and the outer case is galvanised, enamelled blue. It is sold complete with two yards of cable (three cores for live conductors and one for earthing) for coupling to a three-heat control switch. The consumption is three units per hour, but with the control switch it can be regulated to 1½ or ¾ units per hour. The special construction of the sump plate automatically stirs the boiling water into constant rotation, driving the hot suds through the clothes. This automatic circulation, assisted by the copper condenser at the back of the hinged lid, keeps the steam within the boiler itself, so that the atmosphere of the wash-house or kitchen is left free and dry. The heating elements of the Arora wash boiler are the usual reliable Arora heating tubes, totally enclosed. It is said that a full boiler of clothes can be washed for an approximate cost of 3d. for current. The specification shows that the boiler is supplied with proper earthing arrangement to obviate any risk of shock. Another interesting line is the "Arora" "Halo" fire. This is a glowing and cheerful companion for chilly occasions, and an invaluable companion all day during the winter.

A really delightful suggestion for an inexpensive and yet most attractive and novel gift is found in the electric night light of JOHN SHAW AND SONS, (WOLVERHAMPTON) LTD., of Wolverhampton. This night light or watchstand is supplied in the form of an owl, bulldog or monkey, as the purchaser wishes: an illustration in these pages shows the owl. Strongly made of cast metal, finished in bronze, these should prove one of the most popular Christmas selling lines. The eyes are electrically illuminated and provide an excellent night light, and in addition, a hook is provided to take a watch on which the illuminated eyes project a beam of light—clearly lighting up the watch face. Current is supplied by an ordinary 4½ V flash lamp battery, and is controlled by a lever switch conveniently located at the front of the stand.

The "Everbright" pocket lamp of the RUNBAKEN MAGNETO Co., Tipping Street, Manchester, has been designed to meet the need for a lamp that can be thoroughly relied upon to give a continuous light for a number of hours. The case is made of moulded bakelite. An unspillable accumulator, a miniature of those used in the London Police lamps, is fitted, providing sufficient current to give continuously 9 to 10 hours of brilliant light. The re-charging is a very simple matter and can be carried out without removing the battery from the lamp. Plug and socket connections enable the battery to be connected through a battery charger to the nearest lamp holder, the battery being fully charged in a few hours. It can also be recharged similarly from any motor car. A focussing attachment can be added to the standard lamp. This gives an exceedingly strong concentrated light which can be used for observing distant objects. Other features of the lamp are as follows:—all parts interchangeable; black or brown finish; 5-plate unspillable battery, 9 to 10 hours continuous light; metal parts lead plated to prevent corrosion; chart for registering date of last charge; model 264A can be re-charged without removing battery, and is fitted with spare bulb and clip; and the weight is 8½ ounces.

New Fires.

ELECTRICAL UTILITIES, LTD., of Tudor Works, Park Royal, London, N.W.10, are now marketing a new design of fire, utilising their standard "infra-ray" element. The fire is fitted with detachable trivet for carrying a small utensil or a plate of food, etc. The fire has been so designed that the casting weight counterbalances the trivet, so that it is possible to put up to 4 lb. in weight upon the trivet. The loading can be either 1 or 1½ kW, and the prices are reasonable. It can be supplied in the new fabric finishes, which are attractive

(*Continued on page* 610.)

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FURTHER ELECTRICAL GIFTS FOR CHRISTMAS.

The "Osram Music Magnet" receiver.

A "McMichael" portable set.

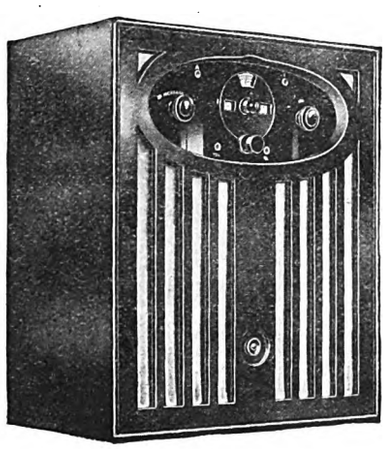
One of the portable sets offered by Ultra Electric, Ltd.

A specimen of the "Moonmist" glassware offered by Lighting Trades, Ltd.

The "Igranic" portable receiver is another interesting set.

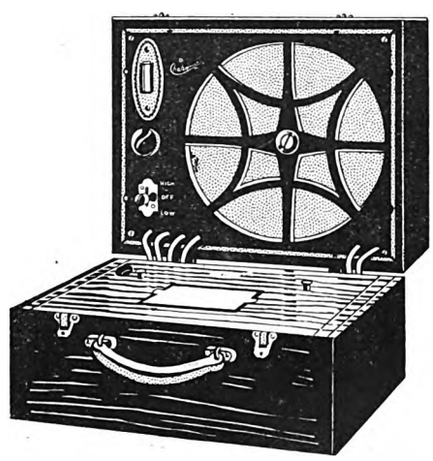
A cabinet type "Stork" loud speaker by the G.E.C.

A transportable receiver design by J. Dyson and Co., Ltd.



Truphonic Radio, Ltd., also market a well-designed self-contained receiver.

Another model in the range offered by Ultra Electric Ltd.



The "Chakophone Warwick" receiver by the Eagle Engineering Co., Ltd.

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and appear to be proving popular this season. Their "Lilies" fire can be supplied in grey, green, brown and white vitreous enamels, and also in red, blue or black "fabric" finish.

THE ELECTRIC HEATING CO., of George Street, Croydon, suggest a "Utility Frame" for converting a household electric iron into the equivalent of a hotplate. The iron has merely to be turned with the sole plate facing upwards and slid into the frame, where it is held in place by spring runners. An asbestos pad, which is laid with its metal side on the iron, helps to spread the heat over a larger area. As a low-priced method of learning the electric heating habit this device may certainly have its uses.

The Electric Heating Co. also suggest their "Elect" Marcel pattern waving iron. The "Elect" waving iron is stated to be reliable and well constructed. It is heavily nickel-plated and polished.

An immersion heater would certainly make a useful Christmas gift, and various types and sizes are made by GEORGE GREEN AND CO., of Chapel Road, West Norwood, London, S.E. 27. A heater of this type may be fitted very easily to a tank or cylinder, and an adaptation to electric heating is, therefore, a simple and inexpensive mattter. An immerser fixed in the storage tank of an existing hot-water installation is a useful auxiliary or alternative to the coal range, and is a great boon in the early morning. The design of the elements in the "Gee-Gee" heater permits the rapid transference of the heat to the surrounding liquid.

The "Universal" 5-valve portable of the IGRANIC ELECTRIC CO., LTD., 147, Queen Victoria Street, E.C.4, has much to commend it. Consisting as it does of two screened-grid h.f. stages, detector, and two l.f. (one power valve). The frame aerial is carried in the lid of the case, in which is also contained the adjustable cone-type loud speaker. Tuning is effected by vernier drum control. Variable reaction and volume controls are also incorporated, and these, combined with the stability of the screened-grid valves, ensure good control. This receiver can be run from a mains unit if desired, battery connections being brought out to a suitable plug. The separate battery case, however, contains two 54-volt h.t. batteries, and a 20 Ah (actual) 2 volt non-spillable accumulator, and will, of course, operate the receiver under all conditions. The grid bias battery is accommodated in the receiver itself. The range is stated to be exceptionally good, both indoors and out. All distant stations of medium power on both long and short wave-length bands are easily received at good strength, and the change-over from one wave-length band to the other is effected by means of a simple switch. The receiver is directional, and if placed on the turntable on the battery case, it can be freely swung in the direction to give maximum strength on any given station. A small compass on the panel will facilitate this operation.

LISSEN, LTD., of Worple Road, Isleworth, Middlesex, also offer a portable wireless set for Christmas. Although the Lissenola five valve portable is simple in its operation, its long range qualities are distinctly good. All the main British broadcasting stations may be received at loud-speaker strength. For certain reception the maximum distance is fifty miles in the daytime during the summer. The majority of the principal foreign stations are stated to come in at excellent loud-speaker strength, especially when the directional effect obtained by turning the receiver to the best receiving point is borne in mind. The use of an outdoor or small indoor aerial, with earth, will increase range and strength.

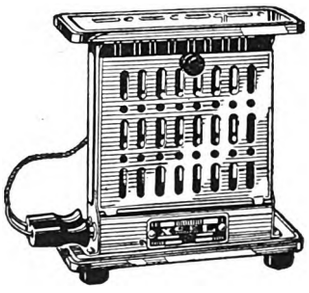
Mention should also be made of the "Passport" receivers of HART COLLINS, LTD., 38A, Bessborough Street, London, S.W.1. These are made in two types—namely, portable and transportable, the first consisting of a battery-operated self-contained 4-valve equipment, and the other is a 3-valve mains-driven outfit. The portable model measures 14¾ in. by 12 in. by 8½ in., and employs the popular screened-grid valve; the all-electric set is also of the screened-grid type, all accessories, including the loud speaker, aerial and earth being self-contained.

Another suggestion is the "McMichael Super Range Portable Four." This receiver is manufactured by L. McMICHAEL, LTD., of Slough. The circuit comprises a single stage of tuned h.f. amplification, employing a screened-grid valve, followed by a detector and two stages of l.f. amplification. The difficulty of the inherent high anode consumption of the D.E.P. 215 output valve is overcome by careful selection of h.t. and grid bias values. The total h.t. current consumption is, in fact, rated at 9 mA. The four valves are housed in a narrow well and are screened by means of a hinged aluminium lid. Hinged bases are provided for the screened-grid and output valves. Tendencies to microphonic noises are prevented by cotton-wool packing. A very neat control panel is provided, tuning being effected by two knurled, edgewise knobs; the right-hand control operates the tuning condensers of both frame and h.f. circuit, the left-hand control being a compensating device for bringing the two tuned circuits into resonance. The other two controls are a combined range switch and filament rheostat and a reaction control. The company's super-screened portable four is a cabinet receiver in figured walnut. This is a receiver in which quality has in no way been sacrificed to price, and it has two screened-grid valves, giving the radio-frequency amplification, with a pentode for magnification in the audio-frequency stage. This receiver has a "valve" switch which in addition to switching on the set will grade the volume at will.

TRUPHONIC RADIO, LTD., Truphonic House, Hanover Park, London, S.E.15, are now supplying the "Melo-Set" portable in suit-case form. It offers the same simplicity of operation, the same wide choice of stations at home and abroad, the same richness of tone as the ordinary Melo-Set. The suit-case

A Hart Collins "Passport" portable.

A suggestion by Siemens Electric Lamps and Supplies Ltd.



The Xcel toaster is always a popular line.

The "Lissenola-5" is another useful set.

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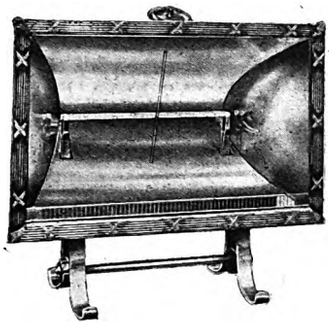
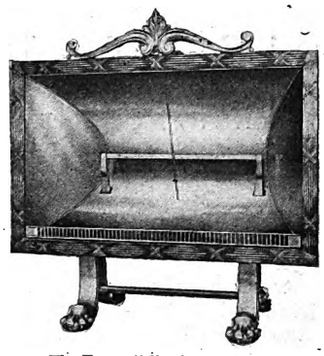
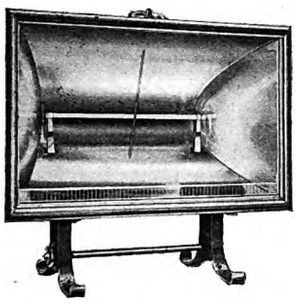


One of the latest "Ferranti" 3 kW fires.

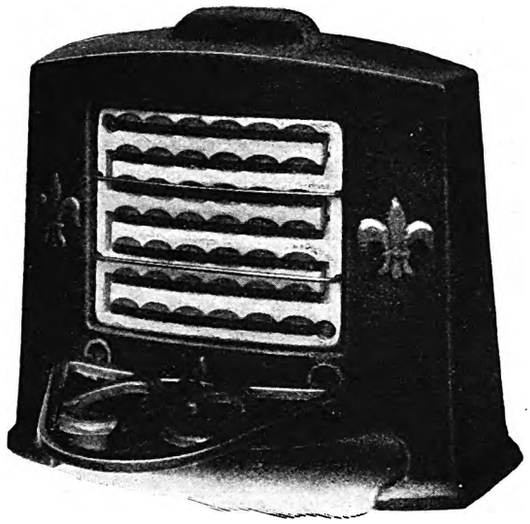
A novelty suggested by John Shaw and Sons (Wolverhampton) Ltd.



The Ferranti fire in another new design.



The Ferranti single bar fire in plain but attractive finish.



The "Lillies" fire of Electrical Utilities, Ltd., fitted with trivet.

A new model introduced by The General Electric Co., Ltd.

model is sturdily built and attractively designed. It is no bigger than a portable gramophone. There is a choice of two case coverings—either rexine or real hide.

The ultra air chrome screened-grid set, manufactured by the ULTRA ELECTRIC, LTD., 661–663, Harrow Road, London, N.W.10, employs four Cossor valves, a screened-grid high-frequency valve, detector and two transformer-coupled, low-frequency valves. Both the aerial and the h.f. stages are independently tuned. Long and short waves are controlled by two simple switches. The tuning range of the short wave band is 240 to 580 metres and 750 to 1 950 metres for the long wave band. Tuning is effected by two edge-operated drums mounted close together with coarse and fine movement. Reaction is incorporated. In readiness for the regional scheme, a station rejector is fitted, which, it is claimed, permits the reception of other stations without any interference from a powerful nearby transmitter. Its sound reproducing system comprises the air chrome speaker.

THE BRITISH RESISTOR CO., LTD., Clare Road, Halifax, suggests the Imbery-Whitehouse electric heat accumulator. The principle employed in this warmer dispenses with the necessity for any electrical connections to the heater when in use in bed. Thus is eliminated any possibility of shock, and the apparatus is "full-proof" in use. Compared with the present types of hot water bottles, where no small amount of labour in filling and carrying is needed, the present warmer is exceedingly popular. It can also be used as a utility device for keeping plates and other utensils warm, when not in use for its specific purpose, and motorists also will find it useful. The dimensions of the heat accumulator are 12 in. by 6 in. by 3 in. All parts are to gauge and interchangeable. Special alloy metals of heat-resisting properties are used in its construction. The heater is constructed to operate on all voltages from 100 to 250 inclusive. The total watts rating is 500. The heating elements are of special type. They operate at a low temperature which ensures cool operation of the terminals and other working parts. The outer container is of welded sheet metal and filled with dry refractory sand of a special nature to give good heat absorption. The outer container and plug connections are nickel plated. Two yards of special flex with adaptor are provided as standard with the heater. The type B. 1 heat accumulator is guaranteed for a period of two years from date of despatch.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38–39, Upper Thames Street, London, E.C.4, offer a wide range of domestic appliances, some of which are illustrated in these pages. The same company also suggests "Cosyglo" electric fires as being suitable for Christmas gifts, while the Xcel range also possesses many possible sales. Hotplates, bathroom fires, bowl fires, electric cookers, etc., are also suggested. Electric towel rails commend themselves as suitable presents, and in a climate such as ours, where a bath or face towel usually remains damp for some hours after use, these hold out many possibilities.

Whilst considering subjects for Christmas trade the wide range of electrical toys now available should not be overlooked. The "Marklin" series, for instance, obtainable through the W. SEELIG ORGANISATION, 23, White Street, Moorfields, London, E.C.2, includes a comprehensive range of motors for electric drive. These can be operated from either a two or four volt accumulator and are made for driving other plants, toys, boats, etc. Other types are available for use with a.c. mains, while switchboards, searchlights, dynamos, and similar toys are well worth considering.

The same firm also supplies railway sets for running from the supply mains, the voltage being reduced to a maximum 20 by means of transformers in the case of a.c. and motor generators, in the case of d.c. Accessories, such as signals, signal-boxes, lamp standards, etc., also for 20 V operation are also available.

Electrically operated toys are also made by BASSETT LOWKE, LTD., of Northampton. These include battery driven motor boats, railway stock, locomotives, rails and points. An electrically driven model of the "Royal Scot" is included in the range and this for operation with a 6-8 V accumulator. These electric models are very exact in their fidelity to the prototype, including such details as the slope of the firebox top, the outside steam-pipes, the cab with side-windows, the miniature chimney, the self-trimming tender, and every other detail which forms a part of the distinctive outline of the "Royal Scots." Only in the matter of the reduced size of bogie wheels has it been necessary to depart from scale; in this connection prospective users of the model should be reminded that it is undesirable to run a lengthy model of this type, which measures 18 in. overall and weighs 4¾ lb., over curves of less radius than 3 ft.

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NEWS IN BRIEF.

The L.C.C. and its Tramway Department—The L.N.E.R. and Electric Cooking—Car Batteries and Merchandise Marks—Birmingham E.C.A. and the E.T.B.I.

MANCHESTER City Architect is to obtain tenders for the electric lighting of the Nell Lane depot.

Bexhill Health Committee recommends the adoption of electric lighting at the isolation hospital.

Hertfordshire Education Committee has decided to instal electric lighting at Barnet Byng Road C.C. School, at a cost of £150.

Contracts for the erection of electricity sub-stations in Kingsway and in Newfields (Tunstall), at £1 415 and £650 respectively, have been placed by Stoke-on-Trent Corporation.

A new all-electric cooking and refrigerating kitchen and restaurant car on the L. & N.E.R. 8.30 p.m. Hook Continental express from Liverpool Street was put into service last week.

At a general meeting of the Royal Institution last week, with Sir Robert Robertson, treasurer and vice-president, in the chair, Col. G. R. Crosfield and Mr. E. H. Neville were elected members.

The Standing Committee of the Board of Trade is to consider applications for Orders-in-Council to require the marking with an indication of origin of imported motor-car accessories, fittings and batteries.

The Birmingham Branch of the E.C.A. is holding a dance at "Tony's" Ballroom, Hurst Street, on November 29th, in aid of the E.T.B.I. Tickets, 2/6 each are obtainable from Mr. S. Dagnall, 420, Stratford Road, Sparkhill, Birmingham.

The annual congress of the British Institute of Radiology, incorporated with the Röntgen Society, will be held at the Central Hall, Westminster, on December 4th, 5th and 6th. A trade exhibition will be held in connection with the congress, and the Sylvanus Thompson and Mackenzie Davidson Memorial and other lectures will be given.

A Church Council meeting at Great Chart has decided that a faculty be applied for in order that the church may be lighted electrically.

Local electrical contractors have expressed their intention to support the arrangements made by Douglas Electricity Committee with respect to showrooms.

Hull Corporation's cooker hiring scheme which was inaugurated recently has been very successful. The engineer has been authorised to secure the services of a lady to give electric cooking demonstrations.

A meeting of the Institution of Electrical Engineers, North Midland Students' Section, will be held at the Hotel Metropole, Leeds, on November 19th, at 7.30 p.m., when a discussion, "Should the Railways be Electrified," will be opened by Mr. H. J. Fraser.

Mr. Hugh Quigley states, in an article in "World Power," that home production (in Canada) of purely electrical products covers about 80% of the market requirements, the remainder being met in 1927 by 16·7% from the United States and 2·1% from Great Britain. The obstacles placed in front of British trade are to be found, above all, in the developments of power finance, and the only possibility of meeting such competition lies in a more determined effort to bring to the attention of Canada the technical and economic capacity of the British electrical industry.

LOOKING BACKWARD.

FIFTY years ago according to THE ELECTRICIAN, *dated November 15th, 1879:—*

The use of electric light in "The Times" offices was extended to the making-up room.

It was stated that in laying the original Red Sea cable 106 miles were stretched to 107, this being one of the causes of failure.

An appreciation of James Clerk Maxwell, who died on November 5th, said that "he was not simply a man of science . . . His love of humour was so apparent that those who were not most intimately acquainted with him frequently found it hard to decide when he was in earnest."

* * *

TWENTY-FIVE years ago THE ELECTRICIAN, *dated November 18th, 1904, recorded that .—*

The National Telephone Co. was refused permission to place wires over the Thames at Wallingford.

Mr. Swinburne urged the cultivation of the business side of engineering, "as this is more remunerative than purely technical or professional work."

* * *

FIFTEEN years ago it was recorded in THE ELECTRICIAN *of November 13th, 1914, that :—*

Differences between contractors and central station engineers were discussed at a meeting of the "Point Fives" Association.

* * *

TEN years ago THE ELECTRICIAN, *dated November 14th, 1919, stated that :—*

Mr. W. S. Foale, engineer and manager of the Portsmouth Electricity Department, died, aged 46 years.

Mr. Thomas Clark retired from the service of the Telegraph Construction and Maintenance Co., with whom he had been connected for over 54 years.

Tenders are invited for the erection of a telephone exchange in Bayswater, London.

A tender for the erection of a sub-station, to cost £2 672, at Norman Lane, Eccleshill, has been accepted by Bradford Corporation.

Torquay Electricity Committee has given permission to the East Devon Electrical Association for Women to visit and inspect the Newton Abbot power station on January 2nd, 1930.

The next meeting of the Institute of Fuel will be held at University College, Nottingham, to-day, Friday, when a paper will be presented by Dr. J. W. Whitaker entitled "Coals and Their Impurities."

Mr. E. J. Jennings, secretary of Birmingham Electric Supply Department, lectured to the members of the Birmingham and Midlands Branch of the Electrical Association for Women at the Birmingham Y.M.C.A., on October 31st, on "Supply Undertakings and the Domestic Consumer."

The third lecture of the 20th E.L.M.A. Illumination Design Course took place on November 4th, and was attended by a representative gathering of the electrical industry, numbering 95. The address was delivered by Mr. T. Catten on the subject of "Selling Better Lighting to the Shopkeeper."

Sir Hugo Hirst presided at the dinner of the Incorporated Society of British Advertisers on October 30th at the Hotel Cecil, London. Sir Edward Crowe, comptroller-general of the Department of Overseas Trade, said the proverb "good wine needs no bush" was inaccurate to-day. The best goods needed the best advertisements, and they should see that the article came up to the description in the advertisements. Exhibitions were a very good way of advertising.

Mr. W. Imrie Smith delivered an address on Modern Lighting Methods, at a Rotary Club Luncheon in Edinburgh, on October 31st.

The intermediate and final examinations prescribed by the Board of Trade under the Register of Patent Agents Rules, 1920 and 1926, will be held by the Chartered Institute of Patent Agents, at Staple Inn Buildings, London, W.C.1, in April next.

The Calcutta Electric Supply Corporation has decided to construct a tunnel under the river Hooghly for the accommodation of cables and electric mains supplying the east bank of the river. The contract for the construction has been placed with John Cochrane and Sons, Ltd.

London County Council Highways Committee, reporting in regard to the resignation of Mr. J. W. J. Townley, electrical engineer in the tramways department, states that 26 applications for the vacant position were received, five candidates were invited to attend for interview and one of the selected candidates subsequently withdrew. The response to the advertisement was disappointing and it has therefore considered what further steps should be taken for filling the position. The Committee is of opinion that, in order to widen the field of candidature, the remuneration attaching to the position should be increased, and it proposes that an inclusive scale of salary of £1 700 a year, rising by annual increments of £100 to £1 900 a year, should be fixed.

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OVERSEAS TRADE.

Electrical Exports for Ten Months £9 405 064 in Excess of Imports.

UNITED Kingdom exports of electrical machinery, apparatus and material during October amounted to £1 925 580, an increase of £380 458 when compared with the same month last year. Similar exports for the ten months of 1929 amounted to £15 995 778, or £747 190 more than during the corresponding period of 1928. Imports of electrical goods during October last amounted to £1 007 423, as against £650 798 during the same month last year, the increase being £356 625. During the ten months of this year imports, by comparison with the same months last year, increased by £1 433 605.

The excess of exports over imports during October was £918 157, an improvement of £370 548 on the September figures. For the ten months the excess was £9 405 064.

Exports of rubber insulated wires other than telegraph and telephone improved during the month by £28 140; similar wires other than rubber insulated, by £91 779; telegraph and telephone wires other than submarine, by £85 917. Other large increases were recorded in shipments of telegraph and telephone instruments excluding valves, electric glow lamps, switchboards and various electrical goods.

The increased value in imports was brought about largely by electrical machinery, increase, £40 130; telegraph and telephone instruments, £160 901; electric glow lamps, £47 344, and batteries and accumulators, £27 169.

The following are detailed figures :—

	Month of October		Ten Months.	
	1928.	1929.	1928.	1929.
	£	£	£	£
Imports.				
Electrical Machinery	153 324	193 454	1 437 061	1 541 285
Electrical Wires and Cables, Insulated—Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	29 722	20 600	151 621	205 909
Insulation other than rubber (not being Telegraph or Telephone Wires or Cables)	62 871	67 998	490 270	525 714
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	4 179	448	66 437	39 316
Submarine Telegraph and Telephone Cables	—	—	—	—
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	76 055	236 956	523 487	1 343 335
Carbons, Electric	9 845	12 953	102 835	129 264
Electric Lamps and Parts thereof—Electric Glow Lamps	25 781	73 125	378 813	347 875
Arc Lamps and Electric Searchlights	633	348	5 839	6 397
Parts thereof (except Carbon Rods)	4 013	7 048	26 043	12 975
Batteries and Accumulators (including parts)	114 857	132 026	551 081	654 204
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (excluding Ammeters, Voltmeters, etc.), House Service Meters, and Scientific	27 695	49 901	233 490	312 535
Switchboards, other than Telegraph and Telephone	145	243	937	1 960
Electrical Goods and Apparatus, all other Sorts	141 678	212 323	1 189 195	1 469 945
Total of Electrical Goods and Apparatus	650 798	1 007 423	5 157 109	6 590 714
Exports.				
Electrical Machinery—				
Railway and Tramway Motors	44 676	22 260	421 953	256 478
Other Motors and Generators	188 831	198 580	2 006 015	1 837 699
All other Sorts	328 227	330 197	3 111 502	3 151 207
Electrical Wires and Cables, Insulated—Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	112 604	130 744	1 141 445	1 378 409
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	122 448	214 227	1 212 369	1 356 780
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	57 155	143 072	721 219	960 667
Submarine Telegraph and Telephone Cables	35 825	98 823	566 030	332 760
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	220 371	238 650	2 222 884	2 331 464
Carbons, Electric	552	486	12 770	8 594
Electric Lamps and Parts—				
Electric Glow Lamps	58 075	74 832	434 812	539 124
Arc Lamps and Electric Searchlights	812	3 136	10 585	10 665
Parts thereof (except Carbon Rods)	118	405	5 716	8 370
Batteries and Accumulators (including parts)	107 278	87 732	921 944	834 450
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	36 271	33 127	318 913	324 859
Switchboards, other than Telegraph and Telephone	3 817	5 978	62 204	52 131
Electrical Goods and Apparatus, all other Sorts	228 062	343 331	2 078 227	2 612 121
Total of Electrical Goods and Apparatus	1 545 122	1 925 580	15 248 588	15 995 778

PERSONAL.

SIR Felix Pole, chairman of the Associated Electrical Industries, Ltd., has returned to England from the United States.

Miss G. F. Sharp, daughter of Mr. E. E. Sharp, of Venner Time Switches, Ltd., has published a new book, entitled, "The Rising Sun."

Mr. J. F. Richards, rolling stock superintendent of Oldham Corporation Tramways, has been appointed general manager in succession to Capt. J. C. Jackson, who is leaving for a similar position at Plymouth.

Mr. E. E. Rosen, managing director of Ultra Electric, Ltd., greeting Mr. F. Marchev, president of the Temple Radio Corporation, on the latter's arrival at Southampton recently.

Lt.-Col. N. H. Firmin has been presented with a gold cigarette case by the chief officials of the Newcastle-upon-Tyne Electric Supply Co., Ltd. in connection with his leaving the company to take up an appointment in London.

Coun. F. Stafford Clark, who has since 1927 been chairman of the Electricity Committee, has been elected Mayor o Bromley, Kent.

Mr. John Walsh, electrical engineer, Blackburn, who has represented St. Mark's Ward as a Conservative for the past eight years, was defeated in the recent municipal election by 48 votes.

At Oxford University on Tuesday, Congregation passed a decree conferring the title of Reader in Engineering Science upon Mr. E. B. Moullin, of King's College, Cambridge, a lecturer on engineering in that university. Mr. Moullin is well known for his work on wireless, and has largely reorganised the Engineering School at Cambridge.

An interesting event took place at St. Pancras (London) station on November 9th, when Mr. John Ritchie, late commercial manager of the Marconiphone Co., Ltd., was presented with a portable receiver on the occasion of his leaving for Australia, where is he to manage the Australasian Branch of the Gramophone Co. (H.M.V.). The presentation was made by Mr. C. W. Charlesworth general manager of the company.

The Nobel Prize for Physics for 1928, it is reported from Stockholm, has been awarded to Prof. O. W. Richardson, F.R.S., Yarrow Research Professor of the Royal Society and Director of Research in Physics at King's College, London. Professor Richardson is best known for his research work relating to the emission of electrons from hot bodies. It was he who named the science of the behaviour of these electrons "thermionics." For his work in this subject he was awarded the Hughes Medal by the Royal Society in 1920.

An interesting function was held at the Reform Club, Sheffield, recently, when a number of business friends gave a complimentary dinner to Mr. A. E. Jepson, who has left the General Electric Co., Ltd., Sheffield, to take up a position, as already announced, with the Manchester branch. Coun. Melling was in the chair, supported by Mr. T. Beardsell, and a gold wristlet watch, suitably inscribed, was presented by Mr. H. Clarke. This follows a presentation made by the Sheffield staff of the G.E.C. to Mr. Jepson of a Sheffield plate candelabra, on September 16th.

Obituary.

MR. W. E. HELLIER, on November 3rd. He was publicity manager of Venner Time Switches, Ltd.

MR. NAROTTAM MORARJI, at Bombay. He was a director of the Tata Hydro-Electric Power Supply Co., Ltd.

PROF. G. F. CHARNOCK, on November 7th. He was honorary secretary of the Bradford Engineering Society, and died the day after the opening of the Bradford Engineering Exhibition. He had been Professor of Engineering at Bradford Technical College since 1903.

SIR HENRY KIRK, on November 9th, aged 81 years. He was selected in 1902 to be Director-in-Chief of the Indo-European Telegraph Department, and retired in 1912. He was the senior delegate for India at the International Telegraph Conferences held in London in 1906, and 1912, and at Lisbon in 1908.

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LEGAL INTELLIGENCE.

General Electric and Marconi's Agreement "Unlimited as to Time."

MR. JUSTICE EVE, in the Chancery Division, on November 6th, gave judgment which he had reserved in the case of the General Electric Co., Ltd., against Marconi's Wireless Telegraph Co. Ltd., and also in the case of the same plaintiffs against Marconi's Wireless Telegraph Co. and the M.O. (Marconi Osram) Valve Co., Ltd. Both cases related to two agreements, one between Marconi's Wireless Telegraph Co. and the General Electric Co. and the other between these companies and the M.O. Valve Co.

The question raised was whether, as the General Electric Co. said, the agreements were permanent, or whether, as Marconi's Wireless Telegraph Co. said, they either were for a definite term or had been determined. Marconi's Wireless Telegraph Co. and the General Electric Co. formed the M.O. Valve Co. to acquire from the General Electric Co. a factory and equipment owned by them at Brook Green for the manufacture of radio valves, and Marconi's Wireless Telegraph Co. said the obligation of the parties were co-terminous with the lease of the factory. The General Electric Co. took an opposite view.

His Lordship, in the course of his judgment, said: Could he imply from the fact that a term of ten years was fixed for the lease, an agreement either that the adventure was to be existent for that period and no longer—in which case it would have automatically come to an end when the lease expired—or alternatively, that any party might by reasonable notice put an end to it on or after the date when the lease ran out? He did not think he could. The agreement was indefinite and was unlimited as to time. Some term had necessarily to be fixed for the duration of the lease, but there was not a word in the document to indicate that any of the obligations undertaken by the contracting parties outside those embodied in the lease were to subsist only so long as the lease was running. The more he examined the document the less able did he feel to raise any implication that the parties contemplated their relationship as being in any way dependent upon the leasehold term. In his opinion it was not. The result was that the applicants were entitled to a declaration that the agreement was not determined on May 25th, 1929, and Marconi's Wireless Telegraph Co. had no power to determine it. The costs must be paid by Marconi's Wireless Telegraph Co.

Rochdale and Terms of an Agreement.

In the Manchester Chancery Court on October 28th the Vice Chancellor, Mr. Courthope Wilson, K.C., had before him a petition in which the plaintiffs were the Lancashire Electric Power Co., Ltd., and the defendants were the Rochdale Corporation. The Court was asked to decide a question as to the construction of clause 7 in an agreement between the parties dated November 22nd, 1926.

Mr. Craig Henderson, K.C., and Mr. J. Bennett, appeared for the plaintiffs; Mr. C. E. R. Abbott represented the defendants.

Mr. Henderson said the agreement provided for the supply of electrical energy in bulk to the Corporation at a price made up of a kilowatt charge and a unit charge. Either party might give six months' notice in writing to the other requiring the prices to be revised, and must state in the notice the grounds upon which, and the manner in which, they desired the prices to be revised. In the event of disagreement as to the revision of prices the dispute was to be referred to arbitration. On September 27th, 1928, the Town Clerk sent to the plaintiffs a notice requiring the prices to be revised as from March 31st, on the ground that as the maximum demand of the Corporation had increased the kilowatt charges should be reduced. The matter was referred to Dr. S. L. Pearce, the engineer-in-Chief of the London Power Company, when differences arose as to the proper construction of clause 7 of the agreement. The Corporation claimed that the arbitrator could only consider the revision of prices specified in the notice, which set forth the grounds upon which and the manner in which the Corporation desired the prices to be revised. The company contended that the whole question of revision was referred to the arbitrator, whose duty it was to determine a reasonable price having regard to all the facts and circumstances proved before him, without being in any way restricted by the original notice. With the consent of the arbitrator the parties agreed that this question should be decided by the Court.

The Vice Chancellor held that if one party gave notice of revision, satisfying the condition precedent of clause 7, the whole matter was at large when it came before the arbitrator. Therefore he made a declaration that the arbitrator had power to consider any revision of prices upon which a disagreement had taken place after notice given, and that the whole question of revision, and not merely any specific revision which may have been asked for by one party by a preliminary notice, was referred to the arbitrator, and it then became his duty to determine such price as to him seemed reasonable.

The costs of these proceedings would be costs in the arbitration unless the parties had already made an agreement about them.

Valve Holder Patents.

In the Chancery Division on November 7th, Benjamin Electric, Ltd. and the Igranic Electric Co., Ltd., sought an injunction to restrain Garnet Whiteley and Co., Ltd., from infringing the plaintiffs patents for improvements in wireless valve holders.

Mr. Trevor Watson, for the plaintiffs, said the infringement complained of was the selling by the defendants of certain valve holders. The defendants admitted the sale, but pleaded that the holders they sold did not infringe the plaintiffs' patents, and that those patents were invalid. The patents in question related to holders for valves used for rectification and amplification in wireless telegraphy and telephony and the inventions aimed at the provision of valve holders which would be shock absorbing and also ensure sufficient rigidity of electrical contact.

At the conclusion of the arguments on Monday, his Lordship intimated that he would take time to consider his judgment.

IN PARLIAMENT.

Appointment of Additional Electrical Inspectors of Mines.

IN the House of Commons on November 6th Mr. Gordon Macdonald moved for the appointment of a committee of inquiry to make suggestions for new legislation relating to mines. He said the whole body of mining regulations made in 1911, before the introduction of electrical machinery, needed thorough revision. In the course of the debate, the Secretary for Mines (Mr. Ben Turner) announced his intention of appointing additional electrical inspectors of mines, whose duty would be mainly that of inspecting electrical plant below ground. He hoped to appoint four, including one at head office. The motion was agreed to.

Railways Nationalisation.

Mr. F. A. Broad moved a resolution in the House of Commons on November 6th expressing the opinion that the solution of our transport difficulties would only be found in the nationalisation of railways and long distance road transport. An amendment disapproving of the motion and recommending that the House should decline to anticipate the report of the Royal Commission was defeated, but Mr. Broad's resolution was talked out.

Replies to Questions.

The rental for a telephone circuit to a private residence is already less by 30s. per annum than for a circuit to business premises. The costs of providing and maintaining the circuit and equipment do not depend on the amount of use made of the service. A further reduction in the rental is not practicable at present.

The question of improving the telephone service between this country and South America is engaging the attention of the Postmaster-General.

Amongst the schemes of development which the railway companies propose to carry out consequently upon the repeal of the Railway Passenger Duty are the following: Great Western Railway Co., substitution of electric light in gas-lit stock, £80 000; L. and N.E. Railway, substitution of electric light in gas-lit stock, £56 000; Southern Railway, electrification of lines between Coulsdon and Brighton, between Redhill and Guildford and between Preston Park and Brighton, £2 100 000.

In regard to the London Power Co.'s Battersea power station scheme, an interim report of the government chemists on the precautions proposed to be taken for consumption of smoke and prevention of evolution of oxides of sulphur has been received, and is under consideration.

The Minister of Transport has been informed that the L. and N. E. Railway Co. has under consideration schemes for the improvement of Liverpool Street (London) Station and the electrification of the suburban area served by that station.

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COMMERCIAL MOTOR TRANSPORT.

Brief Descriptions of Some of the Electrical Exhibits at Olympia—Trolley-Buses, Petrol-Electrics and Portable Tools Among the Items Shown.

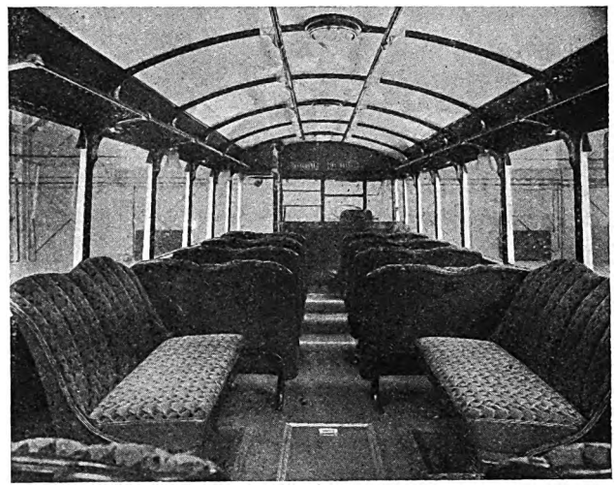
JUDGING from a visit to the Commercial Motor Transport Exhibition which opened at Olympia, London, on November 7th, one of the most likely large-scale applications for electricity in the field of road transport is the trolley-bus. Several of these vehicles are on view, and among them may be mentioned that produced by THE ENGLISH ELECTRIC CO., LTD., of Queen House, Kingsway, London, W.C.2. This bus accommodates 56 passengers, and has an overall length of 28 ft. 6¾ in. The layout has been kept as simple as possible, a special twin motor mounted near the centre of the vehicle transmitting the drive to the rear bogie through a cardan shaft. The bogie is arranged with a third differential—accommodated in the front of the foremost axle—to ensure that the two axles are equally loaded under all conditions. The bogie is provided with double swivelling points, which equalise the load on each axle under all conditions of braking and acceleration. Three separate brakes are provided. The electric brake works on the transmission, the braking being obtained by operating the motor as a generator and dissipating the energy in the resistance. The effective and even braking thus afforded can be used from all speeds down to a minimum stated to be approximately 4 m.p.h. Secondly, there is an air brake operating on each of the six wheels; on the rear bogie the air-cylinders are mounted directly on the axles, enabling brake rigging to be reduced to a minimum. The third brake, which is manual, operates on the four rear wheels. The electric motor is a D.-K. 122 twin, rated at 80 H.P. It consists of two armatures mounted on the same shaft and in the same frame. The motor is of the interpole self-ventilated type and is made in a specially flat shape so as to give a low floor height and small angle of drive at the universals, while retaining the advantage of the short propeller shaft. Although the motor has been specially designed, with a view to giving the maximum of lightness, none of the usual features of the "English Electric" traction motor have been sacrificed. Dynamic balancing is one of the new features which have been incorporated.

The foot-operated controller is mounted at the side of the driver's seat. It is of the cam shaft contactor type, having a total of eight power notches, made up of four series, three parallel and one reduced field. It is fitted with a ratchet and pawl operating mechanism, whereby it can only be advanced one notch at a time, to ensure even acceleration. The electric brake has four notches, and braking is obtained by means of a foot pedal adjacent to the controller pedal—a brake changeover switch is first actuated, and the resistance is then cut out in steps through the main controller in the same way as when operating on power. The resistances are of the continuous unbreakable strip type, and are carried on the side frames of the chassis.

The twin trolleys mounted on the roof enable the vehicle to operate at a distance of 16 ft. to either side of the centre line between the trolley wires.

An electric trolley-bus shown by the English Electric Co., Ltd.

GUY MOTORS, LTD., of Wolverhampton, also show a trolley-bus, the motor of which is a special compound wound machine The vehicle is capable of smooth yet rapid acceleration, while a stable position of the power pedal is claimed to be maintained at all speeds. At the same time gentle retardation is provided on down grades and on the level, reducing the use of mechanical brakes to a minimum. Under slow traffic conditions it is said to be unnecessary to introduce resistance in series with the motor unless speeds under 10 m.p.h. are involved—and even then only a relatively small amount of resistance will be required.



The interior of one of the buses shown by the Brush Electrical Engineering Co., Ltd.

The motor is a Rees-Roturbo special compound interpole, rated for 60 B.H.P., 500 V and 900-2 500 r.p.m. Its capacity for heavy overload is in accordance with B.S.S. No. 173/1928. The armature appears to be of the standard drum type, the coil being held in the slots by hardwood wedges. The shunt field coils are former wound, insulated with micanite and taped. The series field coils are wound with double cotton covered wire, stoved, impregnated in vacuo under pressure, and similarly insulated.

The control gear consists of a "Stevens" combined drum-type controller and shunt regulator, mounted on an aluminium case. The controller actuates a contactor panel of standard manufacture. The starting resistance is of the unbreakable non-corroding type, designed specially for heavy traction service. Mounted on an aluminium case is a patent reversing switch, which is mechanically interlocked with the control lever so that the controller cannot be operated with the switch in the "off" position. Thus, by combining shunt and series winding with regulating resistance an easy start and smooth acceleration are obtained; the series starting resistance is actuated by contactor gear in conjunction with the power pedal control, the current on each contact being reduced to a negligible amount.

To prevent the voltage of the generator rising above the line voltage when the vehicle is coasting with the power pedal in the "off" position and with the outside supply cut off a resistance is automatically brought in circuit with the shunt winding, to keep the voltage of the machine within safe limits. A further safety device can be provided to retard backward running of the vehicle if the trolley pole leaves the line. This consists of an additional pair of contactors which short-circuit the armature and series coils of the motor immediately the line current is broken. The arrangement is stated to limit the run-back speed of the vehicle to 2 or 3 m.p.h.

Another trolley-bus exhibit is the six-wheeled chassis manufactured by RANSOMES, SIMS AND JEFFERIES, LTD., of Orwell Works, Ipswich. The model is one of a fleet of six which is being supplied to the Nottingham Corporation. It is constructed to carry a double-deck, top-covered body, having a seating capacity for 60. The main-frame members of the chassis are constructed in high-tensile steel, and are braced with pressed-steel and tubular cross-members. The bogie

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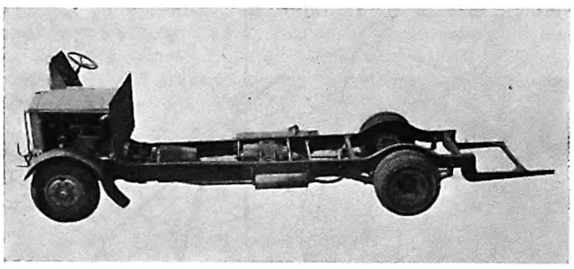
which is built under Thornycroft patents, employs two inverted, semi-elliptic springs on each side. In addition to the usual two differentials working in a lateral direction, one in each side of the bogie, a third is provided to distribute the drive equally between the two axles. This construction is claimed to increase the life of the tyres, and to decrease current consumption. The motor, which is constructed to B.S.S. for traction motors, is an 80 B.H.P. double-armature type of Ransome's manufacture. with series-parallel control. The Marles steering system is employed, and the steering column is well raked. The brake pedal controls a Westinghouse gear,



A petrol-electric chassis of Tilling-Stevens Motors, Ltd.

which brings into operation shoes on all six wheels. The hand lever controls shoes on the wheels of the bogie. The Ransome cam gear is incorporated—it expands both sets of shoes on each drum when the service brake is called upon, but only one set of shoes per wheel when the hand lever is applied.

TILLING-STEVENS MOTORS, LTD., of 5, Iddesleigh House, Caxton Street, London, S.W.1, are exhibiting a four-wheeled petrol-electric chassis with forward steering and 16 ft. wheelbase; Dunlop pneumatic tyres, size 36 in. by 8 in., are fitted—single front and twin rear. This chassis is designed for passenger bodies with seating for 52. The engine has a Treasury rating of 36·15 H.P., and is stated to develop 95 H.P. There are four cylinders, bore 4¾ in., stroke 6 in. The final drive is by worm. The C.A.V. "Myt" constant voltage system of electric lighting is fitted.

An interesting novelty is on view on the stand of GENERAL MOTORS, LTD., of The Hyde, Hendon. It takes the form of a travelling shop; by means of a small electric motor the sides of the van can be expanded beyond the wheels and the roof can be raised, so that the interior is enlarged. The salesman is thus able to display his wares during tours of villages.

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., of Falcon Works, Loughborough, is exhibiting two examples of bus bodies, one single deck saloon type and one double-deck top-covered type. The single deck saloon bus body has front entrance and door, and a seating capacity of 30 passengers. The vehicle is mounted on a chassis of the Leyland Lion 4 type, having a wheel base of 16 ft. 7¼ in., the overall length being 26 ft. and the overall width 7 ft. 6 in. The body is built to the registered designs of the British Electrical Federation, Ltd., and incorporates a new type of seat upholstered in blue lozenge moquette. A novel form of parcel rack, with which the interior lamps are combined, is fitted, the ceiling immediately above being covered with leather. The general furniture is chromium plated, with grabs and other such fitments covered in blue composition material to match the upholstery scheme. The inside lining panels are covered in blue rep, with cappings and finishers in mahogany. The double-deck top-covered bus body had a seating capacity of 24 passengers in the lower saloon and 26 passengers upstairs. This vehicle is mounted on a Crossley six-cylinder 38/110 H.P. double-deck chassis with forward steering. The overall length is 25 ft. 11⅞ in., the overall width 7 ft. 5 in., and the wheel base 16 ft. 7½ in. It embodies several new features, particularly in regard to ventilation. The lower saloon has air extractors along each side, and the front end is fitted with two ventilators of a new movable panel type. The upper saloon has a three-piece roof, with ventilators along each side; these, together with the panel ventilators, are covered by provisional patents. A parcel rack is provided over each wheel arch, and internal fittings are chromium plated. The interior woodwork is in light oak and mahogany, with rep-covered lining panels.

C. A. VANDERVELL AND CO., LTD., Acton, London, W.3, are devoting their stand chiefly to the compensated voltage-control dynamo lighting system, which is standardised on a large number of motor buses and coaches. This system consists of a simple shunt wound dynamo, used in conjunction with a voltage regulator. The system is being demonstrated under actual running conditions on the stand, The other exhibits include the Luvax shock absorbers and Luvax-Bijur chassis lubricating system.

THE BRITISH THOMSON-HOUSTON CO., LTD., Alma Street, Coventry, is showing a number of magnetos—designed for use on commercial vehicles of all kinds—and also combined magneto-coil ignition sets, impulse startors, automatic ignition timing devices, flexible magneto couplings with infinitely variable adjustment, and Fabroil silent timing gears.

The Hobart "one day battery charger," exhibited by FREDK. J. GORDON AND CO., LTD., of 92, Charlotte Street, London, W.1, enables one to charge a full size startor battery in 6-8 hours, so that the motorist can bring his battery in the morning and be sure of having it fully charged the same same night. The charger is entirely automatic and with the constant potential system it is impossible to overcharge the battery. The equipment is of the motor generator type, with two commutators giving an output of 50 and 100 A at 15 V and 7½ V respectively. The Hobart electrical test bench is a complete unit for testing dynamos, startors, magnetos, coil ignition and batteries. It is fitted with a variable speed reversible motor capable of handling all types of electrical equipment.

A large range of accessories is on view at the stand of B.E.N. PATENTS, LTD., 92, Tottenham Court Road, London, W.1. Two models of car washer are displayed—the "B.E.N.-Myers," and the "B.E.N.-Myers Universal one-gun." Models of air compressors suitable for almost every requirement are included; capacities from 1-124 c. ft., per min. Air-cooled, water-cooled, fully automatic and semi-automatic types are provided. A complete series of B.E.N. portable electric tools is also exhibited, including drills, decarbonising outfits, valve grinders, valve refacers, combination reamer and decarbonising machines, toolpost grinders, bench and pedestal grinders, buffers and sanders.

Another exhibit among the accessories which is of electrical interest is on the stand of FLEXIBLE LAMPS, LTD., 59, New Oxford Street, London, W.C.1. It consists of "Rubbelite" tail lamps which, being made of rubber, are unbreakable and vibrationless. The "Rubbelite" lamp is stated to be practically foolproof. In the most interesting model, which is a patented combined stop-signal and rear lamp, two separate lampholders with connectors supply the illumination to the two compartments; wiring up is a simple operation, the flex being screwed in the interior of each compartment with no necessity for soldering. The division between the upper (or stop-signal) part of the lamp is made of rubber moulded in one piece with the rest of the lamp. This construction, it is pointed out, obviates the risk of the dividing piece working loose, with the possibility that the "stop" sign may be more or less permanently visible. The lamps are fitted with wide windows which will illuminate thoroughly either a rectangular or square plate. Extra glasses are supplied, so that in the event of a collision breaking the rear glass the spare can instantly be inserted and the journey resumed.

THE SOCIAL SIDE.

WE give below the latest results of matches shot in connection with the Electricity Supply Rifle League :—

DIVISION 1.

City A.	(Matthews 98)	..	578	City B	(Webster 98)	.. 575
,,	(Harlow 99)	.. ..	582	Central A	(Beale, Gaze, Lyons)	578
,,	(Jones 99)	.. ..	583	Shoreditch A.	(Herbert, Thomas 97)	577

	Shot	Won	Lost	Scores For	Scores Against	Points
City A	7	6	1	4061	4022	12
Central A	5	4	1	2909	2875	8
City B	5	2	3	2886	2881	4
Shoreditch A	5	1	4	2871	2890	2
County A	4	0	4	2276	2335	0
B. & K.	Unable to complete.					

DIVISION 2.

Greenwich	(Andrews 97)	..	574	Hackney	(Sandford 87)	.. 500
,,	(Reggler 97)	..	567	Shoreditch B.	(Draper 99)	.. 552
,,	(Coveney 98)	..	571	Barking	(Beaumont 95)	.. 548
St. James'	(Johnson 99)	..	571	Greenwich	(Vines 96)	.. 569
,,	(Andrews Johnson, 97)		571	Shoreditch B	(Draper 93)	.. 528
City C	(Gascoyne 96)	..	566	Barking	(Beaumont 92)	.. 515
St. James'	(Clark, Andrews 98)		573	City C	(Gascoyne 99)	.. 569
,,	(Liddell, Andrews 98)		578	Hackney	(Mathews 89)	.. 511

	Shot	Won	Lost	Drawn	Scores For	Scores Against	Points
St. James'	13	11	1	1	7427	7108	23
City C	11	8	2	1	6234	6043	17
Greenwich (County)	11	8	3	0	6206	6014	16
Central B	9	6	3	0	5108	4992	12
K. & K.	8	3	5	0	4470	4435	6
Shoreditch B	10	2	8	0	5429	5022	4
Hackney	9	1	8	0	4570	4510	2
Barking (County)	9	0	9	0	3703	5023	0

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BRAINTREE GUARDIANS.—Electric light installation at the Institution. Particulars from the Clerk.

LIMERICK MENTAL HOSPITAL.—Electric lighting installation throughout hospital.

BELFAST EDUCATION COMMITTEE, November 15th.—Electric light installation at Harding Memorial Public Elementary School, Cregagh Road, Belfast. Specification, etc., from the Education Architect, Victoria Street, Belfast; deposit £1 1s.

FRAMLINGHAM PARISH COUNCIL, November 15th.—Supply and fixing of an electric pump and gearing to the water supply known as Jeaffreson's Memorial Well, Framlingham. Specification can be seen by appointment, with the clerk, Mr. H. C. Taylor, Double Street, Framlingham.

Ironbridge Power Station.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, November 15th.—Supply and erection at Ironbridge power station of (*a*) two 6 000 kVA, 33 000/3 300 V, 50 cycle, indoor type transformers, with off-load tap changing switches; (*b*) two 1 200 kVA, 3 300/400/230 V, 50 cycle, indoor type transformers with off-load, tap changing switches; (*c*) two 150 kVA, 3 300/400/230 V, 50 cycle, indoor type transformers, exclusive of tap-changing switches. Specification (No. 7) and form of tender from Mr. E. F. Hetherington, at the offices of the Authority, Phœnix Buildings, Dudley Road, Wolverhampton; deposit £1 1s.

COLWYN BAY URBAN DISTRICT COUNCIL, November 16th.—Supply, erection and laying of e.h.t. and l.t. overhead lines and cables for Glan Conway and Llysfaen supply. Specifications from the Engineer, Electricity Offices, Colwyn Bay; deposit £1 1s.

LANCASTER CORPORATION, November 16th.—Supply of medium tension, four-core, paper insulated, lead covered, steel tape armoured cables of British manufacture. Specification, etc., from Mr. G. C. Milnes, borough electrical engineer, North Road, Lancaster.

WAREHAM CORPORATION, November 16th.—Four centrifugal pumps and electric motors, with automatic control, etc. Specifications from Mr. W. E. Blizard (Messrs. Lemon and Blizard), Castle Lane, Southampton; deposit £2 2s.

BOOTLE CORPORATION, November 18th.—Electric light installation in dressing pavilion and conveniences at Orrell playing, fields Captains Lane, Bootle. Specification, etc., from Borough Engineer, Town Hall, Bootle.

GLASGOW CORPORATION, November 18th.—Electric lighting installation at Shieldhall Hospital. Specifications, etc., from the General Manager, Electricity Department, 75, Waterloo Street, Glasgow.

GLASGOW CORPORATION, November 18th.—Electric lighting installation in connection with Janefield Street re-housing scheme. Specifications, etc., from General Manager, Electricity Department, 75, Waterloo Street, Glasgow.

MID-GLAMORGAN WATER BOARD, November 18th.—Electric lighting work, supply of transformers, switchboards, meters, etc., in connection with construction of pumping station, etc., at Schwyll, Ewenny, near Bridgend, and installation of electrical depth transmitters on various reservoirs, with cables, etc. Specifications, etc., from the Board's Offices, Bridgend, or from Messrs. Thomas and Morgan and Partners, civil engineers, Pontypridd; deposit £2 2s.

WARRINGTON CORPORATION, November 18th.—Supply of e.h.t. sub-station switchgear. Specification, etc., from Mr. F. V. L. Mathias, borough electrical and tramway engineer, Warrington; deposit £1 1s.

EAST RETFORD CORPORATION, November 19th.—Electrically driven centrifugal borehole pump (60 000 gall. per hour). Specification from Mr. S. O. Pacey, Gas and Water Electricity Offices, East Retford; deposit £2 2s.

MANCHESTER GUARDIANS, November 19th.—Supply and erection of electric hospital bed lift at Withington Institution, Nell Lane, West Didsbury, Manchester. Particulars from Mr. Hargreaves, Union Offices, All Saints, Manchester.

WALLINGFORD RURAL DISTRICT COUNCIL, November 19th.—Electric light wiring of 34 houses at Cholsey, Berks. Specification, etc., from the Clerk, 7, St. Martin's Street, Wallingford.

FIFE EDUCATION AUTHORITY, November 20th.—Electrical work at reconstructed Cowdenbeath School. Schedules (£1 1s. deposit) from Mr. Geo. Sandilands, architect and master of works, Education Offices, Kirkcaldy.

ALLOA CORPORATION, November 23rd.—Electrical installation work in connection with erection of 36 houses at Ashley Terrace, Alloa. Schedules, etc., from Messrs. J. Melvin and Son, architects, Mar Street, Alloa.

MANAGERS OF CENTRAL LONDON SCHOOL DISTRICT, November 23rd.—Electric motor, with reduction gearing, startor, etc., Specification from Mr. G. P. Morrell, clerk to the Managers, Greenford House, Hanwell, London, W.7.

SALFORD CORPORATION, November 25th.—Electric travelling and slewing jib crane (2½ tons capacity). Specification, etc., from the City Electrical Engineer, Frederick Road, Salford.

PLYMOUTH CORPORATION, November 25th.—Supply of steel lamp columns. Specification, etc., from the City Electrical Engineer, Electricity Department, Armada Street, Plymouth.

STONE (STAFFS) URBAN DISTRICT COUNCIL, November 25th.—Overhead 11 000 V transmission line (2 300 yds.), outdoor sub-stations (2–50 kVA), l.t. overhead distribution (1 400 yds.), services, etc. Specification from Mr. W. M. Selvey, Independent Buildings, Sheffield; deposit £2 2s.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., November 28th.—High tension and low tension switchgear, transformer and cables, for H.M. Office of Works' generating station, South Kensington, S.W. Specification, etc., from the Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

STOCKPORT CORPORATION, December 2nd.—Supply and erection of 6 600 V switchgear, comprising metal-clad, compound-filled switch units. Specification (No. 3A) from Mr. R. Lee, borough electrical engineer, 23, Tiviot Dale, Stockport; deposit £1 1s.

NEWBURY CORPORATION, December 5th.—Electric motors, starting gear and centrifugal pumps, with ancillary works, at pumping station. Specification, etc., from Messrs. Howard Humphreys and Sons, 28, Victoria Street, Westminster, S.W.1, on and after November 18th; deposit £3 3s.

STEPNEY (LONDON) BOROUGH COUNCIL, December 5th.—Installation of wireless receiving equipment and apparatus at each of the Council's three hospitals, with l.t. charging machines. h.t. generators, motor to drive generators, accumulators, etc. At the three hospitals the requirements include 1 160 pairs of headphones and 24 loud speakers. Specifications, etc., from the clerk, Mr. S. McClelland, Bancroft Road, Mile End, E.1; deposit £1.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., November 15th.—(1) Primary battery supplies; and supply of (2) gasfilled and vacuum lamps, (3) overhead contact wire and stranded catenary cable. Specification (10s.) from the secretary, Mr. S. G. S. Young, The White Mansion, 91, Petty France, Westminster, S.W.1.

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 15th.—Supply of 42 000 lb. of galvanised signal wire and 31 500 lb. of galvanised point wire (tender No. P.S. 2 025). (Reference A.X. 8 712.)

ANGORA POSTS, TELEGRAPHS AND TELEPHONES, November 16th.—Supply of telephone wire, cable boxes and insulators. (Reference B.X. 5 846.)

INDIAN STORES DEPARTMENT, November 17th.—Supply of electric cables for 12 months (order No. 9 920). (Reference B.X. 5 808.)

GREAT NORTHERN RAILWAY (IRELAND), November 18th.—Six or 12 months' supply of stores, including electric fittings, lamps, cable, and wire (form 11), and signalling materials

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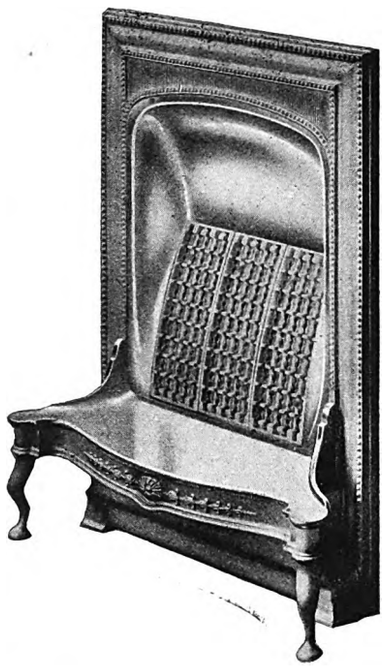
(form 26). Tender forms (1s. each), from the Secretary, Amiens Street Station, Dublin.

INDIAN STORES DEPARTMENT, November 18th.—Supply and erection of two 20 kW oil engine driven d.c. generators, etc. (order No. N. 10 253). (Reference B.X. 5 757.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 18th.—Resistance spools (P. and T. 151/1 832). (Reference B.X. 5 716.)



AN attractive 3 kW fire introduced by Domestic Electrification, Ltd., is the "Townsend." The finish is art bronze with chromium plated reflector and fender top.

EGYPTIAN MINISTRY OF THE INTERIOR, November 19th.—Supply of 160 H.P. Diesel-electric generating set for Manfalout power station (Assiut Province). (Reference B.X. 5 720.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 19th.—Telephone transformers (P. and T. No. 151/1807). (Reference B.X. 5 718.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 19th.—Automatic wall and table telephones (P. and T. No. 151/1 825.) (Reference B.X. 5 717.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Supply of telephone generators and motor generators (schedule No. C. 479). (Reference B.X. 5 662.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 19th.—Motor generators (schedule C. 486). (Reference B.X. 5 694.)

DUBLIN BOROUGH COMMISSIONERS, November 20th.—Electric lighting and power installation at City Abattoir, North Circular Road, Dublin. Specification from the City Engineer, 28, Castle Street, Dublin, or Mr. F. McArdle, architect, 29, Rosemary Street, Belfast; deposit £3 3s.

INDIAN STORES DEPARTMENT, November 21st.—Supply of h.d., high conductivity, bare, solid copper conductors, for overhead power transmission, for one year (order No. N. 10 280). (Reference A.X. 8 759.)

JOHANNESBURG MUNICIPALITY, November 21st.—Supply of tramcar axles, gear and pinion wheels, etc. (Reference A.X. 8 750.)

SOUTH INDIAN RAILWAY CO., LTD., November 22nd.—Lighting, power and signalling switchgear for stations, in connection with Madras electrification. Specifications, etc. from the company's offices, 91, Petty France, London, S.W.1.

CHRISTCHURCH (N.Z.) MUNICIPALITY, November 23rd.—Supply of pump and electric motor, for Beckenham pumping station. (Reference A.X. 8 737.)

EGYPTIAN MINISTRY OF EDUCATION, November 23rd.—Diesel engines, electric motors, machine tools, etc. (Reference C.X. 3 146.*)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92). (Reference B.X. 5 614.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Vitreous resistances, each consisting of wire element wound in vitreous spool, for telegraph battery feeds (schedule C. 489). (Reference B.X. 5 696.)

MELBOURNE CITY COUNCIL, November 27th.—Totally-enclosed, metal clad, 6 000 V, three-phase switchgear (specification No. 1 000). (Reference B.X. 5 708.)

MELBOURNE CITY COUNCIL, November 27th.—Supply of 600 V d.c. switchgear (specification No. 1 001). (Reference B.X. 5 734.)

VICTORIAN RAILWAY COMMISSION, November 27th.—Indication transformers for railway signalling (contract No. 43 412). (Reference B.X. 5 737.)

VICTORIAN RAILWAY COMMISSION, November 27th.—Supply of automatic oil switches (contract No. 34 411). (Reference B.X. 5 735.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General for Western Australia, Savoy House, Strand, London, W.C.2.

EGYPTIAN MINISTRY OF THE INTERIOR, November 30th.—Diesel engine driven electric lighting installation at Abou-Tig. (Reference B.X. 5 791.)

BLOEMFONTEIN MUNICIPALITY, December 2nd.—Supply of two electrically driven low lift pumping units and two electrically driven high lift pumping units, with cables, starters, valves, etc. (contract No. 18, 29/30).

BLOEMFONTEIN MUNICIPALITY, December 2nd.—Supply of copper conductors, poles, transformers, switchgear, etc., for electrification of Mazelspoort Waterworks (contract No. 19, 29/30). (Reference B.X. 5 825.)

INDIAN STORES DEPARTMENT, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

VICTORIAN ELECTRICITY COMMISSION, December 9th.—Supply of 3 000 kVA transformers and spares (specification No. 29/119). (Reference B.X. 5 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Switchboard keys and parts (schedule No. C. 496). (Reference B.X. 5 776.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Electric lamps, lamp caps and sockets for telephone purposes (schedule C. 497). (Reference B.X. 5 783.)

GATOOMA (SOUTHERN RHODESIA) MUNICIPALITY, December 12th.—Two fire-tube boilers, steam engines, alternators and switchboard, etc. (Reference A.X. 8 749.)

CHRISTCHURCH DRAINAGE BOARD, December 13th.—Supply and installation of four electrically-driven automatically-controlled pumping plants, each consisting of two horizontal centrifugal pumps with direct-coupled electric motor (contract No. 29/420); and two horizontal type, 3 H.P. a.c. motors direct coupled with centrifugal sewage pumps (contract No. 29/421). (Reference A.X. 8 788.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, December 16th.—Supply and erection of electrically-driven pumping plant, with ironwork, crane and gantries, for Junee water supply. (Reference A.X. 8 740.)

VICTORIAN ELECTRICITY COMMISSION, December 16th.—Oscillograph equipment. (Reference B.X. 5 692.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Secondary batteries (schedule C. 505). (Reference B.X. 5 777.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Telephone fuses, heat coils and protectors (schedule C. 498). (Reference B.X. 5 784.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Loading coil pots (schedule C. 499). (Reference B.X. 5 785.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 27th.—Telegraph material, including g.i. tubular arms, insulators, upper tubes for poles, etc. (tender No. 175). (Reference A.X. 8 734.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, December 28th.—Supply and erection at site of Mankabad Barracks of three Diesel engine driven electric generators, and sinking of two wells. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 4th.—Supply and erection at site of Meadi Barracks, Cairo, of two Diesel engines to drive existing generators. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineer 41, Tothill Street, Westminster, S.W.1.

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EGYPTIAN MINISTRY OF PUBLIC WORKS, January 6th.—Supply and erection of plant for supply of filtered and unfiltered water, including pumps, electric motors, etc. (Reference A.X. 8 746.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of testing instruments (schedule C. 504). (Reference B.X. 5 786.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of timing clocks (schedule No. C. 507). (Reference B.X. 5 762.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of contact pressure testers (schedule No. C. 516). (Reference B.X. 5 821.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of telephone hand sets (schedule C. 526). (Reference B.X. 5 823.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 13th.—Supply of four-point jacks (P. and T. 151/1897). (Reference B.X. 5 840.)

VICTORIAN ELECTRICITY COMMISSION, January 13th.—Supply of 2 200 V switchgear and accessories (specification No. 30/2). (Reference B.X. 5 827.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of ringing motor-generator sets, for automatic telephone exchanges. (Reference B.X. 5 839.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of telephone indicators (schedule C. 518). (Reference B.X. 5 822.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 14th.—Two air compressors (capacity not less than 800 cu. ft. of free air per min.), and two electric motors. (Reference A.X. 8 784).

NEW ZEALAND GOVERNMENT RAILWAYS, January 15th.—Supply of automatic telephone exchange equipment for new station at Auckland. (Reference B.X. 5 841.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

Tenders Accepted.

SWALLOWNEST WESLEYAN CHURCH.—H. Stewart, electric light installation.

HULL CORPORATION.—Siemens and Halske, supply of five miles of lead-in cable.

OLDHAM EDUCATION COMMITTEE.—S. Charlesworth and Co., electric lighting of new clinic at Scottfield.

BRIGHTON CORPORATION.—Edison Swan Electric Co., Ltd., supply of lamps for street lighting for 12 months.

SHEFFIELD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply of ten sets of traction motors, £200 each.

HASTINGS CORPORATION.—Ferranti, Ltd., supply of 375 kVA transformer, at Gypsum Mines, Mountfield, £303 10s. (Recommended).

SLEAFORD URBAN DISTRICT COUNCIL.—General Electric Co., Ltd., supply of feeder control panel and switchgear, £113. (Recommended).

GREAT WESTERN RAILWAY.—Crompton Parkinson, Ltd., supply of transformers to nine new 3-ton cranes at South Quay, Newport.

CARDIFF CORPORATION.—Babcock and Wilcox. Ltd., water tube boiler, £5 740; E. Green and Son, 320-tube fuel economiser, £1 554.

HIS MAJESTY'S OFFICE OF WORKS, ETC.—Greenwood and Batley, Ltd., steam driven generating set, etc., for Rampton State Institution.

WARRINGTON CORPORATION.—Mather and Platt, Ltd., pumps, and Electroflo Meter Co., Ltd., measuring appliances for river filtration works.

GENERAL POST OFFICE.—Telephone exchange equipment, Wanstead, Automatic Telephone Mfg. Co., Ltd.; Morecambe, Standard Telephones and Cables, Ltd.

HAMPTON URBAN DISTRICT COUNCIL.—Twickenham and Teddington Electric Supply Co., overhead cable (£72) and wiring and fittings (£55 10s.) for the sewage works.

LONDON COUNTY COUNCIL EDUCATION COMMITTEE.—Coleby and Co., electrical work at Bloomsbury Trade School for Girls, £337. Stegman and Co., electric lighting at Baring Road School, Lewisham, £215.

SHEFFIELD CORPORATION.—T. A. Ashton, Ltd., maintenance of internal telephone system at hospitals for twelve months, £60; Moorwoods, Ltd., supply of lamp pillars for twelve months, £1 17s. 6d. each. (Both recommended.)

LEEDS CORPORATION.—Pickering, Ltd., provision of electric lift at the boiler house, £661; supply of cables, W. T. Henley's Telegraph Works Co., Ltd., £1 296; Macintosh Cable Co., Ltd., £1 849; and Enfield Cable Works, Ltd., £1 325.

GREAT WESTERN RAILWAY. — Metro-Vick Supplies, supply of Cosmos gasfilled and vacuum type ordinary and train lighting lamps (part contract); Siemens Electric Lamps and Supplies, Ltd., 18 months' supply of Siemens gasfilled lamps.

WESTMINSTER CITY COUNCIL.—Gaillard and Robinson and Co., electric light installation on staircases at Marshall Street dwellings, £26; electric time switches at Schomberg House, £40; and time switches at Admiral House, £40. (All recommended.)

CARLISLE CORPORATION.—British Thomson-Houston Co., Ltd., e.h.t. switchgear, £7 691 15s.; J. Spencer, feed-water and blow-down piping, £398; Pratchitt Bros., extension to low pressure c.i. piping, £378; Dewrance and Co., steam and water valves, £953.

LONDON COUNTY COUNCIL.—L. Andrew and Co., Hamnett and Andrew Macinlop, Ltd., Mica Manufacturing Co., Ltd., Mica and Micanite Supplies, Ltd., Pomana Rubber Co., Rubber Industries, Ltd., Rykneld Mills Co., and A. Sample, supply of insulating materials.

MANCHESTER CORPORATION.—Equipment and Engineering Co., Ltd., electric tram rail welding equipment; Rail Welding Co., Ltd., two rail grinding machines; Titan Trackwork Co., Ltd., special trackwork; R. and J. Dempster, Ltd., supply of electric lift for waterless gasholder at Bradford Road gasworks.

OLDHAM EDUCATION COMMITTEE.—W. Caton and Sons, electric wiring work between transformer house at municipal technical college and machines in spinning and weaving rooms. Supply of motors for machines in spinning department of college: English Electric Co., Ltd., British Thomson-Houston Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., Siemens-Schuckert (Great Britain), Ltd.

THE NATIONAL REGISTER.

Further Fourteen Applications Accepted for Registration.

AT a meeting of the Executive Committee of the National Register of Electrical Installation Contractors on November 8th, the Committee considered twenty-four applications for registration from electrical installation contractors. Of this number fourteen were accepted and ten declined.

The names and addresses of the successful applicants are as follow:—

Boyces, 44, Manchester Road, Nelson, Lancs.

Mortimer and Gall, 57, Basinghall Street, London, E.C.2.

Watkins and Richardson, 1148, London Road, Norbury, London, S.W.16.

Peacock, Robert, Junr., and Co., 1156, Cathcart Road, Mount Florida, Glasgow.

Raistrick, Albert L., Thorp Garth, Idle, Bradford.

Day, George Wm., and Co., 10, Dacre Street, Westminster, London, S.W.1.

Ritchie, Andrew, 120, George Street, Glasgow.

Noble, Herbert, 1, Carshalton Road, Lakenham, Norwich.

Barker and Wilkinson, 1, Cold Bath Road, Harrogate.

Rickards, Charles, Ltd., 12, Spring Street, Paddington, London, W.2.

Hubbard and Williams, 354, Oldham Road, Newton Heath, Manchester.

Ashton, Ernest R., 9, Green Lane, Heaton Moor, Stockport.

Leek, R. W., and Co., 97, Clayton Street, Newcastle-on-Tyne.

Allom Bros., Ltd., 15, George Street, Hanover Square, London, W.1.

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ELECTRICITY SUPPLY.

Limerick Harbour Lighting—New Generating Plants in Japan—Supply Inaugurated at Cemmaes—Electrical Progress in North Wales—Extension of Lichfield System—Proposed Transfer of Hereford Undertaking.

ILFORD Electricity Committee is to seek sanction to a further loan of £50 000 for mains and services.

Guildford T.C. has applied for a loan of £50 397 for extensions to Woodbridge power station and plant.

The Macclesfield New Electricity Co. is to erect overhead transmission lines in Bollington urban district.

The Mersey Power Co. is to erect overhead transmission lines to the parishes of Daresbury and Kekewich.

Hornsey Electricity Committee seeks sanction to borrow £20 000 for general main extensions and £10 000 for house services.

The Holywood sub-station is almost completed. A large number of applications have been received for supplies to private consumers.

The South Wales Electrical Power Distribution Co. has extended its supply in the rural areas of Glamorgan by the opening of a service in Coychurch Village.

The Calcutta Electric Supply Corporation, Ltd., has placed with a London firm a contract for the construction of a tunnel to carry cables and mains under the Hugli river at Calcutta.

Leeds Electricity Committee seeks sanction to borrow £175 000 for the estimated expenditure on electricity services to March, 1931, and £50 000 in connection with assisted wiring.

The City Engineer of Bristol is to report upon proposals that gas lamps in the city should be converted to electric lamps and that the public lighting in certain thoroughfares should be improved.

An application by the Cornwall Electric Power Co. for a bulk supply from Plymouth Corporation for certain areas in East Cornwall has been referred to a sub-committee for negotiation and report.

At a recent meeting of Limerick Harbour Board a letter was read from the Electricity Supply Board agreeing to fix the charge for lighting the port at 4d. per kWh, renewals to be charged as heretofore. The present price is 8d.

Ennis Corporation has received a notification from the Irish Electricity Supply Board that electricity for the public lighting of the town will be available on January 1st, 1930, and for other purposes about the middle of January.

The removal of the steam plant at the Lowestoft electricity works has been carried out during the past month, and the installation of the two last convertors is nearly completed. The whole of the supply of current will be taken from Yarmouth.

The Nankai Water Power Co. has been incorporated at Osaka, with a capital stock of 10 million yen, to develop water power by harnessing the Kitayama river at Wakayama prefecture. The power obtainable, at three sites, is estimated at 30 000 kW.

In connection with the proposed supply to Eastdean, Eastbourne Electricity Committee has amended the application for the Fringe Order so as to provide for underground transmission. The committee has authorised street lighting extensions and improvements at a cost of £8 000.

The Ujigawa Electric Co. proposes to construct an additional steam-driven electrical plant at Kitsugawa. The existing one has an output of 60 000 kW from two turbo-generators. The proposed extension will consist of three generators of 35 000 kW each. The site has the advantage of being near the great consuming centre of Osaka.

A supply has been provided for the parish of Cemmaes (Montgomery) by Mr. J. Norman Jones, of Aberandell. Power is obtained from the river Angell by a turbine supplied by W. Warburton and Co., coupled direct to a 60 A dynamo made by the Electric Construction Co. Energy is distributed to the villages of Cemmaes, Aberangell, and Cwmllinan.

A Government inquiry regarding electricity charges in Newcastle-upon-Tyne will be held on December 17th. A conference of 20 local authorities, held in the Newcastle Council Chamber on April 9th last, passed a resolution to demand a public inquiry into the charges of the Newcastle-upon-Tyne Electric Supply Co., Ltd., and the Newcastle and District Electric Lighting Co., Ltd.

Bexhill Electricity Committee has received from the Electrical Engineer a scheme for the provision of a new sub-station, with Hewittic rectifier plant, necessary cable, etc., in the districts north of Broadoak Lane. The estimated cost of the scheme, excluding a site for the building, was £3 825. It is proposed to make further inquiries as to sub-stations in operation in other towns.

Limavady Urban District Council has been informed by Mr. J. T. Irwin, consulting engineer, that Major Ritter, the proprietor of the local Electric Supply Co., would give the undertaking, asked for by the Council, not to raise the existing charge for current, if the Council gave their consent in the matter of his applying for powers as the authorised supplier of electricity in the urban area.

In the supply area controlled by Electricity Distribution of North Wales and District, Ltd., there are 53 towns and villages in which supply is available, and cabling is under construction for sixteen more places. In connection with Anglesey, negotiations are progressing satisfactorily for the construction of a line from Beaumaris to Holyhead, where the railway company would also be supplied.

At a recent meeting of Wicklow County Board of Health Mr. Delargy, of the I.F.S. Electricity Supply Board, attended with a view to arranging a contract for lighting Rathdrum and Baltinglass by electricity. He said the charge would be £2 10s. per lamp until March 31st next. Mr. Henry protested against placing the cost of the lighting of those small towns on the rural people who lived five miles out from them.

The supply of current by Lichfield to Shenstone was inaugurated recently. The supply is taken in bulk from Walsall Corporation. Messrs. Crompton Parkinson, Ltd., supplied the necessary transformer and switchgear, and Messrs. W. T. Henley's Telegraph Works Co., Ltd., the distribution cables. A street lighting scheme has not yet been agreed upon, but there is a growing demand for supplies for private purposes.

The Borough Electrical Engineer of Battersea (London), has prepared a report showing the cost of (*a*) laying electric mains for private services in all streets, or parts of streets in which they are not at present laid; (*b*) laying public lighting mains and converting gas lamps in such streets, and (*c*) providing services for the consumers likely to be obtained during the first year. The estimated cost is: (*a*) £29 973; (*b*) and (*c*) £5 638.

Guildford Electricity Committee is about to extend mains in West Clandon and Burpham, at a cost of £3 336.—A supply is to be given to Gooserye at an initial cost of £4 282.—A supply is also to be provided at Albury Heath, Farley Green, and Little London, at a cost of £1 500.—The Electricity Committee has been asked to consider the advisability of laying electricity mains along the route of the by-pass road during its construction.

Hereford T.C. has applied to the Electricity Commissioners for consent to a transfer of the electricity undertaking to the Shropshire, Worcestershire and Staffs Electric Power Co. It is understood that the company will expend approximately £85 000 on development, and provide about 70 miles of additional power lines in rural areas, lay mains in a number of streets in the city not already served, and change over the system from d.c. to a.c.

The Borough Electrical Engineer of South Shields has proposed that consumers who have prepayment meters should be enabled to purchase lamps or other small electrical apparatus, the payment for them being recovered from the rebate due to the consumer on his meter being read. The record of the goods supplied, and the price to be paid for them, would appear on the back of the meter reading leaflet. The suggestion has been adopted by the Electricity Committee.

The Council for the Preservation of Rural England has been invited by the Minister of Transport to send him a deputation to discuss recommendations made by the Council respecting the electrification of England and Wales. The Council suggests that there should be consultation as to localities where the presence of masts would be particularly incongruous; suggestions are made as to the scheduling of sites to be preserved; open sub-stations to be surrounded by a belt of indigenous trees; power lines should not run over sky lines; importance of architectural designs for transformer houses and harmonious colouring. On the question of new roads the Council will put forward a policy to check "the objectionable riband development of recent years."

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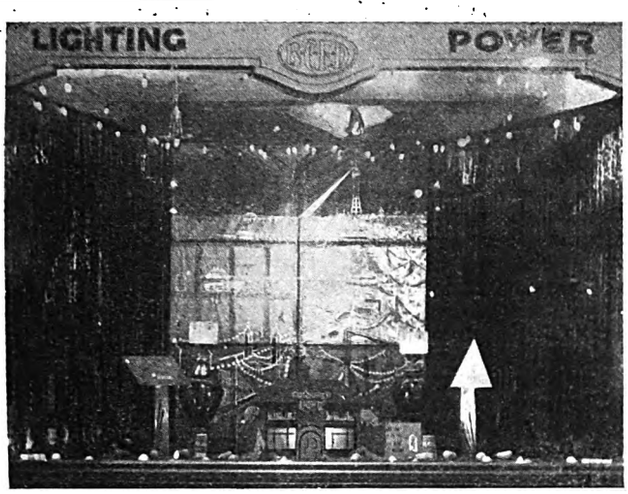
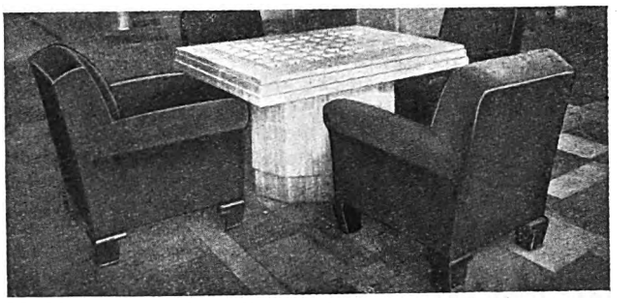
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

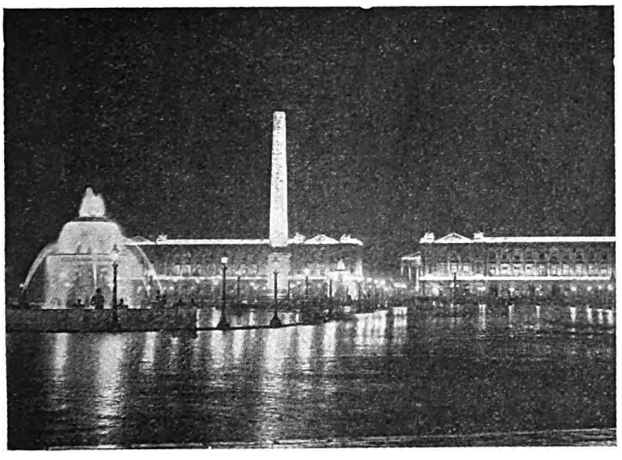


A window display by the Bradford Electricity Department. The background is a complete working model of the Blackpool illuminations recently concluded.



Marble control table for lighting fittings in the showrooms of the A.E.G. From this table the customer can switch in and examine the effect of any fitting. (Photo: "A.E.G. Progress.")

The Electrical Contractors' Association, London, had a happy inspiration when they conceived the idea of organising the ball and cabaret which took place at the Portman Rooms, London, last week, in aid of the E.T.B.I. The festivity was arranged in commemoration of Mr. H. Marryat, one of the past-presidents of the Association, and this year's president of the Institution. The number of tickets sold was about 550, and from 450 to 500 persons were present. The function was very successful, an interesting feature being a distribution of prizes to holders of lucky ticket numbers.



The occasion of the eleventh anniversary of the Armistice was marked in Paris by a number of special illuminations, two of which are shown above. That on the left is of the municipal buildings in the Place de la Concorde, and on the right is the Arc de Triomphe where General Gouraud rekindled the Flame of Remembrance.

Brighton Electricity Committee has approved a scheme by Mr. Christie for providing assisted wiring. Under the scheme the work is to be left open to all local contractors who are prepared to carry it out under the department's supervision and in accordance with the conditions laid down. The material and fittings used will be provided by the department and issued to contractors as required, the contractors to provide labour and small sundries, such as screws, etc., at a priced rate of 7s. per point. Fittings and cables will be standardised. The consumer will be allowed to choose his own contractor. Orders will only be given to contractors whose names appear on the list, and the Corporation reserves the right to strike off the list the name of any contractor whose work is not satisfactory.

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ELECTRIC TRACTION.

"Pay-as-You-Enter" Experiment on the Metropolitan Electric Tramways.

THE tramways section of the Underground Group has been experimenting with a number of specimen cars that mark a radical departure from what has long been accepted as the London standard of tramcar practice. In 1926 the Metropolitan Electric Tramways constructed an experimental car, whose salient features were high loading capacity; lightness of construction; low centre of gravity; a one-level floor from end to end of the lower deck; roomy end vestibules, with doors at each side; front exit; and semi-enclosed driving cabs. A second car, embodying most of the features of the first, but differing somewhat in design, was subsequently put into operation on the system of the London United Tramways.

These cars pointed the way to further improvements, with the result that the Union Construction and Finance Co., of Feltham, was commissioned to build two additional cars. These are an all-enclosed, double-deck type, with a streamline body having a slightly turn-under waist punch and tapering sides above the waist-line. The first car, No. 320, a 64-seater, was placed in operation by the M.E.T. a few months ago; and the second, No. 330, a 62-seater, was put into service on the same system on November 6th.

Constructional Details.

The body of car No. 330 is carried on a steel underframe. The framework of the two saloons is one unit, and is riveted to the underframe. The exterior sheets, including those of the roof, are of aluminium. The dash-panels are of high tensile aluminium plate, having a special advantage of lightness. The waist panels, quarter panels, and roof panels are lined with loose-woven canvas, to deaden noise and drumming when the car is in motion. Although the car exceeds the usual length of double-deck bogie cars, its weight is practically the same as the weight of the latter, being only 17 tons. The car is mounted on maximum traction bogies having 28 in. driving wheels. The taper, or sloping in, of the upper part of the car is designed to increase the clearance between the tops of passing cars when rounding curves or swaying through inequalities of track. The exterior width of the lower saloon is 7 ft. 2¼ in., thus enabling double cross seats to be used in that compartment. The car is designed for fare collection on the "pay-as-you-enter" principle, the staircases rise in one flight towards the end of the car, i.e., in the reverse direction to those on car No. 320. The space under the staircase in each vestibule is occupied by a cabinet, in which are disposed the motor resistances, sand-hoppers and air engines operating the exit doors. The doors of these cabinets have a louvred front, and are fitted with electric radiators.

On one side of each vestibule are two double-hinged doors, and on the other side is a sliding door. The former provide two clear openings of 2 ft. 3 in., and are hand operated. Attached to the base are hinged flaps and gas-fillers, which automatically expose or close-in the platform step as the doors are opened or shut. On the rear vestibule of the car, when in service, these doors will be used for both boarding and alighting. The sliding door, which provides an opening 2 ft. 4½ in. wide, is air-operated, and the one in the forward vestibule will be used for egress. It is interlocked with the traction circuit, and the car cannot be started until the door is closed.

The driving-cabs are separate compartments, and partly project from the ends of the car. The total capacity of the car, including standing passengers, is 78.

The motors are B.T.H. 509, 60 H.P., and the controllers are B.T.H. B527B. In conjunction with the controllers, the car is fitted with line-breakers and an overload relay on both poles, as well as with field-shunting contactors operated by an auto-shunt relay, which comes into operation on the last parallel point of the controller. The controllers have five series, four parallel, and seven brake notches. Two trolley booms are provided—one for the up and the other for the down journey. In addition to the usual hand-brake and the magnetic track-brake, the car is fitted with the British Air-Brake Co.'s standard straight air-brake equipment, operated by a 10 in. short stroke cylinder. Compressed air is supplied by a KLL 1 type 2-stage rotary compressor, giving a maximum output of 8·6 c. ft. of air per minute at 100 lb. pressure per sq. in. The compressor is direct-coupled to a 500 V d.c. motor. The compressor governor is a Westinghouse E.S. 16 type. The brake gear is applied to all the eight wheels. The air brake gives a smooth stop up to 4 or 5 ft. per sec. per sec. and the magnetic type up to 8 or 9 ft. per sec. per sec.

BUSINESS ITEMS.

MR. CAWLEY, radio engineer, St. Helens, Lancs, has removed his business to new premises at 66, Liverpool Road, and Baldwin Street.

An agency in Salonika desires to represent British manufacturers of d.c. and a.c. generators, dynamos and electric motors. Further information from the Department of Overseas Trade, reference No. 517.

A Johannesburg firm of engineers desires to represent for the whole of the Union of South Africa a British manufacturer of electric motors up to 50 H.P. Particulars from the Department of Overseas Trade, reference No. 511.

BRUCE PEEBLES AND CO., LTD., Edinburgh, have been granted by BROWN BOVERI AND CO., LTD., Baden, Switzerland, the sole licence for the manufacture and sale in Great Britain of their mercury-arc rectifiers. The correct title of these products is Peebles-Brown Boveri mercury-arc rectifiers.

A manufacturers' agent in Wellington desires to obtain, on a commission basis for the whole of the Dominion, agencies of British manufacturers of electrical goods other than switches, plugs and electrical brassware. Further particulars from the Department of Overseas Trade, reference No. 474.

An agent, established in Bombay, desires to secure the representation of British manufacturers of electric lighting plants for suburbs and hill stations, and electrical and mechanical accessories for electric railways for the whole of India and Bombay Presidency. The Department of Overseas Trade has further details. (Reference No. 465.)

The YORKSHIRE ELECTRIC POWER CO. announces that the Hotel Metropole, Leeds, one of the largest hotels in the city, has recently installed electric radiators in all the bedrooms. The radiators are all "Belling" 2 kW models and are provided with slot meters. The current is taken from the Leeds Corporation supply. This hotel also uses electricity in the laundry and for toasters and grillers, etc.

MR. T. J. ANDERSON, who has been appointed to be H.M. Consul at Maracaibo, Venezuela, will be available at the Department of Overseas Trade until November 30th to interview, by appointment, manufacturers and merchants interested in the export of British goods to Maracaibo or to the Dutch colonies of Curaçao and Aruba, which will be included in Mr. Anderson's consular district. (Reference No. 1 942/29.)

The STERLING TELEPHONE AND ELECTRIC CO., LTD., 15, Alfred Place, Tottenham Court Road, London, W.1, announces that the sole selling agency for "Sterling" telephone supplies, hitherto held by the Marconiphone Co., Ltd., reverts to them. Orders and correspondence relating thereto should be sent to the address above, but remittances, etc., should be sent to the company's accounts department at Marconi House, Strand, London, W.C.2.

The versatility of the range of winding machines made under the registered trade mark "Leesona" by the UNIVERSAL WINDING CO., LTD., is exemplified by some interesting facts that have recently come to light. The whole of the weft used in the fabric of the airship R.101 was re-wound on the "Leesona" No. 90 machine, while in an entirely different class of business small electric coils are being wound on the 'Leesona" No. 102 machine for use in automatic milking machines.

In connection with the exhibitors showing items of electrical interest at the Bradford Engineering Exhibition, which closes at Bradford, to-morrow, Saturday, the following names should be added to those published in our issue of November 1st, page 542: The Airedale Electrical and Manufacturing Co., Ltd.; Allen-Liversidge, Ltd.; Bradford Corporation Electricity Department; James Tate and Co.; the Roto Engineering Co. (Bradford), Ltd.; and the United States Metallic Packing Co., Ltd.

With reference to the recent announcement by the UNDERFEED STOKER CO., LTD., Africa House, Kingsway, London, W.C.2, concerning the rights that they have secured for manufacturing Vibro conveyors under the Schenck-Heymann system at their Derby works, this company has already secured an order for six such conveyors from Imperial Chemical Industries. The conveyors are of special design and are capable of handling fine cement dust at a temperature of approximately 400 deg. C., with capacities up to 30 tons per hour. We also understand that a further conveyor of this type has been ordered for use as a combined conveyor and screen, its capacity being 100 tons of limestone per hour. The Underfeed Stoker Co. announce that a descriptive catalogue is in course of preparation and will shortly be available.

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COMPANY NEWS.

Effect of American Slump on British Market—Ferrantis' Increased Profit—Birmingham District Power and Traction's Rearrangement of Capital—Dividend Announcements—New Electrical Companies Registered.

THE renewal of selling on the New York Stock Exchange is having its effect on this side, and electrical securities have shared in the general downward tendency. Hydro-Electric Securities which at the mid-October London settlement "made up" at 62 dollars, and a week ago had fallen to 51 dollars, have further declined to nearly 30 dollars. Associated Electrical ordinary have dropped from 33s. 9d. to 30/-. General Electric ordinary shares have changed hands in large numbers, and at 43s. 9d. are 5s. down.

The ordinary shares of W. T. Henley's Telegraph Works, which are to receive an interim dividend at the same rate as a year ago, have declined 7/6, from 125s. to 117s. 6d. Callender's Cable and Construction ordinary at 72s. 6d. are 2s. 6d. lower, while Johnson and Phillips have receded from £2 apiece to 38s. 9d., and Ever Readies from 19s. to 18s. 9d. Brush Electrical Engineering stock at 127½ is a point up. Cables and Wireless keep fairly steady, the "B" stock is 3 points lower at 47½, and the "A" is almost unchanged at 81½.

In the electricity supply section the ordinary shares of the Metropolitan Company are now dealt in without their rights in the allotment of new capital, and are quoted 17s. 6d. lower, at 38s. 9d. The same remark applies to the shares of the Midland Counties Company, which, at 28s., are 2s. down. North Metropolitan shares at just over 50/7½ are 1s. 3d. lower; Clyde Valley ordinary shares, which have declined from 38s. 9d. to 37s. 6d., show a larger proportionate fall. County of London Electric shares at 50s. 6d. are 2/- to the bad on the week. Bournemouth and Poole at 60s. 7½d., Newcastle Electric at 25s. 7½d., and Yorkshire Power at 33s. 6d., are respectively 1s. 3d., 7½d., and 6d. lower.

In the transportation group, the ordinary shares of the Underground Electric Railways of London, which company controls the London General Omnibus Company, fell 1s. on an abortive local strike. City and South London Consolidated ordinary stock, of which less than £20 000 out of nearly 1½ million of stock is in the hands of the public, has changed hands this week at over 65.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	21/6	21/6	22/6	19/9
6½	" " " C. Cum. Pref. ..	21/6	21/6	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	60/7½	61/10½	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	54/4½*	54/4½	56/-	32/6
5	" " " 5% Cum. Pref.	21/3	21/3	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	37/6	38/9	41/6	26/6
8	" " " 8% Pref.	28/6	28/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	24/4½*	24/4½	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	50/6	52/6	68/6	25/9
6	" " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	51/10½	51/10½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	35/7½	35/7½	45/-	26/9
4	Fife Tram. Lt. & P Ord.	13/9	13/9	23/6	10/-
6	" " " 6% C.P. ..	17/6	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " " 4½% 1st Mt.Deb.Stk.	89	89	92	80½
(e)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	28/-	28/-	32/9	22/10
6	" " " 6% C. 1st Pref. ..	27/-	27/-	28/6	24/9
7	" " " 7% Cum. Part.P.	28/6	28/6	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/6	27/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	97	97	104	95
10	Melbourne Electric Ord. Stk. ..	177½	177½	180	150
1/9½	Metro. Elec. Sup. Ord.	(h) 38/9	56/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	(h) 28/-	30/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	34/4½	34/4½	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	25/7½	26/3	30/3	19/3
6	N. Metro. Elec. Ord.	50/7½	51/10½	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(c)	St. James & P.M. Ord. (£1) ..	26/6	26/6	28/6	23/6
8	Scottish Power Ord.	30/-	30/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	26/6	26/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	20/-	20/-	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	92	92	98½	86½
7	Urban E.S. Ord.	36/10½	36/10½	46/6	18/-
5	Victoria Falls Power Ord. ..	60/-	60/-	69/-	46/3
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/6	25/6	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
7½	Whitehall Elec. Inv. Pref. ..	23/9	23/9	25/3	18/9
6	" " 1st Mt. Deb. ..	100½	100½	106	97½
8	Yorks Elec. Power Ord.	33/6	34/-	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	81½	81½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	87½	87½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	122½	152	117
7·67	" " " " 6% Pf. Stk.	124½	124½	133	103½
6	Calcutta Trams Ord.	15/7½	15/7½	24/-	14/6
5	" " " " 5% Cum.Pf.	13/9	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71½	72	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb. ..	77	77	83	77½
5	City & S. London, Cons. Ord. ...	67	67	64	52
4	" " 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	74	74	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	60	61	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	73	73	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	84½	86½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	21/-	22/-	28/2	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	84½	84½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	5/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	30/-	33/9	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " " 4% Mt. Deb.	75½	75½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	77/6	77/6	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/-	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	127½	126½	153½	120
15	Callender's Cable Ord.	72/6	75/-*	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " " 7% C.P. ..	21/3	21/3	22/9	21/-
4	" " 1st Mt. Deb. ..	66½	66½	75	68
20	Enfield Cable Works Ord.	97/6	97/6	82/-	60/-
7½	" " " 7½% Cum.Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	7/6	7/6	15/9	5/-
—	" " 6% C.P.	8/9	8/9	18/9	7/-
5½	" " 1st Mt. Deb. ..	88	88	103½	86
6	" " Conv. Deb. ..	71½	71½	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/9	19/-	92/3	18/1
10	" " 7% Partic. Pref. ..	29/6	29/6	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	43/9	48/9	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/-	25/-	27/9	22/9
7	" " 1st Mt. Deb. ..	103½	103½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	117/6	125/-	120/-	69/3
10	International Auto. Telephone O.	35/-	35/-	50/6	35/-
10	Johnson & Phillips Ord.	38/9	40/-	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord.	27/6	27/6	36/6	24/9
10	" " " Cum. Pref.	32/6	32/6	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/3	21/3	23/6	17/3
	Telegraph and Tel phon .				
9	Amer. Tele. & Teleg. Cap. Stk. ..	210	245	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Tele. Ord. Stk.	60	60½	63½	56½
6	" " " 6% Prefd. Stk...	98½	98½	105½	91
1½	" " " Deferred Stk...	24½	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	20/7½*	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	81½	82	—	—
—	"B" Ord. Stk.	47½	50½	—	—
—	5½% Cum. Pref. Stk.	97½	97½	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	75*	76	81½	74
4	Eastern Extension 4% Deb. Stk.	76	76	80	74½
22	Great Northern Telegraph (£10)	29	29	43½	26
10	Indo-European (£25)	47½	47½	48½	30
—	International Teleph. & Teleg. ..	$75	$90	161½	48½
15	Marconi Int. Mar.	42/6	43/9	90/-	16/6
4½	New York Tele. 4½% Mt. Bds. ..	96½*	96½	101	96
12	Oriental Telephone Ord.	38/9	38/9	65/-	41/-
4½	United R. Plate Tele. 4½% Deb.	85/-	85/-	89½	82
4	Western Tel. 4% Deb. Stk. ..	76	76	82	76

(a) 19½d. per share. (b) 1s. 0·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. * Ex dividend.
(g) 2s 2½d per share. (h) Ex. rights 11/11/29.

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Directors' Reports, etc.

CAWNPORE ELECTRIC SUPPLY CORPORATION, LTD.—Div. of 3% on ord. shs. (same as last year) will be payable on Nov. 22.

RICHARD JOHNSON AND NEPHEW, LTD.—The 7% cum. pref. sh. register and transfer books will be closed from Nov. 18 to 30, inclusive.

NORTH AMERICAN CO.—Qrtrly div. on common stk. of 2½% in common stk. (at rate of $\frac{1}{40}$ of a sh. for ea. sh. held) will be payable on Jan. 2.

PHILIPS GLOWLAMPWORKS, LTD.—It is understood that the company has taken over the large Splendor Incandescent Works at Nijmegen.

JOHNSON AND PHILLIPS, LTD.—Intm. div. of 5% actual, less tax, on ord. shs. has been declared. Registers are closed until Nov. 21, inclusive.

BRITISH ELECTRIC TRACTION CO., LTD.—Divs. of 3% on 6% cum. participatg. pref. and 4% on 8% non-cum. pfd. ord. will be payable on Nov. 16.

AMAZON TELEGRAPH CO., LTD.—Gross rev. for year ended June 30, 1929, £52 663; workg. exes., £35 172; income tax, £549; deb. int. £4 222; sinkg. fund, £18 692; fwd. £5 030, agst. £940.

AGRICULTURAL AND GENERAL ENGINEERS, LTD.—The rpt. and accts. for year ended March last will be issued shortly. The company's valuers are engaged valuing the works and plants of the subsidiary companies in order that fair and proper figures representg. the value of these assets can be arrived at and included in the company's rept.

SIEMENS BROS. AND CO., LTD.—Intm. div. of 2½% actual, less tax (same as last year) on ord. shs. is announced.

FERRANTI, LTD.—Net pfts. for year ended June 30, 1929, £66 976, agst. £56 798. After provisn. for pref. divs., £9 520, directors propose to place £40 000 to res., agst. £35 000, makg. total £270 000. Div. on ord. cap., 12%, tax free, on £100 000, agst. 20%, tax free, on £60 000, agn. absorbs £12 000. Fwd. £39 572, agst. £34 116. In arriving at pft., nothing has been included for pft. from subsidiary companies, but provisn. has been made for any loss incurred.

MIDLAND COUNTIES ELECTRIC SUPPLY CO., LTD.—The directors have announced this week that blce. of authorised sh. cap., 250 000 £1 shares, is offered to the existg. ord. shhldrs. in the form of ord. shs. at 26s. p. sh., as nearly as possible in the proportn. of one new sh. for each eight shs. held. The proceeds of the issue will be applied in repaying bank loans and in mtg. further cap. expenditure incurred for extensns. in operatg. companies. The new ord. shs. will not rank for div. for current financial year.

BIRMINGHAM DISTRICT POWER AND TRACTION CO., LTD.—Mtgs. of 6% cum. participatg. pref. and ord. shhldrs. will be held on Nov. 25 to consider proposed scheme of arrangemt. under which the unissued pref. and ord. shs., with 146 846 issued pref. and 412 934 issued ord. shs., will be consolidated into 700 000 ord. of £1 ea. It is proposed to increase cap. to £1 119 560 by creatg. 419 560 additnl. ord. shs. of £1 ea. Followg. this, £559 780 will be capitalised and applied in distributg. 559 780 ord. shs. to ord. shhldrs. (includg. the converted pref.) in the proportn. of one bonus sh. for each sh. held. Subject to the consent of the Board of Trade, the company's name will be changed to Birmingham and District Investment Trust.

Company Meetings.

BIRMINGHAM ALUMINIUM CASTING (1903) CO., LTD.—Mr. C. C. Maudslay, presiding at the recent general meeting, said the company was breaking new ground in several directions, and a chemical engineering department has been organised. The new metal "Elektron," for which Sterling Metals, Ltd., and the company had the sole right in the British Isles, had before it a considerable future. It was a magnesium alloy 40% lighter than aluminium, having the same physical characteristics as aluminium, and particularly suited for castings where lightness was a consideration. A dividend of 7%, less tax, on the preference shares and a dividend at the rate of 10%, less tax, on the ordinary shares for the year ended July 31st, 1929, were declared, and the report and balance sheet were adopted.

FOUNDATION CO., LTD.—Mr. John Stone, presiding at the meeting on November 5th, said net profit for the year ended June last was £22 655, against £15 281 for the previous year, and the balance brought from 1928 made £40 768 available. It was proposed to place £5 000 to contracts reserve, to pay a dividend on the cumulative preference shares at the rate of 8% per annum, less tax, and to carry forward £26 168. Of the principal contracts at home one was with the Central Electricity Board for what was known as the "North-West Grid"—a high tension transmission line running from Crewe to Carlisle—and one with the London Power Co. for the construction of their new generating station at Battersea. The value of uncompleted work at the end of June last was £1 650 000, this being the balance of contracts still in hand, totalling approximately £3 000 000. The Australian company, registered in January, 1928, as the Foundation Co. (Proprietary), Ltd., had orders on its books amounting to approximately £130 000, of which there was still in hand, uncompleted, about £80 000. The report and accounts were adopted.

New Companies.

G. H. CARTER (EASTERN COUNTIES), LTD.—Cap., £1 200. Electrical engineers, etc. Reg. Office: 69, Green Lanes, London, N.16.

LEYSIAN ELECTRIC LAMP CO., LTD.—Cap., £100. Electrical engineers, manufacturers of electrical accessories, electrical and radio agents, etc. Reg. Office: Leysian Buildings, 114, City Road, London, E.C.

FLEXIBLE WIRES, LTD.—Cap., £3 000. To acquire business carried on by L. A. Gomersall at Astor House, Aldwych, London, W.C.2, and to carry on business of dealers in electric wire, switchgear and electrical appliances. Reg. Office: Astor House, Aldwych, London, W.C.2.

FENBAR SUN-RAY CO., LTD.—Cap., £500. To carry on business of dairymen, producers of milk, cream, butter, cheese and other dairy products, including irradiation of such products with ultra-violet or other electrical rays, etc. Solicitors: Guild and Guild, 5, Rutland Square, Edinburgh.

HARTLEY MAIN POWER CO., LTD.—Cap., £100. To carry on the business of electric power and light company, to generate and supply electricity for all purposes for the use or benefit of the Hartley Main Collieries, Ltd. Secretary: J. T. Roberts, Exchange Buildings, Quayside, Newcastle-on-Tyne.

GREAT NORTHERN TELEGRAPH CO.'S HOLDING CO., LTD.—Cap., Kr. 8 100 000 (£450 000). To acquire and hold, and, if deemed expedient, sell a number of shares in the Great Northern Telegraph Co., Ltd., British address: 5-7, St. Helen's Place, London, E.C. (company incorporated outside United Kingdom).

SALAMAN HANDOLL, LTD.—Cap., £15 000. To acquire from G. E. Handoll goodwill of business known as Handoll Engineering Company, hitherto carried on by him at 23, Broadwall, Stamford Street, London, S.E.1; from R. A. Salaman benefit of business hitherto carried on by him in connection with manufacture of a certain invention relating to the control of theatrical and other lighting known as Salaman Control, and benefit of a contract entered into by him with the Albany Engineering Co., Ltd., for the purchase of the goodwill, etc., of said company; to carry on business of electrical and consulting engineers, etc. Reg. Office: 80, Ossory Road, London, S.E.1.

METAL AND CHEMICAL PRICES.

TUESDAY, November 12th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£74 0 0	—	£1 0 0
Electro Wirebars	,,	£83 10 0	—	10s. 0d.
H.C. Wires, basis	per lb.	11 $\frac{9}{16}$d.	—	$\frac{1}{16}$d.
Sheet	,,	11 $\frac{11}{16}$d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2 $\frac{8}{16}$d.	—	$\frac{1}{16}$d.
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10 $\frac{8}{16}$d.	—	—
Wire ,,	,,	10 $\frac{8}{16}$d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£22 15 0	—	£1 5 0
Foreign or Colonial	,,	£21 5 0	—	£1 0 0
Tin—				
Ingot	per ton	£175 15 0	—	£6 5 0
Wire, basis	per lb.	2s. 4½d.	—	1d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£20 10 0	—	£1 7 6
Mercury	per bottle	£23 2 6	10s. 0d.	—

Sulphur—Flowers, Ton £12 0 0 Roll, ,, £10 10 0 *Copper Sulphate* .. Ton £25 to £25 10 0 *Boric Acid* (Crystals) ,, £20 0 0

Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d. *Sodium Bichromate*—Per lb. 3½d.

Rubber—Para fine, 8½d.; plantation, 1st latex, 7 $\frac{13}{16}$d.

*** The metal prices are supplied by British Insulated Cables Ltd.

THE LEAD MARKET.

In sympathy with the weakness in other metals, the falling price of lead in the United States, and the slump on Wall Street, the lead market, according to James Forster and Co., last week opened with an easier tonea, and fell away until forward lead at one time touched £21 2s. 6d., closing at £21 5s. The American price was cut on November 6th and 7th to 6.25 cents per lb., a fall of about 25s. per ton on the week.

Closing prices on November 8th were £21 12s. 6d. for all positions, 11s. 3d. to 15s. per ton lower on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ARTINGSTALL, G., Pentre Howell, Pencoed, electrical engineer. £29 9s. 11d. October 3rd.

ASHTON AND HOLT, 15, Cross Street, Ryde, I.o.W., lighting engineers. £25 17s. October 1st.

BRITISH ELECTRICAL MANUFACTURING CO., Alexandra Works, Brent View Road, N.W., electricians. £20 1s. 5d. October 3rd.

DOWSE, George, 23, Goring Road, New Southgate, electrical engineer. £20 10s. 10d. September 17th.

GARNETT, Arthur John (late trading as A. AND F. GARNETT, now trading as ST. ANNES WORKS), High Road, Hayes, electrical engineer. £21 13s. 5d. October 9th.

MATHEWMAN, A. E., 6, Wednesday Market, Beverley, electrical dealer. £19 2s. 10d. October 8th.

MILLER, Harding, 138, Bedford Road, Rock Ferry, electrical dealer. £15 11s. October 8th.

WARDLEWORTH, L. and V., Bury Old Road, Heaton Park, electrical dealers. £21 11s. 8d. October 8th.

WESTON ELECTRICAL CONTRACTS CO., 17, George Street, Euston, N.W., electrical engineers. £52 3s. 2d. October 2nd.

Bills of Sale.

ATKINSON, Albert, 11, Shuttle Street, Eccles, electrical engineer. Dated November 5th, filed November 7th. £55.

BARKER, Oliver Horace, Aire Vale House, Pollard Lane, Bramley, Leeds, electrical engineer. Dated November 4th, filed November 7th. £60.

HOCKADAY, Dudley John, Betteley, 18A, Blackheath Road, Greenwich, wireless outfitter. Dated October 30th, filed October 31st. £100.

Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BURGOYNE WIRELESS, LTD., London, N.—Registered November 5th, £1 000 debenture to N. G. H. Dey, Aberglaslyn, Amhurst Park, N.; general charge.

BURNDEPT WIRELESS (1928), LTD., London, S.E.—Registered November 1st, Debenture, to bankers; charged on properties in Lewisham, etc., also general charge. *Nil. September 27th, 1929.

"M. P. A." WIRELESS, LTD., London, W.—Registered October 31st, £500 and £5 000 debentures part of £35 000 and bonus of 12½%; general charge.

SUN-RAY ELECTRIC LAMP CO., LTD., London, E.C.—Registered October 18th, £250 debenture, to S. Nicholson, Old Bank, Frinton-on-Sea, solicitor; general charge.

TARR (R. W.) LTD. (late SUPER RADIO, LTD., and LISTENOLA, LTD.), Swansea.—Registered October 31st, £2 500 debenture, to R. W. Tarr, Hazeldene, Newton Road, Mumbles, cabinet maker; general charge. *Nil. September 19th, 1928.

VIOZONE, LTD., London, W.C., electrical engineers.—Registered October 28th, £5 000 debenture, to S. Strauss, 104, Dartmouth Road, N.W.; general charge.

Satisfactions.

BRITISH GENERAL RADIO CO., LTD., Yeovil.—Satisfaction registered October 28th, £100, part of amount registered April 3rd, 1924.

EAST CORNWALL ELECTRICITY SUPPLY CO., LTD. (late TORPOINT ELECTRIC SUPPLY CO., LTD.), London, S.W.—Satisfaction registered October 31st, all moneys, etc., registered March 19th, 1926.

WADEBRIDGE AND DISTRICT ELECTRIC SUPPLY CO., LTD., London S.W.—Satisfaction registered October 31st, £500, registered February 12th, 1923.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

UNIVERSAL AND GENERAL RADIO CO., LTD., Bravington Road, London, W.—The statement of affairs submitted to the statutory meeting of creditors in this voluntary liquidation showed ranking liabilities of £33 152 and assets estimated to realise £7 508, but subject to preferential claims of £795, leaving net assets of £6 713, or a deficiency of £26 439. The assets included book debts £12 226, estimated to realise £7 000. It was stated that the preferential claims were heavy, as they included a substantial amount for rent, and a claim for income tax. No resolutions were passed, and therefore the voluntary liquidation of the company will be continued with the present liquidator, Mr. H. N. Murray of 7/8, Poultry, E.C.

London Gazette, etc.

Company Winding-up Voluntarily.

BUGLASS AND JAMIESON, LTD. By reason of its liabilities, November 6th. H. C. M'Millan, accountant, 13, Dundas Street, Glasgow, C.1, appointed as liquidator.

Bankruptcy Information.

WESTBURY, Leslie William, trading as L. W. WESTBURY AND CO., and also as the WALSALL RADIO CO., at 146, Lichfield Street, Walsall, wireless goods dealer. First meeting, November 20th, 12 noon, Official Receiver's Office, 30, Lichfield Street, Wolverhampton. Public examination, December 12th, 10.15 a.m., Court House, Lichfield Street, Walsall.

Notices of Dividends.

BROCK, Reginald Lewis, trading as R. L. BROCK AND CO., 5, Bedford Row, Tavistock Road, Plymouth, Devon, electrical engineer. First and final dividend, 3s. per £, payable November 11th, Bradley Hole and Co., 240, High Holborn, London, W.C.1.

HORSFALL, Robinson, 24, Commercial Street, Barnsley, Yorkshire, and trading as HARRISON AND HORSFALL, at Midland Street, Barnsley, electrical engineer. First and final dividend, 4s. per £, payable November 16th, Standard Buildings, City Square, Leeds.

LAWRENCE, Louis Haydn, described as HENRY FREDERICK LAWRENCE, 43, Canterbury Road, Margate, Kent, trading as HENRY F. LAWRENCE, electrical engineer. First and final dividend, 2¼d. per £, payable November 22nd, 5, Cecil Square, Margate.

Notice of Intended Dividend.

SKIPPER, Sydney Harold, 35, Broad Bridge Street, Peterborough, Northampton, lately trading as S. H. SKIPPER AND CO., electrical engineer. Last day for receiving proofs, November 21st. Trustee, F. H. Langmaid, 41, Sidney Street, Cambridge, Official Receiver.

Partnerships Dissolved.

ADAMS BROTHERS AND CO. (Percival Stanley ADAMS, Frederick Harold ADAMS, Ernest Herbert BOND and Henry MONK), electrical engineers, 8, Grand Parade, Westbourne, Bournemouth, October 17th, 1929, as regards E. H. Bond and H. Monk. Debts will be received and paid by P. S. Adams and F. H. Adams, who will continue the business under the style of Adams Brothers.

BROWN AND SWAN (James SWAN and James BROWN), electricians, 62, Hamilton Road, Rutherglen, at October 23rd, 1929. J. Brown at that address will collect accounts and discharge liabilities to that date.

H. HOLDEN AND CO. (Hugh HOLDEN and John CAVANAGH), 1, Union Street, Pendleton, Salford, and 270A, City Road, Manchester, motor cycle dealers and electrical engineers, by mutual consent as from November 4th, 1929. Debts received and paid by J. Cavanagh.

JOHN BRYDEN AND SONS (Francis James BRYDEN and Harry Brooke BRYDEN), electricians, bellhangers and window blind makers in Edinburgh and elsewhere. F. J. Bryden retired September 21st, 1929. The business will be carried on by H. B. Bryden at Edinburgh and elsewhere.

LAING AND KERR (George Liddell KERR and Robert Liston LAING), electricians, 178, Morningside Road, Edinburgh, as at November 6th, 1929, by mutual consent, by the retiral of G. L. Kerr. The business will be carried on under the old name by R. L. Laing on his own account.

MIC WIRELESS CO. (Harry BROWN and George Edward HOUGHTON), manufacturers, factors and retailers of wireless and electrical components, Wellingborough, Northampton, by mutual consent as from October 25th, 1929. Debts received and paid by H. Brown, who will continue the business.

RICARDA ELECTRIC CO. (Ada Annie BELL and Richard William MINSHALL), electrical engineers, 16, Holbein Place, Sloane Square, S.W., by mutual consent, as from October 7th, 1929. Debts received and paid by R. W. Minshall, who continues the business.

VUL-K-LEC CO. (Benjamin GRIFFITHS, Herbert de Lisle CRAWFORD and Alexander Bruce COWIE), electric vulcaniser manufacturers, 58, South John Street, Liverpool, by mutual consent as from October 17th, 1929, so far as concerns A. B. Cowie, who retires from the firm. Debts received and paid by B. Griffiths and H. de L. Crawford. The business will be carried on in the future by B. Griffiths and H. de L. Crawford, in partnership with William Henry Fawcett.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

294 875 BRANDES, LTD. Sound-reproducers. (30/7/27.)
292 926 BRITISH THOMSON-HOUSTON CO., LTD. Treating foods and products thereof. (24/6/27.)
317 583 J. GRANT and W. H. GRANT. Devices for removing and replacing electric lamps. (2/7/28.)
293 315 DEMAG AKT.-GES. Electrically operated pulley-block with stationary motor. (2/7/27.)
317 597 J. W. PATRICK. Switch device for electric irons. (6/7/28.)
317 599 ELECTRO-MECHANICAL BRAKE CO., LTD., and S. SMITH. Air-release valves for tramway and other compressed-air brake systems. (6/7/28.)
317 600 IGRANIC ELECTRIC CO., LTD., and W. K. ALFORD. Resistance-capacity coupling-units for use in radio apparatus. (7/7/28.)
293 864 BRITISH THOMSON-HOUSTON CO., LTD. Manufacture of X-ray anodes. (15/7/27.)
317 603 GENERAL ELECTRIC CO., LTD., and J. H. JONES. Shade fitting for electric lamps. (10/7/28.)
317 605 GENERAL ELECTRIC CO., LTD., H. C. TURNER, and A. SHERWIN. Thermally-operated electric switches. (11/7/28.)
317 610 IGRANIC ELECTRIC CO., LTD., and D. SINCLAIR. Radio-receiving apparatus employing tetrode valves. (17/7/28.)
317 611 T. C. CHRISTIANSON and ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electrical switchgear. (17/7/28.)
317 613 G. W. M. FLETCHER. Devices for actuating the switch-arm of electric light and like switches. (21/7/28.)
317 614 GENERAL ELECTRIC CO., LTD., and T. E. RITCHIE. Mountings for electric light reflectors. (21/7/28.)
317 620 CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., and J. BOWYER. Application of surface markings to vulcanised rubber. (27/7/28.)
317 627 H. H. BERRY. Advertising-signs. (1/8/28.)
295 284 BRITISH THOMSON-HOUSTON CO., LTD. Production of electric signalling-impulses. (8/8/27.)
295 654 BRITISH THOMSON-HOUSTON CO., LTD. Control of dynamo-electric machines. (16/8/27.)
317 641 BRANDES, LTD., and M. S. HOBAN. Electromagnetic sound-reproducing devices. (22/8/28.)
317 642 A. CAMPBELL. Apparatus for the measurement of the capacitance and power factor of electrical condensers. (23/8/28.)
317 647 W. R. EDWARDS. Electric cells. (25/8/28.)
317 655 G. E. HEYL. Means for applying radio-activity for curative purposes. (11/9/28.)
317 661 J. STEELE AND SONS, LTD., and H. STEELE. Trays or stands for use in charging and/or filling electric accumulators or storage batteries. (19/9/28.)
317 666 T. CRACKNELL and E. M. AUSTIN. Electric lamp cap. (5/10/28.)
298 237 H. HALPERIN and K. W. MILLER. Methods of and means for bonding together electric cable sheaths. (6/10/27.)
298 482 BRITISH THOMSON-HOUSTON CO., LTD. Apparatus for the interconversion of sound and electrical impulses. (8/10/27.)
317 667 F. R. FRANCKE. Combined electric switches. (12/10/28.)
298 990 SIEMENS and HALSKE AKT.-GES. Inductances for use in high-frequency circuits, for example, in radio receiving sets. (18/10/27.)
300 511 E. ASCH. Thermionic amplifiers. (10/11/27.)
301 840 BRITISH THOMSON-HOUSTON CO., LTD. Apparatus for the interconversion of sound and electrical impulses. (6/12/27.)
392 729 BRITISH THOMSON-HOUSTON CO., LTD. Electric condensers. (21/12/27.)
306 403 INVENTIA PATENT-VERWERTUNGS-GES. Nozzles for vacuum cleaners. (16/2/28.)
317 531 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., C. GILLINGS, and C. H. EVANS. Telephone systems. (19/4/28.)
317 532 J. A. CRABTREE. Electric lampholder switches. (16/5/28.) [Divided application on 317 514.]
317 533 J. A. CRABTREE. Cord grips for electric lampholders and the like. (16/5/28.)

Applications for Patents.

August 2nd.

23 736 ASSOCIATED ELECTRICAL INDUSTRIES, LTD., and E. Y. ROBINSON. Vacuum tube device.
23 767 H. ASTBURY and CROMPTON PARKINSON, LTD. Oil break electric switchgear.
23 778 BRITISH POWER RAILWAY SIGNAL CO., LTD., and J. H. GRAHAM. Electric signalling, etc., apparatus. (1/8/28.)
23 770 BRITISH THOMSON-HOUSTON CO., LTD. Electron discharge device. (2/8/28, U.S.)
23 842 P. O. DORER and S. SMITH AND SONS (MOTOR ACCESSORIES), LTD. Clock actuated electric switches.
23 792 J. FISCHER DE TOVAROS. Device for lubricating sliding bows of current collectors of electric vehicles.
23 763 W. H. GRINSTED. Telephone systems.
23 739 L. P. HAUSSAUER. Electric water heaters.
23 740 A. HAMILTON. Electrical warning-device.
23 771 INTERNATIONAL GENERAL ELECTRIC CO., INC. Preventing pulsating in compressors. (3/8/28, Germany.)
23 845 C. LORENZ AKT.GES. Electric signalling installations, etc. (15/4/29, Germany.)
23 766 R. G. MADGE. Electric lamp shades.
23 812 MARCONI'S WIRELESS TELEGRAPH, CO., LTD. Multiplexing, commutating, etc., systems. (29/9/28, U.S.)
23 743 H. A. MOORE. Thermo-electric control.
23 843 MOTORENFABRIK DEUTZ AKT.-GES. Electric starting circuits for Diesel motors. (2/8/28, Germany.)
23 789 L. A. E. NORDFOLK. Feeding discharge tubes with current from supply mains. (2/8/28, Denmark.)
23 724 R. PEARSON. Electric switches.
23 778 RELAY AUTOMATIC TELEPHONE CO., LTD. Electric signalling apparatus. (1/8/28.)
23 762 F. SAVAGE. Wireless signalling apparatus.
23 763 SIEMENS BROS. AND CO., LTD. Telephone systems.
23 735 R. TONKS. Tuning inductances.
23 779 R. E. G. TUGWOOD. Device for translating mechanical vibrations into electrical waves.
23 775 WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD., and S. A. STEVENS. Alternating current transformers.

August 3rd.

23 871 W. CASSON and H. ROBERTS. Electrically controlled variable speed gear.
23 916 GRAHAM AMPLION, LTD., W. J. RICKETS and D. SINCLAIR. Wireless systems for navigation.
23 895 H. INGHAM. Thermionic amplifiers.
23 934 C. LORENZ AKT.-GES. Control of alternating currents. (6/8/28, Germany.)
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24 093 F. A. LINDEMANN. Device for preventing arcs in photo-electric cells.
24 094 F. A. LINDEMANN. Photo-electric cells.

COMING EVENTS.

Friday, November 15th (To-day).

INSTITUTION OF MECHANICAL ENGINEERS.—Storey's Gate, St. James's Park, London. Lecture by Mr. Francis Hodgkinson on "Journal Bearing Practice." 6 *p.m.*

ELECTRICAL DEVELOPMENT ASSOCIATION.—Royal Society of Arts, John Street, London, W.C. Lecture by Mr. E. E. Sharp on "Selling Time Switches." 7.30 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, London, S.W.1. Lecture by Mr. W. T. Griffiths on "Nickel and its Uses in Engineering." 7.30 *p.m.*

Saturday, November 16th.

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-EASTERN CENTRE, STUDENTS' SECTION).—Visit to the coal distillation plant of the Newcastle-upon-Tyne Electric Supply Co., Ltd.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (SOUTH WALES BRANCH).—Cardiff. Paper by Mr. R. H. Morgan on "Electrical Measuring Instruments." 6 *p.m.*

PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS. Visit to the Bussey Coal Distillation Co., Ltd., Glenboig, Lanarkshire. 3 *p.m.*

Monday, November 18th.

INSTITUTION OF ELECTRICAL ENGINEERS (MERSEY AND NORTH WALES-LIVERPOOL CENTRE).—University, Liverpool. Paper by Dr. N. W. McLachlan on "The Theory and Practice of Modern Loud Speakers." 7 *p.m.*

INSTITUTION OF MECHANICAL ENGINEERS (GRADUATES' SECTION).—Storey's Gate, St. James's Park, London. Paper by Mr. A. G. Brown on "Artificial Lighting of Factories and Public Buildings." 7 *p.m.*

E.L.M.A. LIGHTING SERVICE BUREAU.—15, Savoy Street, Strand, London. Twentieth Illumination Design Course. Lecture (V.) by Mr. H. Lingard on "Electrical Advertising." 7.30 *p.m.*

Tuesday, November 19th.

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—Junior Institution of Engineers, 39, Victoria Street, London. Paper by Mr. A. Page on "Development of Generation and Distribution of Electric Power in the British Isles."

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-WESTERN CENTRE).—Midland Hotel. Annual dinner.

INSTITUTION OF HEATING AND VENTILATING ENGINEERS (ASSOCIATE MEMBERS' AND GRADUATES' SECTION, MANCHESTER AND DISTRICT BRANCH).—Milton Hall, Deansgate, Manchester. Mr. O. Stott on "Fan Standardisation Committee's Report." 7 *p.m.*

PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS.—39, High Street. Lecture by Mr. H. J. Taylor on "Measurement of Electricity." 7.30 *p.m.*

Wednesday, November 20th.

ELECTRICAL POWER ENGINEERS' ASSOCIATION (MANCHESTER LOCAL TECHNICAL GROUP).—Paper by Mr. D. J. Bolton on "Hire and Hire Purchase of Electrical Apparatus."

ELECTRICAL CONTRACTORS' ASSOCIATION (SUSSEX BRANCH).—Midland Bank Chambers, Brighton. Ordinary meeting.

ELECTRICAL ASSOCIATION FOR WOMEN (SOUTH WALES AND MONMOUTHSHIRE BRANCH).—South Wales Institute of Engineers, Cardiff. Lecture by Mr. T. Catten on "Furnishing your Home with Light."

OVERHEAD LINES ASSOCIATION.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture by Mr. R. Borlase Matthews on "Standard Intermediate Voltages for Rural Electrification." Cinematograph illustrations. 5.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SHEFFIELD SUB-CENTRE).—Royal Victoria Hotel. Mr. A. Tustin on "Organised Scientific Research and Engineering Progress." 7.30 *p.m.*

BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION.—Connaught Rooms, Great Queen Street, London. Annual dinner. 7 for 7.30 *p.m.*

Thursday, November 21st.

INSTITUTION OF ELECTRICAL ENGINEERS.—Institution, Savoy Place, Victoria Embankment, London. Joint meeting with the Institute of Fuel. Discussion on "Low Temperature Carbonisation of Fuel, with special reference to its combination with the Production of Electricity." Introductory papers by Messrs. E. H. Smythe and E. G. Weeks (English Practice); S. McEwen (American Practice); and Prof. Dr. Ing. P. Rosin (German Practice). 6 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (HAMPSHIRE SUB-CENTRE).—University College, Southampton. Paper by Dr. J. W. T. Walsh on "Illuminating Engineering." 7.30 *p.m.*

Friday, November 22nd.

PHYSICAL SOCIETY.—Imperial College of Science, Imperial Institute Road, South Kensington. Papers by Mr. D. P. Dalzell on "Heaviside's Operational Methods," Mr. E. T. Hanson on "The Dynamical Theory of Resonators," and Mr. E. C. Atkinson on "Escapement Errors of Pendulum Clocks." 5 *p.m.*

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Colmore Row. Lecture by Mr. J. D. Morgan on "Dust Explosions." 7 *p.m.*

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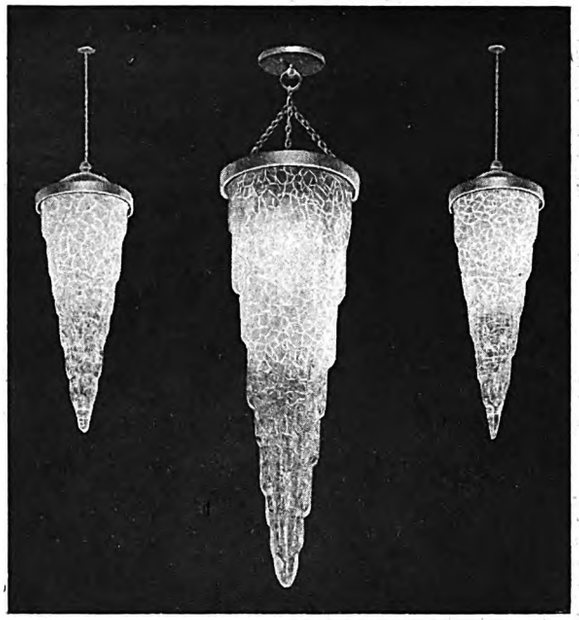

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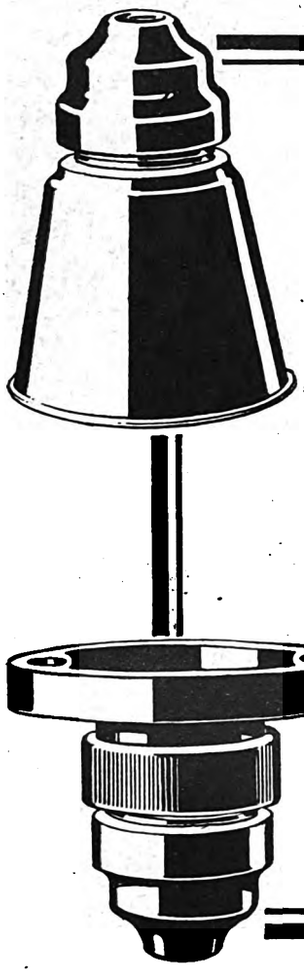

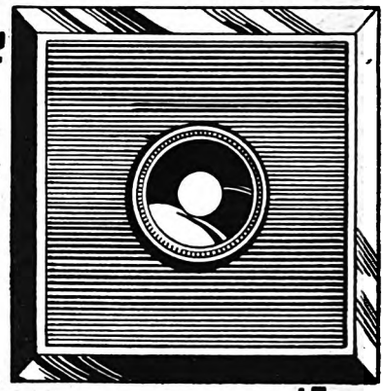

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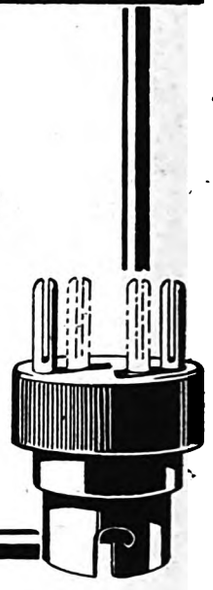

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Current Topics.

Electricity Commissioners and Unemployment.

FOLLOWING on the meeting last July of the Lord Privy Seal, the Minister of Transport, and representatives of the electricity supply industry to discuss means by which the number employed in the industry could be increased, so as to assist the Government in dealing with the problem of unemployment, the Electricity Commissioners last week issued a circular letter relating to the suggestions put forward. Briefly stated, these recommend expediting, where possible, all new constructional work on which electrical undertakings are engaged, the extending of distributing networks in built-over areas to meet the demand for domestic supplies, the initiation of assisted wiring schemes and the extension of hire and hire-purchase apparatus. The Commissioners also state that the annual capital investment in transmission and distribution systems has grown from a little less than £8 000 000 in 1922-23 to over £16 000 000 in 1927-28. Providing expenditure continues to increase, the outlay during the next five years should be over £100 000 000, and the Commissioners are of the opinion that a considerable percentage of this could be accelerated so as to fall within the next two years. It will be appreciated that any scheme promoted by the electrical industry with a view to relieving unemployment will help to absorb not only the comparatively few electrical unemployed, but also some of the larger number outside the industry. Extensions of plant, development of the domestic load, increasing distribution networks, etc., not only in themselves reduce unemployment, but cause workshops and factories also to absorb many of the men and women seeking work. The Commissioners' appeal is a good one, and if answered in the right spirit will, besides bringing relief to many, cause our industry to enjoy a prosperity even greater than is its present lot.

Overseas Trade in Agricultural Machinery.

THE Federation of British Industries has communicated details of a scheme which, it is claimed, will not only absorb a large number of unemployed, but will also develop our overseas trade. Seventeen limited companies are co-operating in the manufacture and marketing of agricultural and general engineering implements, including motors and other electrical plant, with a view to securing for Britain a larger share than has so far been enjoyed of the world trade in these products. Five years have been spent in building up the selling organisation, and over £250 000 have already been spent in developing the scheme. Over eighty countries have been visited for the purpose of establishing branches, and the scheme represents a combined offensive on the world market for agricultural machinery. The organisation states that in each of the countries visited an intensive study has been made to ascertain the market conditions and to test in the field the types of machine required. It goes without saying that electrical plant for agricultural purposes will play no inconsiderable part in this scheme, and since, at the moment, Great Britain's share in the world trade in agricultural machinery is only 7% or 8%, the opportunities for improvement are enormous. Electro-farming at home has not progressed as favourably as many would wish, and if, in developing our overseas trade in this direction, it is possible at the same time to better the conditions in the home market, then the success of the scheme will be more than doubly assured.

Royal Institution Exhibition.

As considerable alterations are being made to the buildings of the Royal Institution in Albemarle Street, in order to bring them up to date with respect to safety from fire, the opportunity has been taken to arrange an exhibition of some of the more important pieces in the Science Museum at South Kensington. The apparatus now for the first time publicly displayed owes its interest to the fact that it illustrates many of the most important contributions made by British

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inventive genius to science and its applications. It has been difficult to display in the allotted space sufficient material to represent the wide range of Michael Faraday's work, but the famous ring with which he discovered in 1831 the laws on which all electrical engineering is built is among the exhibits. The induction coil and the condenser both came from Faraday, and his discoveries of their principles are illustrated by the apparatus of his which is now on view. It was Faraday too who conceived the propagation in space of electric "rays and vibrations." In 1845 he showed that magnetism had a general action in all substances, not in iron merely; he explained diamagnetism, and magne-crystallic action, and found the action of magnetism on polarised light. All these studies are illustrated in the collection and afford an excellent opportunity for all concerned with the industry to familiarise themselves with the earliest stages of electrical development.

Christmas Trade.

THE E.D.A. is to be congratulated on the novelty of its window displays for the December Selling Campaign. No less than five designs have been prepared, each one being sufficiently different to permit of new window dressing for each week of the month, while special literature associated with the windows has also been prepared. We pointed out in our last issue the many opportunities offered by the spending spirit of Christmas, and, fully alive to these increased trading possibilities, the E.D.A. has arranged for advertisements dealing with electrical gifts to be inserted in 19 national newspapers during the month. The Electric Homes (Outlet) Campaign will also receive special attention during December, for it is realised that the electrical gifts campaign is sure to have a favourable influence, in that given a fire one needs an "outlet." Since any success obtained will bring business to the contractor, business to the wholesaler, manufacturer and supply undertaking, the campaign is a very suitable subject for the co-operation of all branches of the industry, and it is hoped that electrical trading during December, 1929, will surpass not only any previous December, but any other month of any other year. Two and a half million domestic users of electricity have been advised to "give electrically" while eight and a half million potential users have been approached with a view to adopting electrical service.

Electrical Development in Mines.

ALTHOUGH the number of working mines using electricity in 1928 was less by 162 than in 1924, the horse-power of motors installed above and below ground increased from 1 481 932 in 1924 to 1 722 322 in 1928. These figures are taken from the report of the electrical inspector of mines, who also records the fact that during 1928 there were 15 fatal accidents at collieries, due in 11 cases to shock and 4 to ignition of fire damp. Reviewing the general progress of electrical development in mines, Mr. HORSLEY points out that while during the years 1907 to 1928 there were only 97 fatalities, the use of electricity below ground, as measured by horse power of motors installed, had increased during this period approximately 70%. These figures show without doubt the rapid strides which have been made in applying "safety first" measures to the electrical equipment specially designed for use below ground and at the same time afford a good sales argument in the selling of coal-cutters and the like. That there are plenty of opportunities for such sales is indicated by the fact that though there were 2 539 mines at work in 1928, no less than 1 072 of them were without electrical plant for mining purposes.

A Timely Settlement.

AFTER many months of litigation and negotiation between members of the Radio Manufacturers' Association and the Marconi Co. with respect to royalties, there at last seems some hope of settled conditions in the trade. This is suggested by a revision of the terms of the agreement proposed last July, and though for the main part the conditions of the new licence are much the same as those proposed four months ago, the chief objection, namely, the free use by the Marconi Co. of certain patents held by licensees, has been removed, by so wording the clause that the licensees shall grant the Marconi organisation licences for such patents. Other substantial changes are that royalties are chargeable on all receiving sets whether they utilise patents subject to the licence or not, and on "kit sets" if patents existing on or after November 14th, 1929, are involved. We have seen a copy of the principal terms of the licence, and these are such that electrical contractors may hope for a settlement of the difficulties by the time Christmas trade starts in earnest. The suspense which has existed in the radio industry during the last few months has left its mark of course, but with all difficulties settled and a reduced royalty into the bargain the future is more hopeful in both the manufacturing and contracting worlds.

Healing Rays?

WITH the firm conviction that the gas industry is fighting a losing battle in the domestic field we are able to disregard most of the pitiful arguments advanced in favour of the methods which it advocates. We do not mind when its representatives claim, as did Mr. C. M. CROFT at the recent B.C.G.A. Conference, that, following the installation of gas fires in a Wandsworth hospital, "the patients are not now being disturbed . . by the clatter of fire irons," for that is obviously true; we also agree that, as a sort of half-way house between coal and electricity, gas fires require no labour and make no smoke. What we do object to is the further claim that these fires are attracting "a great deal of interest in medical circles in view of the healing properties of the rays, particularly in cases of arthritis and similar infirmities." We have yet to hear authoritative medical opinion that gas fires possess any specific curative properties apart from those believed to be the common property of all radiant heating apparatus.

Australia's Policy.

CONFIRMATION of Australia's preference for British goods was forthcoming at the recent Interstate Conference of Australian electrical manufacturers, when the policy of a supply authority was quoted to the effect that they should "Buy Australian first, buy British if you cannot obtain Australian, and if you cannot obtain Australian or British, then do the best you can outside." As we have pointed out on previous occasions, these sentiments are shared by a large proportion of Australian business men, and we should do our best to make it unnecessary for them to go outside the British Empire for their electrical requirements.

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METHODS OF MEASURING TEMPERATURE RISE OF ELECTRICAL MACHINERY.

Safe Temperature for Insulation—Three Principal Methods Explained—Limitations of Embedded Detectors—Variation of Resistance Measurements.

By WALLACE FORD, Wh.Sc., A.C.G.I., B.Sc., D.I.C.

THE rating—that is, the statement of the capacity for doing work—of an electrical machine is based upon the temperature rise of the windings of the machine under test conditions. The life of an electric generator, motor or transformer, depends primarily upon the insulating material used in its construction, and the insulation deteriorates in service due to the effects of heat and vibration.

The criterion of the rating of electrical machines, the temperature rise, is the difference between the temperature of the cooling air and the temperature of the hottest spot on the surface of the windings adjacent to the insulation.

The cooling-air temperature can easily be measured by thermometer; for rating purposes, however, some arbitrary ambient temperature is adopted—usually 40 deg. C.—this temperature plus the allowed temperature rise, giving the maximum allowable conductor temperature of the machine. The temperature of 40 deg. C. is higher than the usual air-temperature in temperate climates, but is of the order of the usual temperature in the tropics, and is a temperature which may easily obtain in some sites in cooler countries. The adoption of a 40 deg. C. arbitrary ambient temperature, therefore, allows a margin of safety for machines which work in places where the air temperature is below 40 deg. C.

Conductor Temperature.

The conductor temperature is exceedingly difficult to measure. It must be realised that the highest temperature occurs at a point in the winding where the conductor is entirely surrounded by insulating material, and the insulated conductor is also partially surrounded by the iron of the core of the machine. There is a great difficulty, therefore, in discovering whether the insulation of a machine is at any point in contact with the surface of a conductor the temperature of which exceeds the permissible maximum temperature compatible with safety to the insulation.

It can be discovered by laboratory experiments what is the maximum safe temperature to which the insulation may be subjected, but here again the investigator must bear in mind that the conditions in a test oven are vastly different from those obtaining in a machine in service; insulation in running machinery is subjected to a periodic pounding and grinding action, as well as to heat.

It is not easy to discover, moreover, the relationship which exists between the conductor temperatures as determined by any of the available methods and the temperature at the hottest spot. Only the results of a great deal of observation and research can enable engineers to state that if the conductor temperature measured by a given method does not exceed a prescribed amount, then the temperature of the hottest spot on the conductor is not such as will imperil the life-expectancy of the insulating material.

There are three principal methods of measuring the temperature rise:—

(i) Thermometer method.
(ii) Variation-of-resistance method.
(iii) Embedded temperature detector (thermostat) method.

The thermometer method is undoubtedly the simplest and the most convenient, since the indication of temperature is obtained directly and without any auxiliary apparatus. The thermometer is ideal for measuring the temperature of a bare busbar or switchblade; the bulb is usually placed adjacent to the metal and both insulated from the air and kept in position by some material such as putty or felt. But the conductors in a motor, surrounded as they are by insulation, and embedded in a slot in an iron core, cannot have their temperature so easily ascertained. The only way is to place the bulb of the thermometer on the conductor insulation at a point where the conductor crosses a ventilating duct.

It is therefore usually specified that, when the temperature rise is to be observed by the thermometer method, the bulb of the thermometer shall be applied to the hottest accessible spot in the windings immediately the heat run is completed and the machine is stationary. In practice, several thermometer readings are taken at points likely to be the "hot-spots," and the maximum reading is used to determine the temperature rise.

When thermometers are used in the stators of rotating machines, or in any place where there is liable to be a change in the magnetic field strength, spirit thermometers should have preference over mercury thermometers, as the latter are unreliable under such conditions.

The thermometer method is generally employed for deducing the temperature rise of small and medium sized motors, when any of the other available methods would be inaccurate or inconvenient.

As previously stated the thermometer method can only be used to measure the temperature at the outside of the insulation of an armature or field coil, and will not reach the insides of coils where the highest temperatures occur. The temperature at the surface of an exposed coil depends on the thickness and heat conducting properties of the insulation and the rate at which the cooling air can collect heat from the surface. The temperature of the insulation surrounding an embedded coil is much higher than that round an exposed coil, and the thermometer cannot reach such a coil. Embedded coil temperature depends again upon the thickness and heat conductivity of the insulation and also upon the heat capacity, conductivity and cooling of the core, and on the conduction of heat along the winding to exposed parts where cooling is more rapid.

In small machines the temperature differences due to the fact that some parts of the winding are embedded, while others are exposed directly to the action of the cooling air are small, so that the temperature indicated by applying a thermometer to the hottest accessible spot of the winding fairly represents the temperature on the outside of the insulation throughout the machine. As the machine under consideration becomes larger, however, it is clear that the difference of temperature between various parts of the surface of the coil insulation becomes greater and the temperature of the hottest accessible spot becomes less and less an indication of the greatest temperature to which the insulation is subjected.

Modern engineers tend more and more to accept the principle that the method of measuring temperature rise by variation of resistance is the best method, and should always be employed except where it is impossible, or presents serious difficulties. For small motors with high-resistance windings the variation-of-resistance method is liable to considerable errors and hence the thermometer method is preferred. But as motors increase in size the thermometer is less and less reliable as an indication of the winding temperature and the resistance method becomes less liable to inaccuracy. It is self-evident, therefore, why the resistance method is adopted as the basic method—that it has immense advantages over the embedded-temperature-detector method for general purposes will become clear later.

Resistance Measurements.

When the initial temperature, the initial and final resistances and the temperature coefficient of the resistance of copper are known, a simple calculation only is necessary to compute the temperature rise of a winding. The usual procedure is as follows: the resistance of the windings is measured when the machine is cold and the ambient temperature is noted (by thermometer); at the end of the heat run the resistance of the windings is again measured.

There are one or two complications involved in this method. The cooling-air temperature may not remain constant throughout the test run, and as a run to prove the continuous rating of a machine probably lasts some five or six hours, there is ample scope for some change. If an appreciable change is noted this of course has to be allowed for. The ambient temperature is usually measured by taking the mean of the readings of several thermometers placed about four feet from and spaced round the machine under test, and so screened as not to be affected by radiation or draughts other than those set up by the ventilating system of the machine under test.

The windings of a machine begin to cool almost imme-

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diately after the power has been shut off. It is impossible to measure the resistance of a rotor before it is stationary, so that the time which elapses between the cutting off of current and the taking of the resistance measurement may amount to upwards of two minutes. The final resistance measurement is not therefore the true resistance of the hot windings at the moment of shut-off. In some cases the difference may not be appreciable, but in a motor where a fan is incorporated in the rotor, the amount of heat removed by the cooling air while the armature is slowing down may be considerable. Any external cooling system should be stopped when the power supply to the machine is cut off. In cases where cooling occurs it is usual to take a series of resistance measurements at close intervals for about five to ten minutes after shut down, and to plot the winding temperatures (or the resistance) against time; then, by extrapolating the curve to zero time, the temperature (or resistance) at the moment of shut-down may be deduced.

There are several available methods of measuring the winding resistance. The Bridge-Megger method can be employed, but is open to the objection that it is difficult to keep the applied voltage steady, and hence inductive effects may make it difficult to obtain a balance. The most usual method is to use some modification of the Wheatstone bridge—the Kelvin double bridge is a convenient choice. There is also the method whereby the drop of voltage across the windings due to a known current is measured.

Good results can only be obtained if the measurements are taken for all readings between the same pair of commutator segments in the case of armatures of d.c. machines, and the brushes must be lifted. The chosen segments should be spaced apart a distance approximately the same as the pitch of the brush arms, and should be marked to ensure ready recognition. When the drop-of-voltage method is adopted, it is better to use an accumulator or battery to supply the current, as this obviates the possibility of fluctuations of supply voltage; it is usual to use a current of about 5 to 10 A. With a current of this magnitude it is better to use separate pairs of contacts for supplying the current and measuring the voltage drop, the voltage being, of course, measured between the pair of segments to which the current is supplied. Some engineers consider it better to choose several pairs of commutator segments, and to take a series of measurements from each pair.

The variation of resistance method of measuring temperature rise gives the average temperature rise of the winding (and the commutator in d.c. armatures). It does not show the temperature rise at the hottest spot of the windings, which is expected to exist where a coil side is completely surrounded—on three sides by the slot lining and the iron forming the core, and on the fourth side by the retaining wedge. The average winding temperature is considerably lower than the maximum temperature, due to the better cooling of the coils over the portions outside the slots.

Commutator Heating.

The heating of the commutator of a d.c. armature is intermittent, and cycles of current are so rapid that little heat variation would take place at individual segments; unless, therefore, the heating due to brush friction and any sparking is large, the commutator temperature would be lower than the embedded-winding temperature, and would tend to reduce the measured average temperature. Only data based on research and extensive experience can assist the decision as to whether a certain measured average winding temperature implies that the insulation is in no part of the machine heated beyond its maximum permissible temperature.

To get over the difficulty of being unable to measure the temperature of the hottest spot when using the thermometer or variation-of-resistance methods, an embedded temperature detector (thermostat) can be employed. This method is useless for rotor windings, and, due to the fact that the detectors (it is usual to fit several in each large machine) have to be built-in to the machine during construction, it is not worth while using this method except for the stators of large machines—turbo generators, large induction motors or large synchronous motors. The most important part of a d.c. machine (or rotary convertor), from the heating point of view, is the rotating armature, hence the E.T.D. method has no application for this class of machine.

It is not generally considered advisable from an economic standpoint to instal embedded detectors in machines of less than 4 000 kVA rating, which practically limits the use of this method to generators (either turbo or slower speed hydraulic types) in large power stations. Further, for generators for voltages under about 5 000 V the method is seldom used, and detectors, unless of a special design, are not used in very high voltage windings; they are not considered suitable for high voltage transformers, although they are suitable for windings for voltages up to the highest voltage for large generators.

Since the limitations of the embedded detector have been pointed out, it will be made clear that the variation-of-resistance method has by far the most wide application.

The British Engineering Standards Association has issued a series of standard specifications for the rating of electrical machinery, each specification dealing with a different type of machine.

Large Machines.

There are three specifications for large electric generators and motors, viz., B.S.S. No. 169—1925, for Large Electric Generators and Motors with Continuous Rating Permitting Overloads; B.S.S. No. 225—1925, for Turbo-Alternators; and B.S.S. No. 226—1925, for Large Electric Generators and Motors with Continuous Maximum Rating. These specifications allow all three methods, with certain qualifications.

For the slot portion of stator windings of machines above a certain limiting capacity (4 000 kVA in B.S.S. Nos. 169 and 226, and 5 000 kVA for turbo generators) the E.T.D. method is specified, but for all other sizes the variation of resistance method is standard, with the provision (in B.S.S. Nos. 169 and 226) that it must not be used for the windings of a.c. machines taking more than five minutes to come to rest—the thermometer method shall then be used. Otherwise the thermometer method can only be used where the other two methods are impracticable. The difficulty of accurately extrapolating a cooling curve to zero time when the first reading is taken after some six minutes will be appreciated: hence the ban on the resistance method.

For Fractional H.P. Motors (B.S.S. No. 170—1926), the thermometer method is standard; this method is also standard for Industrial Motors (B.S.S. No. 168—1926 for motors above those covered by B.S.S. 170 and up to a rating of 2·5 H.P. or 2·5 kW or 2·5 kVA per rev. per min.).

For Transformers for Power and Lighting (B.S.S. No. 171—1927) either the thermometer or the variation-of-resistance method can be used. Since transformer windings are not embedded in slots in the core, the thermometer method is practicable for large transformers. The embedded temperature detector method is not included, because the detectors are not suitable in very high voltage windings.

For Rotary Convertors (B.S.S. No. 172—1927) the thermometer method has preference, probably because constituent parts of a rotary convertor—d.c. exciter, a.c. starting motor, and possibly an a.c. booster and an induction regulator—can all have their temperature rises noted by thermometer at the end of one heat run; for convenience *all* measurements are taken with a thermometer, although the variation-of-resistance method might be better for the armature windings.

The Specification for Traction Motors (No. 173—1928) is a revision of a specification issued in 1923. It is limited to d.c. series-wound motors. The 1923 edition required the temperature rise to be measured by thermometer, whereas the 1928 edition insists that the resistance method shall always be used, except where it "is impossible or presents great technical difficulties, in which case the thermometer method shall be used." This difference in the two editions is probably a reflection of the growing idea among electrical engineers, both in this country and abroad, that the variation-of-resistance method is the method which is most accurate and has the widest application, despite the difficulties which may be imposed—waiting for the armature to stop, for instance.

It may be that in the event of a revision of some of the British Standard Specifications which now call for the thermometer method, we shall find the variation-of-resistance method given first choice. On the face of it, the resistance method seems the better for large motors, especially large d.c. motors, at present included under "Industrial Motors" in B.S.S. No. 168.

As a matter of fact it is quite a usual procedure to measure the temperature rise of fractional horse-power motors by the variation-of-resistance method, although it is essential that expert observers shall take the necessary readings, and that they shall use good instruments. It is claimed by some authorities that for small motors the variation-of-resistance method is quite as accurate as the thermometer method, and under suitable conditions more satisfactory.

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For induction motors also the variation-of-resistance method is permissible. For small induction motors with solid rotors the maximum temperature rise is in the stator, and this temperature rise can conveniently be measured by the variation-of-resistance method; for squirrel-cage motors the majority of the heating is in the stator, the temperature rise of which can be measured by the resistance method, and for induction motors with wound rotors this method can be used by both stator and rotor.

It would, therefore, seem that the thermometer method is only really preferable where the measurements are to be carried out by comparatively unskilled observers, or where the rather elaborate apparatus necessary for the resistance method is not available.

The above gives a résumé of the principal methods of measuring the temperature rise of electrical machinery, and shows how the methods are applied in standard practice.

BOOK REVIEW.

Overhead Power Lines: Elementary Designs and Calculations.

By Capt. W. Morecombe, R.E. (London: Chapman and Hall.) Pp. xi + 236. 15s.

This work, judging by its contents, is intended to be a handbook for those engaged in the layout and equipment of overhead lines. The book as a whole deals primarily with the mechanical stresses met with in line construction, assuming the factors laid down in the regulations at home.

The first chapter starts off with notes on voltage regulations and the choice of voltage, and then deals with line constants and energy losses, giving some useful curves and data. Regarding the choice of voltage, the author does not stress sufficiently the point that up to the limits of apparatus at reasonable price for village supply, at, say, about 15 000 V, the higher the voltage, not merely the lower the losses, but the better the inherent regulation; for example, it is difficult to understand how anybody could put up nowadays a new line at 3 000 V with a number of transformers on it at 50 or 100 kW. The most recent l.t. regulations, with the increased l.t. distribution radius, tend to favour 11 000 V. Chapter II deals with conductors, their sags and stresses, with tables, and Chapter III. handles line fittings, clearances and spacing; the regulation clearances to earth are now reasonable. Bird guards are briefly mentioned; then spacing, horizontal and vertical, as influenced by swaying and unequal loading. A triangular arrangement of conductors is favoured. In the illustrations given the earth is placed below; in districts where lighting gives trouble, an earth-wire above the conductors has proved to be of material advantage. With the aid of a steel top extension piece and a triangular-sideways arrangement of conductors, this can be managed without increasing the length of the pole. One notes that many British bracket arrangements involve too many coach screws, each hole being a source of weakness; that is why the clip system is going ahead abroad. Low tension construction is dealt with, and also the use of h.t. and l.t. lines on the same post.

Chapter IV deals with insulators and conductor fastenings. It is hardly desirable to standardise insulator forms, as we do not know enough about them yet. A few notes are given regarding chain insulators. The writer states, regarding Hewlett and other interlocked forms, that if the insulator breaks, the wire is still linked mechanically, and therefore does not fall. Recent experience on the Orleans railway, as detailed by M. Parodi at the last Paris E.H.T. Conference, tends to show that arcing is a great factor regarding insulator failure, and that when it takes place the arc may burn through the links. On some comparatively low voltage lines chain insulators are being used at material angles instead of those of the pin type.

The author states that glass (pin) insulators appear to be thoroughly reliable up to 22 000 V; and it is a pity that their manufacture has not been undertaken at home. There are far more glass pin insulators for h.t. work being made in France than those made of porcelain. There are many of the pin type giving satisfaction at 60 000 V, and one line—Argentan to Caen—was comparatively recently equipped with them for 80 000 V. During the war the reviewer tried to get the Sheffield University to take an interest in glass pin-type insulators; so far suspension type glass insulators have not been very successful. Moulded material insulators are used in some parts of South America because "broncho-busters" take pot shots at them; the author states that there is a fortune awaiting the inventor of a material with the electrical advantages of porcelain, but without its fragility.

There is an interesting chapter on cross arms and brackets. The author thinks the elongated insulator bolt type of bracket to be a weak design, only suitable for 6 600 V; yet there must be hundreds of thousands of this general type in operation in France, Germany, and Switzerland giving satisfaction for light lines up to 15 000 or 20 000 V. Even if a stalk does get slightly bent in service, the end of the world does not come. Continental overhead ironwork, regarding cross arms, etc., is tending towards the use of clips rather than through bolts and coach screws. Useful tables are given regarding choice of standard wood poles and the selection of spans to give the best results; as spans get longer, so poles must be higher, to allow for sags, and tables and curves show how, even after allowing pole rent charges, on a high voltage line 3·/·147 copper, with a cross triangle arrangement of conductors, there is but little difference in cost per mile between a span of 200 ft and 400 ft., the increased dimensions, and therefore cost, of the wood pole making up for the bulk of the difference. The author points out that "unless we go to extremes, the length of the span has little effect on the overall economy"; it is also noted that owing to the limited span for increased sag, under the regulations, a larger number of posts must be used on a line with smaller conductors, and therefore the economy of the use of these is diminished. This factor encourages the use of alloy or compound conductors. It is stated that in certain circumstances a movement in the ground may avoid a failure of the pole itself; some ground is little better than a sponge; it is elementary physics that until a pole begins to move, the ground cannot begin to resist. It is admitted, that poles are flexible, and to be so is an advantage. It is stated that owing to the extra foundation costs, Rutter type excepted, the only justification for compound poles in distribution work is the reduction in the number of wayleaves required to be negotiated, rather than the cost of wayleaves.

The Rutter pole is dealt with, but it is difficult to realise the economic advantage of a wood structure requiring twenty-two bolts and ten scarf blocks. Tubular steel, channel steel, and channel lattice poles are discussed. The author calculates an example of a ferro-concrete pole with steel of an ultimate strength of 65 000 lb. or, twenty-nine tons, with a factor of safety of 3½. The regulations state 3½ on the elastic limit, not on the ultimate strength. Assuming, however, that fifty tons steel is used, the calculations come out about right; for their centrifugal posts the Italians use a steel so hard that it is liable to break when falling on a stone floor, but which stands up to test when encased in concrete. Very long bars are now available, and welding is usually only required with transmission posts of 80 to 100 ft.

Angles and Terminals.

A chapter is given on angles and terminals, commencing with stays and struts. In some countries, owing to difficulties regarding cattle and ploughing, stays are strongly objected to. The screw guy-anchor, so much used in America, is not mentioned; it has never taken on here.

A short chapter deals with conductors other than copper; cadmium-copper, bronze, copper clad steel, aluminium, steel cored aluminium, and galvanised steel being dealt with. The ice-loading regulations tend to hamper the use of light section copper. Apparently the author has had some trouble with aluminium conductors. A table is given showing the economy possible with galvanised steel conductors as compared with light copper. This, however, is worked out to the 1923 regulations. Material improvements have been made recently regarding the galvanising of steel wire. It is remarkable that the use of copper-clad steel has not taken on in England; perhaps this is due to the price.

The book concludes with a chapter on safety precautions. Commissioners' and P.O. regulations are given in appendices. In most countries elaborate, snow-catching, money-wasting cradles for Post Office line crossings were abandoned years ago.

The book should be useful to indoor and outdoor power-line engineers, and will provide a much-wanted textbook for technical schools. It is a pity that present-day costs of printing and publishing, mainly the outcome of demands of "friends of progress," must necessarily tend to restrict the circulation of useful technical handbooks.

T. R.

SAG CHART CURVES.

With reference to the Sag Chart Curves shown on page 523 of our November 1st issue, it is interesting to note that the values given agree almost completely with those in Capt. Morecombe's book, though their calculation was entirely independent,

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ACHIEVEMENTS IN STEAM GENERATION.

Efficiency and Simplicity Go Hand in Hand—Lively Discussion on Pulverised Fuel—Views on the Grit Problem—Chain Grate Stokers and Large Capacity Boilers—Water Walls.

BEFORE the London Local Technical Group of the Electrical Power Engineers' Association, at the Junior Institution of Engineers, on November 12th, Mr. P. E. Rycroft (Chairman of the Group) presented a paper on modern steam generators, in the course of which he described some of the achievements of modern plants. For purposes of comparison he tabulated the hundred most efficient plants, from the point of view of overall thermal efficiency, of those dealt with in the Electricity Commissioners' returns for the year ended March, 1929, in descending order of efficiency. He added the type of steam generators installed and the system of firing adopted in each case, together with the annual load factor and the yearly output in units. The higher steam pressures were also noted where such were employed.

Looking at the table broadly, the higher pressures were all located near the top, and but for the fact that Padiham—the leading station—operated at only 250 lbs. per sq. in. there would appear to be considerable evidence that the higher pressure plants had the advantage.

In the Padiham station the individual steam-raising units were rated at an evaporative capacity of only 35 000 lbs. of water per hour, whereas its nearest rival (Barton) utilised units evaporating from 100 000 to 160 000 lbs. per hour. It could not be asserted definitely that large steam-raising units made for high efficiency; indeed, it was much safer to say that, beyond units of, say, 20 000 lbs. per hour, if it were assumed that the plant were properly worked, little or no difference in efficiency could be credited or debited on account of the size of unit. As to the types of boilers installed, the table showed a decided weight of evidence in favour of the sectional or header type of water tube boiler with horizontal tubes. Ferrybridge, as a newcomer with vertical bent tube boilers, was an exception to this general rule, and had, of course, the advantage of a super load factor of over 50%, as against 42, 44 and 46% in the case of the first three stations on the list. With regard to the furnaces, the predominance of the travelling or chain grate type of stoker was overwhelming. There was no station in the list completely equipped with pulverised fuel firing except Brimsdown B., which had not yet a full year's working to its credit; of the partially equipped stations, Barking and Lister Drive No. 3 made the best showing, but there was nothing to indicate the relative proportions of load borne by the pulverised fuel sections in either case. Pending the returns from a station completely equipped with pulverised coal burning plant, and operating continuously over a period of 12 months, we were still unable to dogmatise on this question.

An Interesting Observation.

Examining the details of the steam plant at Padiham, he said the outstanding fact was that to all intents and purposes the main design and layout was identical with what was accepted as good practice 20 years ago; simple land type sectional header boilers with horizontal tubes and longitudinal drums, cast iron vertical tube economisers set at the rear of the boilers, integral superheaters raising the final temperature of the steam to only 620 deg. F., the boiler working pressure being 250 lbs. per sq. in., the rated evaporation 35 000 lbs. of water per hour, giving the very modest rating of well under 4 lbs. of water per sq. ft. of heating surface. The units were set in brickwork and fired by means of mechanical chain grate stokers operated for the most part under natural chimney draught conditions with only 0·4 in. draught at the boiler dampers, and equipped with induced draught fans for emergency use only. The keynote of the whole equipment was simplicity and reliability. The result for two years in succession had been an overall thermal efficiency of over 21%.

At the Barton boiler house, the nine original units were of somewhat special design, inasmuch as two sets of horizontal tube sections were placed back to back, and connected into a common steam drum, the furnaces being also double, and fired at both ends. In later units this arrangement had been discontinued in favour of the standard single-ended type. Each complete unit was designed for an evaporation of from 100 000 to 120 000 lbs. of water per hour. Steel tube economisers were superposed above the boilers, and tubular air preheaters were further superposed above the economisers. The complete plant was constructed for a working pressure of 375 lbs. per sq. in., and the furnaces were equipped with chain grate stokers operating with mechanical induced draught only or under combined forced and induced draught when load conditions made this desirable. The overall efficiencies obtained by this plant over a considerable number of years were consistently good, viz., 1924, 20·33%; 1925, 19·83%; 1926, 21·51%; 1927, 21·83%; 1928, 21·07%; and 1929, 21.31%.

The two essential differences between this plant and Padiham were that at Barton air preheaters were installed and forced draught utilised, whereas at Padiham neither of these conditions prevailed.

North Tees Station.

The third example of high efficiency plants was that at North Tees. This operated at the highest steam pressure so far employed by any British power station, i.e., 475 lbs. Secondly, it was designed to function without the aid of economisers, relying entirely on air preheaters for recovering the heat units which passed the boiler. Thirdly, it was the first station to employ steam reheating between the turbine stages by returning the partially expanded steam to the boiler unit. The overall efficiencies obtained from 1924 to 1929 inclusive were respectively 17·69, 18·01, 18·75, 18·33, 20·49 and 21·19%.

The last of the super-efficient plant mentioned was Ferrybridge, and the keynote of this installation, as in the case of the Padiham plant, was simplicity. The boilers were of the vertical tri-drum type with bent tubes, and each unit was complete with integral steel tube economisers placed immediately at the rear of the boiler. The working pressure was 300 lbs. per sq. in., and the normal rated evaporation for each unit was 75 000 lbs. of water per hour. Ferrybridge was a single floor boiler house, with the chimneys erected from ground level, and no air pre-heaters were installed. The furnaces, as in the other 21% stations, were equipped with chain grate stokers arranged to operate with simple induced or induced and forced draught in combination.

Mr. Rycroft emphasised that among the modern steam generating plants of to-day the most efficient was at the same time the simplest in design, and the one which had departed least from well-established practice.

Dealing with super plants which were either just beginning to function or were still under construction, he said the working pressures adopted showed an upward tendency, and the rising evaporative capacity of the individual units was equally marked. Stokers more than held their own against pulverised fuel burning equipment, and in this respect the new Liverpool station was specially interesting, as the stokers were installed to carry the base load, while pulverised fuel burners were to be fitted to the same furnaces for auxiliary purposes. The outstanding features of these new stations was the practically universal adoption of water-cooled furnace walls for all the newer installations. This was one of the definite results of higher furnace temperatures due to more perfect combustion, and there was little doubt that the water-cooled furnace wall would become standard equipment for all the larger plants. Almost equally indisputable was the necessity for fitting all modern steam plants with simple equipment for the systematic removal of soot and fine ash from the heating surfaces, and unless this were done continuously high efficiencies could not possibly be obtained.

Problems of coal supply, ash removal and grit emission were vitally important, and simplicity in coal and ash plants was desirable. The reinforced concrete tank laid down by the London Power Co. at their Deptford West station for coal storage was a good example. Although there were two or three passably good systems available to choose from, he was of the opinion that the ideal method of ash disposal had still to be produced.

The subject of grit emission was so topical that we were in danger of becoming hysterical, but apparatus was available which would readily collect all but the very finest particles, and, by the added refinement of water sprays, even these could could be dealt with satisfactorily Power stations would very soon be able to recover at least 75% of all the sulphur they produced.

With regard to the problem of fuel combustion, there could be no doubt that in this country technical opinion as to the advantages of pulverising coal for firing under steam boilers

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had undergone a considerable change during the last year or two, and we should make all the more real advance if, while frankly acknowledging that with certain qualities of fuel and under certain conditions of operation it might be advantageous to pulverise coal before we consumed it, it was equally certain that many of our coals could be burned at least as satisfactorily in a solid form by mechanical stokers. Mechanical stoking had undoubtedly made great progress during recent years. The introduction of water-cooled furnace walls had opened a new era in stoker performance. There had been a revival of interest in the retort type of stoker, and it seemed probable that more would be heard of these during the next year or two, but the travelling grate had a long lead, and with the elimination of the furnace arch, which may be safely anticipated in the very near future, the one great objection to this type of stoker would have been disposed of.

DISCUSSION.

The CHAIRMAN (Mr. Wilson) claimed that powdered fuel firing had come to stay. Its success or its failure would not be determined by any report or statistics of the Electricity Commissioners, but it must be studied as a distinctive method of firing. The only reliable figures in this country, if they could be taken as such, were those given by the Derby station, which had been working on powdered fuel for over a year, and if one surrounded the Derby station with the Padiham conditions, Derby would show up to greater advantage than Padiham in the Commissioners' return; or, given the Derby conditions at Padiham, the latter could not achieve the same thermal efficiency as it does to-day. Such statistics as those of the Electricity Commissioners, to which Mr. Rycroft had referred, could not be accepted as indicating the value of the modern steam plant installed. If one were going to use statistics for this purpose, then they should include the average yearly boiler house efficiency. The most important factor of all was commercial efficiency, and Derby was about to publish, if it had not already published, the lowest coal costs in the country, which he believed would be 0·09d. per unit sold. If he were again to take charge of a power station embodying large boilers he would not hesitate to give powdered fuel first consideration, but would consider it in connection with a new boiler design, such as could be seen at Brighton, Derby and Manchester. Why we were content to go on adding excrescences to a boiler which was originally designed for stoker firing he did not know; the obvious thing in modern steam generating practice was to make the boiler the combustion chamber; or make the combustion chamber the boiler, to give an assembly of radiant heating surface which obviously should be more efficient, a simplicity of design which hitherto was never visualised, a compactness of design so that the plant would occupy less area, and at a capital cost certainly not exceeding stoker firing. He predicted that when a station in this country was equipped with boilers built on that principle, Padiham would be considered out-of-date.

Mr. MACGUIRE said he had tried to picture what a station such as Hams Hall would be like if it were built on the Padiham lines; Birmingham would hardly be large enough to carry it. The tendency to-day was in the direction of greater concentration of power in power stations, and he would hesitate even to suggest that with the large boilers having capacities of 200 000 or 250 000 lb. or more, such as would be installed in super power stations, stoker firing would be considered reliable. With regard to water-cooling, he said that the new boiler at Sir John Anderson's works at Milwaukee had completely water-cooled furnaces, and these had been running for, he believed, 12 000 hours without any maintenance costs whatever having been incurred in respect of the furnace. As to dust emission, there were many stations working on pulverised fuel firing, at which 85 or 95% of the grit was being collected, with the aid of washing apparatus in addition to the grit collecting apparatus.

Mr. SAMUELS pointed out that when discussing boiler house efficiency we were apt to forget the excellent results which had been obtained in practice by some of the older power stations. A test carried out in London on a boiler which perhaps is now well on the road towards becoming old-fashioned had shown that the efficiency on the gross calorific value of the fuel was about 88·7%. The power taken by auxiliaries was about 0·6%, so that the overall boiler efficiency was 88 on the gross calorific value of the fuel, or somewhere about 91·5 on the nett. With regard to the chairman's remarks as to the type of plant in which the generator was to be the furnace, he said that in a measure that condition was attained in the new water-cooled furnaces; but we could not afford to take away the tubes of the boiler, because we should be losing an opportunity for heat transfer. It had been suggested that the horizontal tube boiler was designed for the mechanical stoker, but that was not so. The horizontal tube boiler was designed for hand firing, and was later developed and made suitable for the mechanical stoker, though the general principles had remained the same. He believed that it had proved very suitable for pulverised fuel firing. As to the suggested impossibility of using chain grate stokers for boilers having a capacity of 200 000 or 300 000 lb. per hour, he said that no difficulty in that respect had been experienced so far. We had surmounted the refractory difficulty by means of the water wall, and with regard to the quantity of fuel burned there was no question that rates twice as great as those to which we had been accustomed could be obtained per sq. ft. on a stoker in a suitably designed furnace.

Mr. W. J. OSWALD suggested that perhaps we were a little premature in expressing definite opinions or in coming to early decisions as to the merits of different types of plant of large capacity, such as would be used in the future, for we had yet to go through an experimental period in the development of these very large plants. He emphasised that cleanliness in a boiler was the basis of high efficiency, and that was a matter which operating engineers would do well to watch closely. With regard to efficiency, he agreed that the overall thermal efficiency of a station was not necessarily the criterion of the efficiency of the boiler house, because so many factors, as, for instance, the turbine plant, the lay-out of the stations, etc., were included in the overall thermal efficiency.

Mr. BLENKINSOPP, referring to the North Tees station, said that although the engineers and contractors were to be congratulated on the latest efficiencies obtained, it had taken seven years of hard work and experiment to increase the efficiency of the boiler plant to its present standard. He understood that the efficiency of one of the boiler units, as shown by recent tests, was about 89·5% on the low calorific value of the fuel. But even that could be beaten. The boiler efficiency of a pulverised fuel-fired station on the Barking extensions, as shown by a 100-hours test carried out by independent authorities, was 91·7% on the lower calorific value of the fuel. Neither of the two figures he had quoted left very much to be desired. He approached the pulverised fuel firing problem with an open mind, and realised that there was scope for it and for stoker firing. With regard to water cooling of the furnace walls, he urged that the cooling system should be designed as an integral part of the boiler plant instead of an adjunct to it, as had been the case in practically all boilers of that type equipped up to the moment. As to boiler drums, he suggested that, inasmuch as pressures of 600 and 800 lb. per sq. in. had become every day practice, riveted drums were things of the past; we had to face the necessity for providing solid forged drums, or at least welded drums, and we might with advantage carry out propaganda on welded drums.

Cooling Problems.

Mr. WALLIS suggested that in considering boiler efficiencies regard must be had to commercial efficiency, so that the basis of comparison should be the cost per British thermal unit in the steam. With regard to the cooling of the walls of the boiler furnace, he said that in the latest development of the Benson boiler the whole of the tubes formed the walls themselves. It might be said that the bare tubes cooled the gas too much, and therefore it lessened considerably the effective volume of the combustion chamber, and he believed that if they were absolutely cold bare tubes one had to consider that the effective volume of the combustion chamber was considerably less than the actual volume of the chamber.

Mr. NUNN, referring to water walls, asked what power station men were to believe with regard to them, because on the one hand they were told to build boilers with water walls, whereas an engineer from a station in North London had advised them not to adopt water walls, his reason being that they did not contain water at all, but a mixture of steam and water, largely steam.

A SPEAKER agreed that the cost per unit of heat in the steam leaving the boiler house was a useful criterion for comparing the efficiency of boilers. The cost of coal per unit generated was also not a bad basis of comparison.

Mr. NUNN pointed out that in arriving at commercial efficiency it was important to bear in mind the different prices which had to be paid for coal by power stations in different parts of the country.

Mr. RYCROFT made suitable reply.

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INTERFERENCE FROM LINE INSULATORS.

Methods of Avoiding Corona and Brush Discharges—Pin and Suspension Insulators Discussed—Moisture and Dirt One of the Worst Causes of Trouble.

By W. JACKSON, M.Sc.

THE expansion of high voltage transmission of electrical energy in this country by overhead lines introduces an important source of radio interference. The extreme sensitiveness of modern radio receivers makes them very susceptible to interference, and the comparatively small amount of energy involved in the electrical discharges likely to occur along high voltage lines is therefore sufficient to produce appreciable disturbance in broadcast receivers.

Different Effects.

These electrical discharges may be of two types—corona discharge and brush discharge. Corona discharge usually occurs at lower voltages than the brush discharge, and appears as a blue glow when viewed in a dark room. Brush discharge occurs after corona and takes the form of fine white streamers. The two produce entirely different interference effects. The corona discharge produces in a broadcast receiver a soft hissing sound which is not ordinarily objectionable. The brush discharge, however, produces a crackling, frying sound which is very annoying.

Corona and brush discharges are liable to occur on high voltage lines, either between metallic surfaces, between insulating surfaces, or between metallic and insulating surfaces. The avoidance of such discharges is a necessity if radio interference is to be prevented, and is therefore one of the problems which must be considered when deciding on insulator designs.

A discussion of the researches recently undertaken in America on this subject are outlined in a recent paper to the American Institute of Electrical Engineers.* In pin type insulators discharge can be avoided by ensuring that all hardware is tight, that adjacent pieces of hardware are either sufficiently well separated or are bonded together, that the conductors and tie-wires make perfect electrical contact with the top of the insulators, and that the pins make perfect electrical contact with the entire surface of the thread in the pinholes. These requirements are readily satisfied, with the exception of the last two. Several methods have been adopted in an attempt to secure good contact between conductors, tie-wires and insulators on existing pin type insulators. Metallic paints have been tried without success, because such paints form a coating of metal particles suspended in varnish, and do not offer a good conducting surface. Partial success has attended the use of metal discs attached to the conductors above the insulators, or by looping the tie-wire so as to form a ring several inches in diameter above the head of the particular insulator.

The best solution at the present time consists of metal gauze placed in the tie-wire groove. For new installations corona and brush discharge on pin type insulators can be eliminated by using metallic threads in the pinholes, by using metal coated or metal capped heads, and in some cases by using a special glaze on the head, or in the pinholes.

The suspension type insulator is a much less difficult problem. Both the spider type and the ball and socket type, while designed primarily for high mechanical strength, and high flashover voltage, rather than for high value of corona and brush discharge voltage, are found to be quite satisfactory from the point of view of radio interference. Clevis type insulators are also satisfactory when the cotter key is designed circular, and with the ends concealed inside the clevis bolt. The link type is satisfactory if sufficient loading is applied to keep the porcelain and links in intimate contact, and the voltage per unit does not exceed 14 000 V.

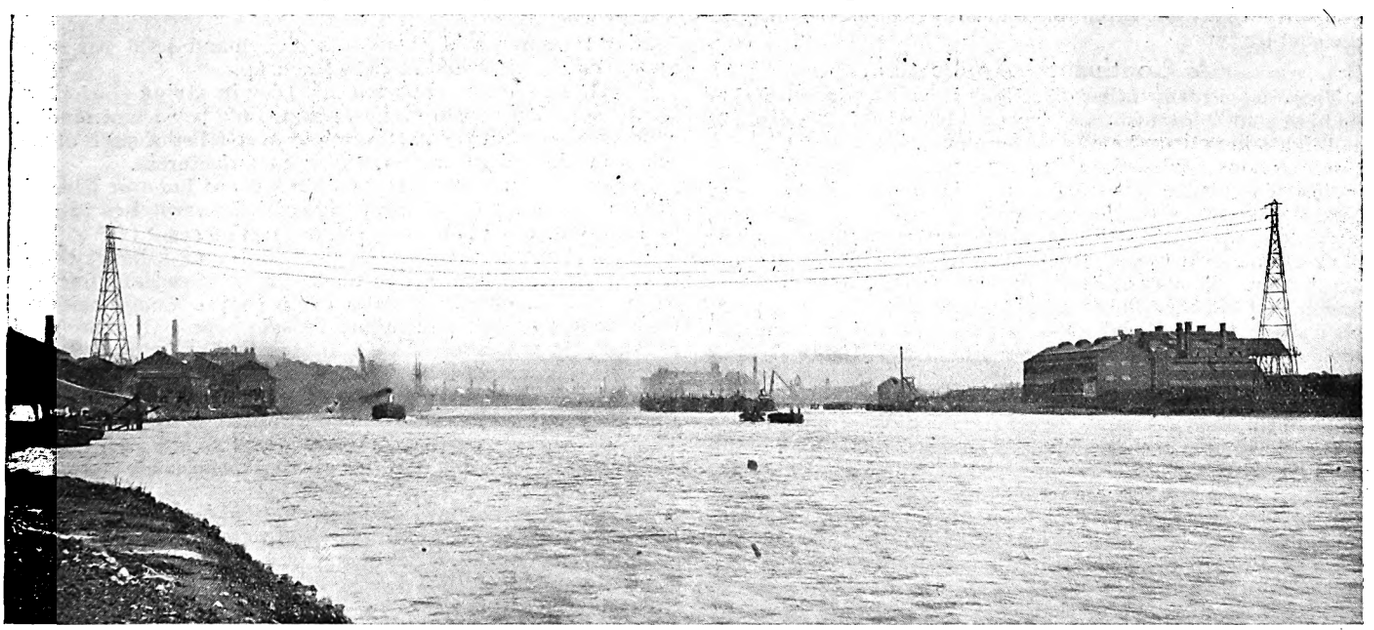
The effect of moisture and dirt in the case of both pin and suspension type insulators is to increase the tendency for discharge and radio interference, while defective, cracked or broken insulators may set up disturbances capable of affecting radio receiving sets many miles away. In either case the remedy is proper inspection and cleaning.

* Van Atta and White. "J.A.I.E.E." September, 1929.

UNDERGROUND LIGHTING FITTINGS.

The Underground Lighting Fittings Specification just issued by the British Engineering Standards Association provides for fittings for use with standard vacuum tungsten filament lamps, with a minimum rating of 60 W, and its main purpose is to ensure interchangeability of such parts as well as glasses that require frequent replacement. The provisions in regard to interchangeability are also extended to cover the attachment of the cables so that with the new standard fittings quick replacement of damaged units will be facilitated.

Copies of the specifications (Nos. 238–1929) can be obtained from the British Engineering Standards Association Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.



CROSSING THE TYNE.

AN interesting overhead line feature on the Newcastle Electric Supply Co.'s network is the river crossing seen above. Part of a 66 000 V double circuit line, it crosses the River Tyne from Dunston power station in a single span of 1 000 ft. The crossing towers are 168 ft. high, and the minimum clearance of the line conductors above high water is 114 ft. In the process of reproduction from the original photograph the conductors have run together, thus unduly emphasising their presence.

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SELLING TIME SWITCHES.

Applications in the Household—Lack of Enthusiasm in the Electrical Industry—An Example Set by New Zealand—Low Temperature Heating Systems—Views on Salesmanship Schools—Speciality Selling.

AT the E.D.A. Salesmanship Conference on November 15th, Mr. E. E. Sharp, lecturing on the subject of selling time switches, referred to the apathy and lack of enthusiasm for electricity among those engaged in the electrical industry. With regard to the selling of time switches, most of those who were or should be engaged in this class of work—contractors, and supply interests—needed a good deal more courage, initiative, and even common sense, than had hitherto been evinced. One of the commonest uses of the time switch was for controlling shop window lighting, but for the most part the work was bungled. As an instance he mentioned the case of a large stores in the neighbourhood where he himself lives. Hearing that there was trouble with the time switch he made a personal call and found the switch fixed low down in a cupboard where it was almost impossible to get at. The time switch was one of the cheapest type, although the premises were big and important; it was connected without a hand switch in parallel so that the window lights could not be switched on during the day in case of darkness or fog. No instructions had been given as to winding and setting, no key had been given to wind the clock and the switch had been set by the wireman to switch on at 4.15 a.m., and off at 9 a.m. He ascertained that it was the draper himself who had suggested the time switch to the local supply company and eventually he had to explain the whole thing and put matters right himself. Mr. Sharp suggested that many others were similarly placed.

How many of them were aware that there were time switches designed to look after themselves? How many of them were guilty of putting in alarm clock arrangements simply because they were cheap. He and his assistants had spoken to hundreds of shopkeepers all over the country—he was not exaggerating—and the story was nearly always the same. They knew there was some automatic appliance for turning off the lights, but they left it to the supply people or contractors to install what was necessary. There were many tiny shops of a primitive sort where alarm clock switching might be justified, but in the great majority of cases something that would turn on as well as off, and go on doing it for years without attention, was wanted. For those engaged in supply work, it was better to hire out the time switch because a cheap rate could be combined with it for lighting after closing time. But failing to do that, it should be explained to the shopkeeper which apparatus would do the most for him with the least attention and also the shortcomings of the simpler types.

A Continental Application.

There were many other directions in which time switches could be sold. For instance, they could be used for controlling hall lights in private houses. There were more switches sold direct to householders for this purpose than were sold by the trade. Then there was the control of staircases in blocks of flats. Everywhere on the continent a switch was used which, by pressing a button, illuminated the lamps for sufficient time to enable a tenant to travel between his flat and the street door. This was often combined with an ordinary time switch that kept the lights going from dusk till 10 or 11 p.m., when the temporary lighting device came into action. Another device was the programme ringer which would ring bells or buzzers all over a factory or business premises at meal times, and so on. There were numerous other applications which he would not catalogue.

Mr. Sharp stressed severely the danger of salesmen being obsessed with the question of price and mentioned several instances when he had obtained large contracts even when competing against prices 50% lower than his own, simply by being able to show the user the advantages of his own goods or suggesting to his client some better way in which they could be applied.

Finally, Mr. Sharp urged that time switches were important adjuncts to electricity supply, and mentioned that in one town in New Zealand there were about 7 000 in use on off-peak water heating and they were being connected at the rate of 50 per week. As an example of initiative, he mentioned that his firm has a scheme by which a salesman is loaned to electricity supply authorities for a week at a time to canvass for time switches in relation to shop window lighting. The appearance of this salesman in the district is preceded by a series of E.D.A. pamphlets sent to the shopkeepers for three weeks in advance, and then, a week in advance, a letter is sent saying the man will call. No mention of any firm or apparatus is made. The shopkeeper is spoken to and interested in shop window lighting, and in very many cases orders are booked, which means, incidentally, a time switch, wiring, lamps, etc., and so, said Mr. Sharp, the whole industry benefits.

Mr. Sharp expressed his disappointment in salesmanship schools and explained that in no case had he come in contact with a satisfactory student from the selling point of view.

DISCUSSION.

Mr. V. W. DALE (E.D.A.) differed from Mr. Sharp's views as to salesmanship schools and suggested that there were some which did useful work. He called attention, however, to the lack of schools for training girls who might enter the sales side of the electrical industry, and expressed the hope that Mr. Sharp might do something in that direction. Adding that he himself had adopted the practice of adding a new piece of electrical apparatus to his home every Christmas, Mr. Dale pointed out that there were two million people engaged in the electrical industry, and if everybody did that, there would be a tremendous demand both for domestic apparatus and appliances and current.

Mr. HAYES suggested that one of the reasons why time switches were not pushed to the extent they might be was that the ordinary electrical salesman had too many items to deal with and he therefore concentrated on the easiest selling line. There was a tendency towards the development of specialist salesmen, and we would have to come to that if all types of electrical apparatus were to be suitably and adequately dealt with.

Mr. H. W. WATTS (Epsom) said the time switch would help many station engineers during the next few years in regard to their maximum load. At the moment he could do with more plant, but hoped to get a bulk supply in December, when he intended pushing ahead with water heating and using time switches.

Col. W. A. VIGNOLES (E.D.A.) agreed that time switches would be a great help in levelling out peaks in the supply load which were troublesome at times. There was a great need for "gingering up," as Mr. Sharp had said, and the point was how to get at those people who did not attend these conferences.

Miss HASLETT said there was a demand here for such apparatus, but it would have to be cheap.

Mr. H. T. YOUNG supported Mr. Dale in saying that there were some salesmanship schools that could be recommended, and suggested that the E.D.A. might keep a list of such of the schools which might prove useful to manufacturers.

Miss READING mentioned that the City of London Electric Lighting Co. had installed a number of time switches in connection with low temperature heating in offices.

The CHAIRMAN (Sir John Brooke) proposing a hearty vote of thanks to Mr. Sharp, said he had not noticed any lack of enthusiasm among those who came to the Commissioners from time to time. It might be said that only the very enthusiastic ever hoped to get anything out of the Commissioners! There was, however, a tendency on the part of some people to regard the future for electricity as so assured that they had only to sit down and wait for it to come along. That, of course, was all wrong and therefore the point made by Mr. Sharp as to the need for greater enthusiasm than ever was a sound one.

Mr. SHARP, in acknowledging the vote of thanks and replying to the discussion, said he was glad to hear there was some good in salesmanship schools, and perhaps one day he would meet a product of such a school who could convince him. Up to now he had not.

Plans for extensions of the engineering department of Lincoln Technical College are in the hands of Mr. W. S. Watkins. The new buildings which will cost about £11 000 will provide advanced engineering education, and the accommodation will include laboratories for practical and experimental work in mechanics, electrical engineering, etc.

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ELECTRIC WARMING.

An Example of Operating Cost.

By R. GRIERSON, A.M.I.E.E., A.M.I. Mech.E.

(*Concluded from page* 601).

THE design of the electric panel system that I have described is such a radical departure from accepted standards that I find that many people regard it with suspicion, and I, therefore, ask you to consider the following details, which relate to the embedded plaster type.

A multiple strand conductor is employed; the conductors operate at a temperature of 130 deg. F. In other forms of electrical apparatus, similar conductors operate entirely satisfactorily for months, and even years, at a temperature of 1 830 deg. F.

In the embedded type the insulating material employed has been tested up to 350 deg. F. without noticeable deterioration, and actually operates at temperatures of the order of 130 deg. F.

I.E.E. Regulations (Table V) permit ordinary house wires to operate normally at 100-120 deg. F., for long periods, and at 130 deg. for short periods.

Short circuits are impossible, because the conductors are rigidly held in hard plaster and a space factor of at least 0·375 in. is maintained between turns and approximately 24 in. between the full voltage points.

The cost of operating an electric warming system is no easy matter to estimate with any degree of precision, for the factors are so variable, accurate measurement is so simple, and the maintenance of the required temperature is so precise. Units are units, but all coke is not good coke, and all stokers are not good stokers. Both coke and stokers can be blamed by hot water engineers. Electrical engineers can only blame the meter or the occupants of the building, or—as a last effort—their own calculations.

To consider only one detail, the animal heat emitted by the occupants of the room exceeds 0·1 Board of Trade units per hour. In our own offices, in two rooms of similar dimensions, one room facing south, occupied by several men, consumes no current on one day, while the other office occupied by one man, may take say 4 or 5 units. Further, heat storage, sunshine, etc., and the temperature maintained in adjoining rooms, all affect the total. On two days in the same month, for the same mean outdoor temperature and with a dead level thermograph chart on the 60 deg. line, the variation may be a difference of anything up to 2 or 3 units per day per room, and the discrepancy is not due to the meters, as these have been carefully calibrated.

From a London cinema equipped with the Dulrae panel system the following figures have been obtained :—

Total load	.. ..	31 500 W, or 107 000 B.Th.U.
Total cube	.. ..	55 000 ft.
Watts per cu. ft.	..	0·586.
Consumption	..	Year ending March 30th, 1928—24 202 units, or 768 units per kW installed.
		Year ending March 30th, 1929—29 627 units, or 940 units per kW installed.

If these totals are figured as to 60% at the 0·75d. rate, and 40% at the 0·5d. rate (which is now available), the annual cost is £60 and £74 respectively. In this case the animal heat of the audience is responsible to a considerable extent for the remarkably low figures obtained.

Figured on a theoretical basis the following results are obtained per kW, installed for a 30 deg. rise :—

One year = 365 days = 8 760 hours, or 8 760 units per kW installed to offset the heat loss.

The heating season can be taken at 212 days or 5 080 hours, or 5 080 units per kW installed to offset the heat loss, e.g., 58% of the year.

The mean outdoor temperature for the heating season is scheduled at 43 deg. F and therefore the average temperature rise required is 17/30 or 56·5% of the maximum of 5 080 units for the seven months, say, 2 875 units per kW installed per annum, to offset the heat loss, which is equal to 32·2% of the maximum possible.

Since the animal heat emitted by the occupants, effect of sunshine, etc., is usually omitted in calculations, the actual consumption will clearly be less than the calculated.

An interesting point is that where thermostatic control is employed and a dozen or more individual thermostats are fixed, it is impossible to conceive that, even in the coldest weather, all the thermostats will be closed simultaneously, e.g., there must be a considerable diversity factor.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Our House in Order."

[To the Editor.]

SIR,—I have to refer to the interesting article by Mr. T. C. Gilbert entitled "Our House in Order" which appeared in your issue dated October 18th, and particularly the reference to the National Register of Electrical Installation Contractors contained in the first paragraph on page 456.

This was brought to the attention of the Executive Committee of the National Register of Electrical Installation Contractors at their last meeting, on November 8th, and I am directed to inform you that this Institution has not at any time expressed any opinion against compulsory wiring rules.—I am, etc.,

A. MONTGOMERY,
For the National Register of Electrical Installation Contractors.

London, November 15th.

Electric Cooking is Cheap.

[To the Editor.]

SIR,—Under the above heading, in your last issue, "Elcook" states that he (or she) has installed an electric cooker and has taken very careful tests on a meter, which have proved that the supposed high cost of electric cooking is a fallacy. While it is gratifying to learn that "Elcook" has come to this conclusion, I think that some details should have been given. It is my belief that there is not a person in existence who would not prefer an electric cooker to a gas or coal cooker—despite the statements made to the contrary by persons having an interest in gas companies' shares—if it can be obtained and operated for an outlay not exceeding, or not greatly exceeding, that involved in the case of the old-fashioned equipment and methods. In some districts the charge for energy puts electric cooking out of the question, except for plutocrats, and before one can be impressed by your correspondent's conclusion it will be necessary for him (or her) to give particulars as to cost of cooker, cost of energy per kWh, and the quantity and class of food cooked per kWh.—I am, etc., DUBIOUS.

November 19th.

Overhead Lines or Underground Cables?

[To the Editor.]

SIR,—I think there are one or two points in the article by Messrs. Crompton and Ekstroem that require a little further explanation.

The relative costs of the overhead line and the cable of £1 000 and £1 300 per mile respectively appear to be a little biased, in so much that it is highly unlikely that the Central Board would use Continental cable, and, since their specifications are based upon the Electricity Commissioners' Regulations, it is unlikely that the cost per mile of even steel tower lines would be £1 000. A sound steel tower line with the tower set in concrete and designed to comply with all conditions, including those of broken wire conditions, can be constructed by direct labour at £500 per mile or less. This line would be suitable for three-phase 33 000 V. I would, therefore, suggest that the item for the cost of line should be £11 000 and the item for the cost of cable should be £40 700. This will, of course, alter the figures very completely.

Could the details of the wayleave costs be amplified a little more fully?

The 1½% allowed for management and upkeep of cable is surely a very low item, especially on 33 000 V cable. I rather think that this figure should be at least equal to the 4% allowed for the overhead line, and probably greater.

In the early part of the article it is mentioned that the major part of the "grid" scheme will be devoted to the development of the urban and rural districts. A development of the rural districts will only be financially successful if the "load on the land" is developed, and the crucial feature of this development is that the supply should be available *at any point on the land*. The use of cables will completely nullify this necessary condition. Personally I do not think that it is as likely that a farmer would allow a cable as it is that he would allow an overhead line, since in the course of the next year or two he will begin to realise the benefit of electricity for power purposes on his land and will come to insist upon an overhead supply being available.—I am, etc. J. A. S.

C

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NEWS IN BRIEF.

Scientific Glassware and Merchandise Marks—The Certification of Electricity Meters—A New Diesel-electric Ship—Rugby and the Hiring of Electric Fires—Chorley and Electric Cooking.

MORECAMBE Electricity Committee has arranged to take a lease of premises in Queen Street for showrooms.

Oldham Health Committee has authorised the purchase of two electric motors and a hauling machine for the sewage works.

Leeds Health Committee has authorised the provision of electricity for heating and lighting at Gateforth sanatorium, at a cost of £544.

The placing of contracts for the erection of sub-stations at Pemberton Road and Greenbank Drive, Liverpool, to cost £769 and £823 respectively, is recommended.

Portland Council is about to adopt electric lighting at Portland Police Station.

Burnley Corporation is to purchase an amplifying apparatus for use at public ceremonies when speeches are delivered to large crowds, at a total cost of £144.

A special sub-committee appointed to consider the reorganisation of Glasgow electricity department has decided to invite the President of the Glasgow Society of Architects to act as adjudicator in the selection of a scheme for the reconstruction of the premises at 75 Waterloo Street, for offices, showrooms, etc.

Warwickshire County Hospitals Committee reports that, owing to the many extensions to the sanatorium and the large number of attendances in the artificial light department, it has been found necessary to consider amplifying the electrical and heating services. A consulting engineer is to report on the work necessary to p ovide efficient services, adaptable for further extension.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated November 22nd, 1879 :—*

The shore end of the French transatlantic cable was successfully laid at Cape Cod.

The number of telegrams forwarded by the Great Northern Telegraph Co. in the nine months ended September 30th, was 647 833.

* * *

TWENTY-FIVE years ago THE ELECTRICIAN *recorded that :—*

The number of revenue earning telephones in use in Portsmouth was 2 000.

The total value of electrical exports from November 16th to 22nd, was £13 364.

* * *

FIFTEEN years ago it was stated in THE ELECTRICIAN, *dated November 20th,* 1914, *that :—*

The U.S. Navy Department had decided to make the super-dreadnought "California," the first electrically driven warship.

The Lancashire and Yorkshire and London and North Western Railways proposed electrifying large sections of their lines.

An exhibit at the British China and Glass Exhibition at Chesham House, Regent Street, London, last week was Verta glass, which is said to be an excellent material for electric light fittings.

The British Industries Fair London Exhibitors' Advisory Committee has agreed that, unless special permission is obtained all stands at Olympia made of stock material should have fascias 3 ft. deep on pilasters 8 ft. high. The Fair is to be held February 17th to 28th.

Ripon Electricity Committee has decided to allow the Power Lines Construction Co. to put in skeleton wiring at the new showroom. The question of obtaining electrical appliances, cookers, fires, irons, etc., has been discussed, and the Engineer is to arrange for firms to send appliances on sale or return for the first three months.

A meeting of the Leeds branch of the Electrical Association for Women was held in the Electricity Department Offices, Whitehall Road, Leeds, on November 13th, Mrs. Maxwell Telling presiding. Mr. C. F. Wells, of the Yorkshire Electric Power Co., dealing with the subject "Electricity in the Home," pointed out that in electrifying our homes we were approaching a solution of the domestic servant problem. There were more electric cookers per head of population in this country than in America.

A draft order in Council laid before Parliament provides that certain classes of imported goods, including scientific glassware, implements and tools, etc., when offered for sale in the United Kingdom, should bear an indication of origin. The goods affected by the Order include domestic, fancy and illuminating blown glassware (other than electric lamp bulbs), permanent magnets, vapour bulbs, condensation bulbs, condenser glass, electrolysis tubes, lecture and experimental apparatus, vapour density tubes, condensation tubes and vapour density apparatus.

Accrington Electricity and Tramways Committee is to be divided. The two departments are in future to be separate sections.

London County Council Public Control Committee has had under consideration a letter from Newcastle Corporation urging the need for introduction of legislation requiring the certification and stamping of all electricity meters.

A new laboratory equipped with mining machinery in the mining department of Birmingham University was opened last week by Mr. Evan Williams, president of the Mining Association of Great Britain. Its equipment includes coal cutters, conveyors and electrical and compressed air apparatus.

Amongst orders which the Furness Shipbuilding Co. has in hand is one for a 3 600 ton Diesel-electric driven vessel.

Eston Electricity Committee has asked the Electrical Engineer to report upon a suitable shop site for use as a showroom.

Coulsdon U.D.C. has decided to invite local firms to submit quotations for the lighting installation at the Council offices.

Hull Electricity Committee has agreed to take over a site on the new street from Paragon station, and the Electrical Engineer is to prepare designs for new showrooms and administration buildings.

Rugby U.D.C. has adopted a suggestion by the Electrical Engineer to let out on hire electric fires, at 8s., including 2s. maintenance costs, per annum for 2 kW, and 15s., including 2s. 6d. maintenance costs, for 3 kW fires.

Mr. H. J. H. Webb, district telephone superintendent, Aberdeen, said, in an address to the Arbroath Rotary Club on November 14th, there were now 20 trunk line circuits between London and Paris. He thought the longest call they had dealt with at Aberdeen had been from California to Portlethen call office.

Chorley Education Committee has received an offer from the Lancashire Electric Power Co. to instal and maintain an up-to-date electric cooker, free of charge, provided the Committee agrees to instruction in its use being included in the cookery course. The company states that current for the cooker would be supplied at 1d. per kWh.

The Committee of Management of Londonderry Asylum decided to use the C.T.S. wiring system in the asylum and accepted a tender for the work. The Northern Ireland Ministry of Home Affairs favoured galvanised screwed tubing. The Committee has decided to inform the Ministry that it will adhere to the C.T.S. wiring or consider the abandonment of the whole scheme.

The report of Mr. A. D. Nicholson, who retired recently from the post of inspector of mines for the Lancashire and North Wales Division, states that in that division in 1928, there were 117 coal-cutting machines driven by electricity and 875 worked by compressed air, compared with 120 and 857, respectively, in 1927. The number of coal conveyors in use last year was 219, an increase of 37.

An experiment by the Glasgow Education Authority, in conjunction with the Telephones Department of the Post Office, was commenced last week, when demonstrations of the working of a telephone exchange were given in Dennistoun Public School, Glasgow, to children attending commercial courses. The object of the experiment is to teach children how to use the telephone. Practical demonstrations are given by operators at miniature exchanges representing Douglas and Central Glasgow.

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PERSONAL.

M. Ad. Curchod has been appointed editor-in-chief of the "Revue Générale de l'Electricité."

Sir Philip A. M. Nash has been re-elected President of the British Cast Iron Research Association.

Ald. H. J. Goldschmidt is succeeding Ald. Swales as chairman of Manchester Corporation Lighting Committee.

Sir Ernest Benn has been co-opted as a member of the Executive Committee of the Advertising Association for the ensuing year.

We are pleased to learn that Sir Hugo Hirst, who has recently been seriously ill, is improving daily, although he has not yet been able to return to business.

Mr. R. L. Acland is proceeding to India shortly on an extensive tour, during which he will visit all the principal electricity supply undertakings. He expects to be away about four months.

Shoreditch (London) Electricity Committee has appointed Mr. A. F. Cox, outside engineer of the Hewittic Electric Co., Ltd., as electrical maintenance engineer, at a salary of £422 17s. per annum.

Estate of the gross value of £10 459 with net personalty £10 439, was left by the late Mr. Henry Thomas, Vevey, Schiasse, for 34 years contract engineer to Callender's Cable and Construction Co., Ltd.

Estate of the gross value of £3 674, with net personalty £2 396 was left by the late Dr. Richard Vernon Hansford, a member of the research staff of the General Post Office, who died on October 5th.

The marriage of Mr. Rowland Wright, assistant superintendent of the Madras Electric Supply Corporation, Ltd., and Miss Gladys Ethel Stubbs, was solemnised at St. George's Cathedral, Madras, on October 26th.

To Miss W. L. Hackett, of King Edward's High School, Birmingham, belongs the distinction of being the first girl to enter the examination for the Bowen Scholarship for Electrical Engineering at Birmingham University.

Mr. G. R. T. Taylor has resigned his appointment as deputy-chairman of Vickers, Ltd., but retains his seat on the Board. Mr. G. G. Sim has been appointed deputy-chairman in his place. Mr. J. Reid Young has been appointed secretary to the company in place of Mr. Sim.

Bristol Electricity Committee has appointed Mr. S. M. Hill, station superintendent of the Padiham station of the Lancashire Electric Power Co., as station superintendent at Portishead at a salary of £672 per annum, and Mr. T. Wells as boiler house superintendent at a salary of £511 per annum.

The marriage of Mr. Reginald H. Palmer and Miss Muriel Irene Maud Cracknell, the soprano, was solemnised at St. Martin's-in-the-Fields, London, on November 15th. The duties of best man were capably carried out by the bridegroom's brother, Major Clifford H. Palmer, who is also very well known in the trade.

Mr. F. Hayes had resigned his position as deputy engineer and station superintendent at Plymouth electricity works in consequence of continued ill-health. The resignation was accepted with much regret and the Committee placed on record appreciation of the diligent and faithful service rendered by Mr. Hayes over a period of 27 years.

Obituary.

Dr. W. C. Escher, chairman of the Board of the Banque pour Entreprises Electriques and a director of the Cia. Hispano-Americana de Electricidad.

Mr. William Brooks Sayers, on November 17th, aged 68 years. His connection with the industry started with Crompton and Co., at Chelmsford, in 1888, and continued successively with the original Chamberlain and Hookham, Ltd., Mavor and Coulson, Ltd., and afterwards in private practice.

Mr. Ernest Laremont Fleming, on November 15th, aged 75 years. He was the originator of the scheme for the production of electric power from the tidal waters of the river Exe, and acted as honorary secretary of the Exe Power Experimental Association. He was a brother of Sir J. A. Fleming, who was present at the funeral on Monday.

Signor Guido Semenza, on November 7th, aged 61 years, past President of the International Electro-Technical Commission. He was for a time with the original Edison Company in America and was chief engineer of the United Edison Company until 1917. He was awarded the Faraday Medal of the I.E.E. in connection with the leading part he played in electrical development. See page 649.

SOUTHEND'S ELECTRICITY.

Electricity Commissioners' Inquiry Regarding Loan for Diesel Sets.

Southend Corporation's application for sanction to a loan of £66 000 to cover the cost of three 1 200 kW land Diesel generating sets was the subject of a recent inquiry by Col. T. C. Ekin, on behalf of the Electricity Commissioners. Mr. Sydney Turner, on behalf of the Corporation, said the existing plant was overtaxed, and instead of encouraging the use of electricity they were obliged to discourage it. In the year ended March last the Corporation generating plant amounted to 8 250 kW, and during that year the maximum load was 8 182 kW. With reference to the present bulk supply from the County of London Co., the Corporation did not regard £5 10s. per kW, plus 0.3d. per kWh as satisfactory.

Mr. A. C. Johnson, acting borough electrical engineer, gave particulars of his scheme to improve the condition of the undertaking, which was on the lines of using a bulk supply for the base load, modern Diesel plant for the lower peak and the existing plant for the top peak. He said they could not urge the sale of electricity for domestic purposes, because of the inadequate supply. It was hoped to close down the Thorpe Bay station in four years' time, and they wished to concentrate the plant at London Road. If they had the new Diesels there would be a saving of at least £15 000 a year.

Mr. F. Lonsdale, sales manager of Fraser and Chalmers, Ltd., said he was responsible for the offer of the three 1 200 kW land type Diesel sets at the cost of £60 000, and he thought £1 000 was reasonable for the foundation of each engine.

Mr. Harold Hobson, supply engineer to the Central Electricity Board, said they were satisfied that the proposal of the Corporation would involve the Board in unnecessary expense. He did not agree that the installation of the sets for which they were applying would have advantages for Southend. They could bridge the gulf between now and the Central Board supply in 1931 by keeping the present plant in commission. After speeches by Counsel, the inquiry was closed.

A.S.E.E. DINNER.

Successful Gathering of Over 240 Members and Their Friends.

The Association of Supervising Electrical Engineers held a whist drive, dinner and dance at the Mecca Restaurant, London, on November 16th, at which over 240 members and their friends attended. The President of the Association was prevented from attending owing to illness, and in the circumstances Mr. B. C. Garman, the chairman of the Association, presided at the dinner. The function was in every way a success, and during the dinner Mr. F. W. Smith (vice-chairman of the Association), following the loyal toast, proposed "The Ladies," which was replied to by Mrs. B. C. Garman.

Mr. E. E. Gammon (treasurer of the Association) acted as M.C. for the whist drive, and Messrs. E. L. Eastell and F. W. Smith for the dance. The spot-lights, which added to the general success of the function, were kindly loaned through the good offices of Mr. L. E. Buckell. The winners of the whist prizes were: Ladies—1st, Mrs. N. Young; 2nd, Mrs. E. R. Carter; booby, Miss P. Wray. Gents—1st, Mr. E. D. Smith; 2nd, Mr. C. Norriss; booby, Mr. C. H. Taylor.

A photograph taken during dinner is reproduced on page 649.

ELECTRICITY SUPPLY IN GERMANY.

Statistics relating to the generation and sale of electricity in Germany during the first seven months of the current year have been supplied by "Wirtschaft und Statistik" and published by the "Financial Times." It is stated that during the first seven months of the current year generation of electricity showed an advance of 18% on the same period in 1928. At this rate of progress the total supply will reach about 32 000 000 000 kWh this year, compared with 27 800 000 000 in 1928. Since 1925 the annual figure has risen by over 60%. During 1928 there were in existence 7 217 power works, of which 1 417 were owned by public authorities, producing about three times the energy of the 5 800 private works. During 1928 sales amounted to 13 200 000 000 kWh, including imported energy to the extent of 293 000 000 kWh. During 1928 brown coal was used in the production of 37% of the total supply of electricity. Mineral fuel followed with 38%. The output in 1928 was 422 kWh per capita, against 392 kWh in 1927. This compares with 830 kWh in the United States in 1928.

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IN PARLIAMENT.

Points from Answers to Questions of Electrical Interest in the House of Commons.

ANGLO-Canadian telephone calls are switched in New York.

The Minister of Transport is not aware that the question of any extension of the Bakerloo tube railway beyond the Elephant and Castle is under consideration at present.

Of the £1 500 000 to be expended this year and next on extensions of the telephone programme, £233 000 is to be expended on improving telephonic communication between Belfast and Glasgow. The cost of the Northern Ireland portion of the work is estimated at £40 000.

Before appointing the Central Electricity Board a large number of associations and individuals representative of the interests of local government, electricity, commerce and industry, transport, agriculture and labour were consulted. The Minister of Transport cannot undertake to give a detailed list of those who were consulted.

A new hand combination telephone instrument is being introduced in the Post Office telephone service as an alternative to the present candlestick pattern, and supplies are expected about the end of the year. The new pattern will be more costly to provide and maintian than the old instrument, and subscribers who desire to have it installed will be asked to pay an additional charge of 4s. a quarter.

The Central Electricity Board has entered into contracts for laying three experimental lengths—totalling about 12 route miles—of main transmission cables in the London area; the estimated cost for double circuit underground cables is £30 000 per mile in round figures and for single circuit underground cables £15 000 per mile; and these amounts are from eight to ten times more than the cost of the erection of double circuit and single circuit overhead lines respectively.

The amount held on deposit at the credit of telephone users was £2 690 717 on September 30th. The Assistant Postmaster-General states that after the subscribers pay their accounts from about five weeks down to the end of each quarter, the Department holds a sum of about £2 500 000 in excess of the proved liabilities of subscribers for the rental and calls. This credit disappears and is replaced by a debit which increases to about £2 500 000 just before the next quarter's accounts are sent out and paid.

In reference to a question whether he will sympathetically consider the granting of free wireless licences to old age pensioners or issuing them at a reduced rate, the Postmaster-General says the Broadcasting Committee, 1925, considered the question of the grant of free wireless licences and recommended that this concession be made to blind persons only. The Postmaster-General does not consider that he would be justified in asking Parliament to grant any similar concession to other classes of the community.

The attention of the Home Secretary having been drawn to the annual Report of the coroner for the City of London and Southwark, and his reference to underground subway explosions in London and the need for an inquiry into the general question of subways of this kind, the Minister says he has been in communication with the other Departments concerned and the London County Council. Replies have not been received from all the Departments which were consulted, and no final decision has yet been reached.

Normally the conversion of a manual to an automatic telephone exchange does not take place until its capacity is exhausted or until the economic life of the plant has expired. The date of complete conversion of the London area to automatic working depends to some extent on the rate of growth of the demand for telephones. About 130 exchanges are expected to be working on an automatic basis by 1940, when about 20 exchanges would remain for conversion. On the basis of present prices the expenditure on buildings and equipment for automatic exchanges up to 1940 will be of the order of £25 000 000.

Statistics issued by the American Telephone and Telegraph Co. show that at the end of the year 1928 the total number of telephones in the world was 30 990 304. Of these, 18 522 767, or 59·8%, were in the United States; in Europe, 8 623 407, or 27·8%, and in the remaining countries, Asia, Africa, Oceania, and the entire western hemisphere outside of the United States, 3 844 130, or 12·4%. Great Britain's share was 1 633 802, or 5·27%. In relative telephone development, as in absolute number of telephones, the United States, with 15·8 telephones for each 100 people, leads the world.

BUSINESS ITEMS.

THE telephone number of the Ipswich branch of the GENERAL ELECTRIC CO., LTD., has been changed from Ipswich 2379 to Ipswich 3771 (two lines).

THE reconstructed showrooms of Rd. Johnson, Clapham, and Morris Ltd., at Manchester.

WALSALL CONDUITS, LTD., announce that the head office organisation and other departments at Walsall have now been transferred to the Excelsior Works, West Bromwich.

EAGLESTON AND SON, LTD., of St. Clement's Street, Oxford, and G. R. COOPER, LTD., of St. Ebbe's Street, Oxford, both electrical engineers, were prize winners in the Oxford window display competition.

The ARROW ELECTRIC DIVISION, of the Arrow-Hart and Hegeman Electric Co., Hartford, Connecticut, has recently moved to new ground floor offices and showrooms at 79, Great Queen Street, Kingsway, London, W.C.2.

The HORSTMANN GEAR CO., LTD., of Newbridge Works, Bath, is showing a full range of "Newbridge" electric time-switches on Stand No. 5, Row B, Gallery, at the Public Works Exhibition, Royal Agricultural Hall, London, which concludes to-morrow, Saturday.

INTERNATIONAL COMBUSTION, LTD., announces that the associated company, International Combustion Engineering Corporation, of America, has secured from the Ford Company an order for two double Ladd boilers 700 000 lb. each actual maximum evaporation, 1 400 lb. pressure, 750 deg. F. superheat, and also a further order for two boilers of 300 000 lb. maximum evaporation at 1 400 lb. pressure and 750 deg. F. superheat for Milwaukee.

West Hartlepool Electricity Department organised an electrical exhibition at premises in Lynn Street, from November 4th to 9th. Special features of the show were an all-electric café and cookery demonstrations. In a temporary lecture theatre coloured lighting effects were produced, illustrating "A Rainbow Curtain." "Joseph's Coat," "Truth in Advertising," "Sunrise in the Desert," etc. Another exhibit took the form of a "bargain counter" where apparatus was "taken in part payment for other appliances."

It is interesting to note that Quin and Axtens, Ltd., have joined a number of other large London stores, amongst which may be mentioned Peter Robinson, Ltd., Arding and Hobbs, Ltd., and John Lewis and Co., Ltd. in the installation of "a special system of 'Marconiphones'" throughout their buildings, prior to the opening of the Christmas bazaars. A number of loud speakers will be placed at convenient points and supplied from a central amplifier driven from the mains. Suitable music will be distributed from gramophone records in conjunction with a new electrical pick-up, and a simple switch will enable an operator to announce any items required by the management. Experience has shown the value of this method of publicity in disposing of any lines which are to be cleared, and in directing the public attention to any special display, etc. Incidentally, where a gramophone department forms part of the stores it has been noted that a marked increase of sales occurs amongst those records which are played through this system.

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ELECTRICITY IN MINES.

More Motors being Installed—Nearly 1 500 Mines Use Power.

THE Report for 1928 of Mr. J. A. B. Horsley, H.M. Electrical Inspector of Mines, which has now been published, contains much of interest to electrical engineers, managers and others concerned with electrical equipment at mines. Progress in electrical development at mines under the Coal Mines Act is analysed in detail. The total horse power of motors installed was 1 722 332, or 38 000 H.P. greater than in 1927. Electricity was used at 1 467 mines. The statistical tables include a regional analysis of the H.P. of motors installed, showing the comparative use of direct current and alternating current, and analyses (with comparative figures for 10 years) of fatal accidents, classified according to the type of accident, the employment of the persons killed and the nature of the equipment involved.

The Inspector describes the 15 fatal accidents attributable, either directly or indirectly, to the use of electricity which occurred during the year, and makes suggestions with a view to preventing accidents of a similar nature in future. He also gives particulars of three dangerous occurrences of an unusual nature, and describes 21 recent electrical accidents involving trailing cables and plugs. The Inspector classifies the latter, and discusses the question of design of plugs and trailing cables.

In regard to coal-cutting machines, general analyses of the number and description of machines in use at coal mines during the last ten years are given, together with regional analyses of the quantities of machine-cut coal and other mineral got by electricity and by compressed air. The report states that 25·2% of all coal mined during 1928 was machine cut, and 65·9% of machine-cut coal was got by means of electric coal cutters. The Inspector draws attention to the interest which is being shown in the application of automatic startors (remote control) to coal-cutting machines and to the question of the practicability of the standardisation of trailing cables, which is now being investigated by the B.E.S.A.

Copies of the Report (price 6d., by post 7d.), can be obtained from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

INDIVIDUALIST LUNCHEON.

Sir Ernest Benn and the Liberty to Build.

A FEATURE of the 28th of the series of monthly Individualist luncheons, held on November 13th at the Hotel Cecil, was the return of Sir Hugh Bell to the chair after an absence of many months, occasioned by his long illness. Sir Hugh introduced the principal speaker, Sir John Tudor Walters, M.P.

Sir John Tudor Walters, at one time chairman of the Committee on housing and now President of the Housing and Town-planning Trust, said that he thought it would be a surprise to many people to learn that there was such a thing as private enterprise in housing; many imagined that to-day the only new houses were council houses. The first industrial housing association which was formed for the erection of houses in Yorkshire, Nottingham and Derby, had built 12 000 houses in four years, and simply with the aid of the State loan it was able to build houses without subsidy, and, which was more, had earned and paid the dividends on the loan, and had been left with annual surpluses that were being expended on the provision of public baths, hospitals, welfare centres and other amenities. Some of these houses were parlour and others non-parlour houses, each with a good kitchen-scullery, three bedrooms, central heating, and electric light at ½ of a 1d. per unit, not to mention adequate provision for the perambulator. The rent was in many cases as low as 7s. 6d. per week, The difficulties facing those who set out to provide housing accommodation could be surmounted, without troubling the State, by private enterprise.

Sir Ernest Benn in reply said that there was a great deal more in the housing question than was generally realised. He saw a great nation spending millions a year in educating a great people for whom they had made no adequate provision. He did not believe that their children would be content to live in the houses that many lived in to-day. Sir Tudor's great achievement was the genius that had enabled him to pick his way through over three hundred Acts of Parliament and to overcome the barriers in his path. In voicing the need for individualism in housing, the liberty to build, they could do no better than try to get rid of the restrictions which surrounded the building of a home.

SMOKE ABATEMENT.

A Brief Review of Some of the Outstanding Items Shown at Manchester.

THE electrical industry was well represented at the Smoke Abatement Exhibition held in Manchester under the auspices of the "Daily Dispatch." Perhaps the most striking, and certainly the largest exhibit in the show was that of the E.D.A., which represented in a practical manner the manifold ways in which electricity can be used to provide us with a cleaner atmosphere. The stand was made up of special exhibits by a large number of supply undertakings, contractors, and manufacturers. The centre of the stand was occupied by the various rooms of an all-electric house. Then there was an all-electric bakehouse equipped by the General Electric Co., Ltd., which was representative of a large number of electric bakeries which have been started in various parts of the country. Something new in the way of electric fires, and of which a description will be available shortly, was shown by Ferranti, Ltd., Hollinwood. This is built into the hearth, and preliminary tests indicate a thermal efficiency of over 90%. The ventilation provided changes the air in the average room once in an hour. Electric washers, wringers, and ironers were shown by the Edison Swan Electric Co., Ltd., while W. E. Beardsall and Co., Ltd., of Manchester, were showing the "Two-Twelve" electric boilers. The Siemens-Schuckert (Great Britain), Ltd., demonstrated their electrical precipitators, which are also used for precipitating dust in the manufacture of coal brickettes, and for a large number of other purposes. Briefly, one high voltage electrode charges the carbon or dust particles, which causes them to be attracted by another electrode. They then fall into a container by their own weight. The same firm illustrated an electrical method of measuring carbon dioxide in boiler flues. W. R. Patents, Ltd., were showing their various mine safety devices.

COLONIAL AND FOREIGN IMPORTS.

Amendments to Duties Affecting the Importation of Electrical Goods.

THE following amendments in the Hungarian Customs import duties came into operation on October 6th. The duty on wireless equipment and apparatus, parts and accessories (except receiver and transmitter electron valves) is now 800 gold kr. per 100 kilos, compared with the former duties of 400 or 600 gold kr. The duty on receiver valves is 1·50 gold kr. each, and on transmitter valves 30 gold kr. each (not specified in old tariff); on electric light bulbs the duty is 15 gold kr. per lin. metre (not previously specified). The former duty of 30 gold kr. per 100 kilos on electro-therapeutic apparatus has been superseded by a duty of 60 gold kr. each in the case of X-ray tubes and quartz lamps and a duty of 250 gold kr. per 100 kilos in the case of other electro-therapeutical apparatus. The duty fixed for articles falling under the heading of "electro-therapeutic apparatus" may be levied only on complete apparatus and on X-ray examining (lighting) stands and equipment, X-ray illuminating tables and X-ray stands and electro-therapeutic transformers weighing more than 5 kilos. Other articles under the same heading will pay 10% of the nominal duty.

The following are recent decisions as to the classification of various articles imported into Belgium: Magnets, 10 cm. or more in length, dutiable as "magnets" (No. 1 078), duty, 240 frs. per 100 kilos.; less than 10 cm., to be used as toys, dutiable as "toys" (No. 1 195); duty, 20% *ad. val.*; magnetos, dutiable as "dynamo-electric machines" (No. 1 075), duty according to weight; medium frequency wireless transformers, dutiable as "electrical apparatus, with coils" (No. 1 089*a*), according to weight.

New Zealand imported electrical machinery, etc., during July last valued at £132 782, and the aggregate from January to July, inclusive, was £934 499.

The electrification of the Great Northern Railway of America is the subject of publication No. 1857, issued by the WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., East Pittsburgh, Pa. Other publications received from the same firm are are D.M.F. 5229, dealing with electric tools; L.161 D, describing class 13-125 and class 13-225 magnetic starters for wound rotor induction motors; and L.20382 A, concerning induction frequency changers.

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CIRCUIT-BREAKING.

Problems of Line Flashovers—New Switchgear of Outstanding Dimensions.

IN these days of interconnected systems, oil circuit-breakers are being subjected to more and more severe operating conditions. With the increase in size of any electrical system, new switching difficulties arise. Line flashovers become more prevalent as the lengths of the transmission lines are increased. Large amounts of power are lost in these flashovers, and continuity of service may be seriously affected thereby. It is possible to increase the insulation of a transmission line to a point that flashovers will be negligible, but when a surge occurs it will rebound greater distances and greatly endanger the generating or distributing apparatus.

When it is practical to increase the line insulation to a point that line flashovers will be reduced to a minimum, it is also necessary to increase the size of the oil circuit-breakers and other equipment at the sub-station. In this connection it is interesting to note that what is claimed to be the largest oil circuit-breaker has been ordered by the Public Service of New Jersey from the Westinghouse Electric and Manufacturing Co. for the Roseland sub-station. The overall height of the breaker is 25½ ft. The internal diameter of each tank is 10 ft., and the assembled pole units and mechanism extend 45 ft. wide. The tanks hold 22 000 gall. of oil and are insulated for 250 kV. The weight of the complete unit is 141 tons. The circuit-breaker has a continuous current rating of 600 A and a published interrupting rating of 8 000 arc-amperes at 220 kV or 3 000 000 arc kVA. One solenoid mechanism operates the three poles at a high speed. The mechanism is mechanically and electrically trip-free in any position of the closing stroke. The tanks are constructed of boiler-plate steel with riveted and welded seams. They are cylindrical in shape with domed shaped tops and bottoms. Baffled vents for the release of gases are located at the extreme top of the tank. A gauge glass of sufficient length to indicate the oil level over a wide range of temperature changes is provided. The pole unit mechanism is mounted in the top of the tank and is connected with the pull rod through a short shaft. This arrangement is made gastight as the pull rod is mounted in a separate chamber, which makes it impossible for gas or oil to communicate from pole to pole. The lift-rods are of woodbase Micarta. The arcing contents are of the bayonet rotating high-speed type. The moving contacts travel with the lift rod, while the bayonet contacts travel in the opposite direction, making the contact separation at an extremely high speed. Hydraulic bumpers retard the moving contacts after they have travelled 95% of the opening stroke, and prevent rebound. The condenser type of terminal bushings are used, and these are tapped for the condenser bushing potential device that is used in place of a metering transformer. Multi-ratio bushing-type of current transformers are used for metering and relay operation, giving ten ratios from five leads. A semaphore operating indicator readily reveals whether the circuit breaker is in the "open" or "closed" position.

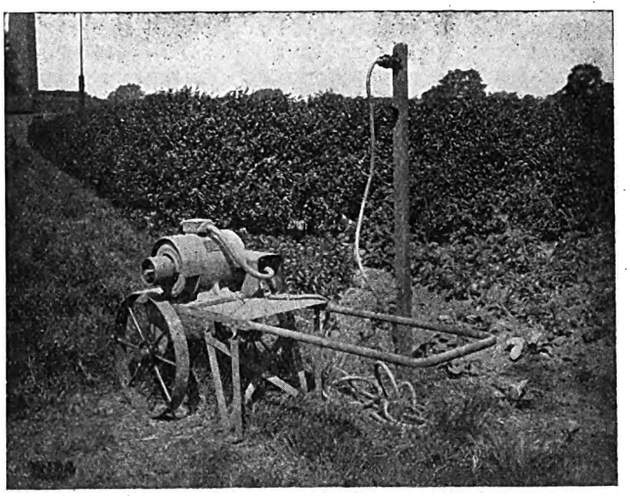
HOLBORN SUBWAY EXPLOSIONS.

Recommendations with Respect to Ventilation, etc.

LONDON County Council General Purposes Committee having considered the recommendations made by the Commission of Inquiry into the Holborn explosions and fires, advises that the Council should express the opinion that effect should be given to the recommendation of the Commission as to the ventilation, etc., of underground cavities only so far as regards the ventilation of cellars and vaults constructed under streets and connected with buildings and that the necessary action should be taken by way of an amendment of the London Building Acts, that the employment of continuous detectors to give warning of the presence of gas is not practicable in the case of sewer manholes, and that in view of the serious objections which exist to the setting up of a new co-ordinating authority, as suggested by the Commission, consideration should be given to the possibility of securing the end in view by some extension of the powers of the Minister of Transport under the London Traffic Act, 1924. Mr. Culpin has given notice of an amendment that the necessary powers and duties, so far as the Administrative County of London is concerned, should, pending the setting up of a new directly elected central authority for an enlarged area, be conferred on the Council.

AGRICULTURAL MOTORS.

WITH the increasing adaptation of agricultural machinery to electric operation certain types of motors are being specially developed by leading firms for the exclusive use of the farmer. Among such agricultural motors may be mentioned the



An example of the B.T.H. 5 H.P. motor equipment designed for agricultural purposes.

two standard models manufactured by THE BRITISH THOMSON-HOUSTON CO., LTD., of Rugby. These motors are rated at 2 H.P. and 5 H.P., respectively, the speed of each being 1 400–1 500 r.p.m. They are suitable for 3-phase a.c. at 220 V (50 cycles) or for d.c. at 220 V. Other sizes, voltage ratings, etc., can be obtained if specially desired. A complete portable unit can be obtained by mounting the 2 H.P. motor, together with the startor, on a steel cradle, or by similarly mounting the 5 H.P. motor on a structural steel wheelbarrow. A 5 H.P. portable outfit is shown in our illustration; the motor is fitted with a pulley 5½ in. dia. by 4 in. face, and starting is effected by a robust Y-delta startor housed under a protecting cover; connection is made to a water-tight socket by a 4-pin plug at the end of a 40 ft. length of 3-core ·01 sq. in. C.T.S. cable with earthed core. It is stated that most farmers who instal one or more electric motors on trial prefer the portable arrangement at first, so that they can test the motor with different machines, at the same time keeping capital outlay at a minimum. Since many agricultural machines run at a comparatively low speed, sufficient reduction often cannot be obtained by belting. This difficulty is obviated by the use of a countershaft, or alternatively by employing a B.T.H. back gear equipment.

The construction of the motors is briefly as follows: The 2 H.P. a.c. motor is of the squirrel cage type, while the 5 H.P. size is a slip-ring motor. The rotor of the 2 H.P. motor has bars and end-rings of aluminium cast in one piece. The motors are equipped with a roller bearing at the pulley end and a ball bearing at the other; the end shields in which the bearings are carried are spigotted into the stator frame.

The d.c. motors, 2 H.P. and 5 H.P., are alike in construction, having commutating poles and the same kinds of bearings and endshields as the a.c. motors. Both a.c. and d.c. types are stated to be able to operate continuously as their rated loads without the temperature rise, exceeding 40 deg. C., except at the slip rings and commutator. On the latter parts the rise will not, it is claimed, exceed 45 deg. C. The overload torques which the motors will sustain without injury are given as 25% for 15 minutes, 50% for one minute, and 100% for 15 seconds.

PHOSPHOR BRONZE BARS.

A specification for phosphor bronze bars or rods has recently been issued by the British Engineering Standards Association. This specification is drawn up on parallel lines to the specifications for brass bars published in 1926, and covers round, square, and rectangular bars from ¼ in. to 2 in., and hexagon bars for standard nuts from No. 3 B.A. to 1¼ in. B.S.W. and 1⅛ in. B.S.F., with specified margins of manufacture. The chemical composition of the material, mechanical tests, and the procedure for selecting samples for these tests are laid down.

Copies of the specification (No. 369—1929) can be obtained from the British Engineering Standards Association, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

AMALGAMATED ANTHRACITE COLLIERIES, LTD.—Six months' supply of electrical goods (form 8). Particulars from the Controller of Stores, Amalgamated Anthracite Collieries, Ltd., Eagle Chambers, Swansea. Stamped, addressed envelope to be sent.

HAMBLE PARISH COUNCIL, November 22nd.—Electric street lighting installation. Specification, etc., from the Clerk of the Council, Elstow, Hamble Lane, Hamble.

WEST DERBY GUARDIANS, November 22nd.—Electric supplies. Forms of tender, etc., from the clerk, Mr. G. O. Holloway, Union Offices, Brougham Terrace, Liverpool.

ALLOA CORPORATION, November 23rd.—Electrical installation work in connection with erection of 36 houses at Ashley Terrace, Alloa. Schedules, etc., from Messrs. J. Melvin and Son, architects, Mar Street, Alloa.

BEXHILL CORPORATION, November 23rd.—Electric light installation at isolation hospital. Particulars from the Borough Electrical Engineer; deposit £1 1s.

EDINBURGH CORPORATION, November 23rd.—Electric lighting and power installation in block of twelve houses and eight shops at Prestonfield Shopping Centre. Specification, etc., from the City Electrical Engineer, Dewar Place, Edinburgh; deposit £1 1s.

MANAGERS OF CENTRAL LONDON SCHOOL DISTRICT, November 23rd.—Electric motor, with reduction gearing, starter, etc. Specification from Mr. G. P. Morrell, clerk to the Managers, Greenford House, Hanwell, London, W.7.

WEST RIDING EDUCATION COMMITTEE, November 23rd.—Electric lighting installation at Mexborough County School. Specification from the Education Officer, County Hall, Wakefield.

HOLYWOOD (CO. DOWN) URBAN DISTRICT COUNCIL, November 25th.—Supply of watt-hour meters. Specification, etc., from the Electrical Engineer and Manager, Sullivan Place, Holywood; deposit £1 1s.

PLYMOUTH CORPORATION, November 25th.—Supply of steel lamp columns. Specification, etc., from the City Electrical Engineer, Electricity Department, Armada Street, Plymouth.

SALFORD CORPORATION, November 25th.—Electric travelling and slewing jib crane (2½ tons capacity). Specification, etc., from the City Electrical Engineer, Frederick Road, Salford.

SALFORD CORPORATION, November 25th.—Alterations to electric light installations in two schools. Particulars from the Secretary of Education, Education Offices, Salford.

STONE (STAFFS) URBAN DISTRICT COUNCIL, November 25th.—Overhead 11 000 V transmission line (2 300 yds.), outdoor sub-stations (2–50 kVA), l.t. overhead distribution (1 400 yds.), services, etc. Specification from Mr. W. M. Selvey, Independent Buildings, Sheffield; deposit £2 2s.

HEMEL HEMPSTED CORPORATION, November 27th.—Supply and fixing two electrically driven high lift turbine pumps, with starters and control gear, at Marloes waterworks. Specification, etc., from the Water Engineer, Market Square, Hemel Hempsted.

Equipment for Government Generating Station.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., November 28th.—High tension and low tension switchgear, transformer and cables, for H.M. Office of Works' generating station, South Kensington, S.W. Specification, etc., from the Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

EDINBURGH EDUCATION AUTHORITY, December 2nd.—Electric lighting and heating installations in the projected extension of Lochend Road School. Specifications, etc., from Mr. J. M. Johnston, 47, Charlotte Street, Leith.

STOCKPORT CORPORATION, December 2nd.—Supply and erection of 6 600 V switchgear, comprising metal-clad, compound-filled switch units. Specification (No. 3A) from Mr. R. Lee, borough electrical engineer, 23, Tiviot Dale, Stockport; deposit £1 1s.

BIRMINGHAM GUARDIANS, December 4th.—Electrical work at Western House. Specification, etc., from Mr. C. P. Beech, Union Offices, Edmund Street, Birmingham; deposit £2 2s.

NEWBURY CORPORATION, December 5th.—Electric motors, starting gear and centrifugal pumps, with ancillary works, at pumping station. Specification, etc., from Messrs. Howard Humphreys and Sons, 28, Victoria Street, Westminster, S.W.1, on and after November 18th; deposit £3 3s.

STEPNEY (LONDON) BOROUGH COUNCIL, December 5th.—Installation of wireless receiving equipment and apparatus at each of the Council's three hospitals, with l.t. charging machines h.t. generators, motor to drive generators, accumulators, etc. At the three hospitals the requirements include 1 160 pairs of headphones and 24 loud speakers. Specifications, etc., from the clerk, Mr. S. McClelland, Bancroft Road, Mile End, E.1; deposit £1.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, December 10th.—Extra high and medium pressure cable extensions (contract No. 48). Specification, etc., from Mr. R. W. Willis, electrical engineer and manager, 37, High Street, Cheadle, Cheshire; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, December 21st.—Supply and erection of 132 000 V transformers in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.-F.T.1) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2, on and after November 25th; deposit £2 2s.

HALIFAX CORPORATION, December 21st.—Electrician's work in connection with erection of new Girls' High School at Craven Lodge. Names of intending contractors to be sent by December 21st to Mr. A. C. Tipple, borough engineer, Crossley Street, Halifax; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH INDIAN RAILWAY CO., LTD., November 22nd.—Lighting, power and signalling switchgear for stations, in connection with Madras electrification. Specifications, etc., from the company's offices, 91, Petty France, London, S.W.1.

CHRISTCHURCH (N.Z.) MUNICIPALITY, November 23rd.—Supply of pump and electric motor, for Beckenham pumping station. (Reference A.X. 8 737.)

EGYPTIAN MINISTRY OF EDUCATION, November 23rd.—Diesel engines, electric motors, machine tools, etc. (Reference C.X. 3 146.*)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Watt-hour meters, recording instruments and remote metering equipment, for Metropolitan terminal stations and sub-stations (specification No. 29/92). (Reference B.X. 5 614.)

VICTORIAN ELECTRICITY COMMISSION, November 25th.—Switchgear, for Yallourn power station (specification No. 29/103). (Reference B.X. 5 636.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Vitreous resistances, each consisting of wire element wound in vitreous spool, for telegraph battery feeds (schedule C. 489). (Reference B.X. 5 696.)

MELBOURNE CITY COUNCIL, November 27th.—Totally-enclosed, metal clad, 6 000 V, three-phase switchgear (specification No. 1 000). (Reference B.X. 5 708.)

MELBOURNE CITY COUNCIL, November 27th.—Supply of 600 V d.c. switchgear (specification No. 1 001). (Reference B.X. 5 734.)

VICTORIAN RAILWAY COMMISSION, November 27th.—Indication transformers for railway signalling (contract No. 43 412). (Reference B.X. 5 737.)

VICTORIAN RAILWAY COMMISSION, November 27th.—Supply of automatic oil switches (contract No. 34 411). (Reference B.X. 5 735.)

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General for Western Australia, Savoy House, Strand, London, W.C.2.

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EGYPTIAN MINISTRY OF THE INTERIOR, November 30th.—Diesel engine driven electric lighting installation at Abou-Tig. (Reference B.X. 5 791.)

BLOEMFONTEIN MUNICIPALITY, December 2nd.—Supply of two electrically-driven low lift pumping units and two electrically driven high lift pumping units, with cables, startors, valves, etc. (contract No. 18, 29/30).

BLOEMFONTEIN MUNICIPALITY, December 2nd.—Supply of copper conductors, poles, transformers, switchgear, etc., for electrification of Mazelspoort Waterworks (contract No. 19, 29/30). (Reference B.X. 5 825.)

MADRAS GOVERNMENT, December 3rd.—Electrically-driven hoisting drums, in connection with Pykara hydro-electric scheme. Specification (C.17—part of) can be obtained (on payment of 5s.), from Messrs. Balfour, Beatty and Co., 66, Queen Street, London, E.C.4 (acting on behalf of Power Securities Corporation, Ltd.).

INDIAN STORES DEPARTMENT, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

CAPE TOWN MUNICIPALITY, December 4th.—Supply of 200 c.i. pole bases (specification No. 481/1929). (Reference A.X. 8 771.)

CAPE TOWN MUNICIPALITY, December 4th.—Supply of 50 35 ft. tubular poles (specification No. 479/1929) and 1 500 30 ft. tubular poles (specification No. 480/1929). (Reference A.X. 8 773.)

VICTORIAN ELECTRICITY COMMISSION, December 9th.—Supply of 3 000 kVA transformers and spares (specification No. 29/119). (Reference B.X. 5 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Switchboard keys and parts (schedule No. C. 496). (Reference B.X. 5 776.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Electric lamps, lamp caps and sockets for telephone purposes (schedule C. 497). (Reference B.X. 5 783.)

GATOOMA (SOUTHERN RHODESIA) MUNICIPALITY, December 12th.—Two fire-tube boilers, steam engines, alternators and switchboard, etc. (Reference A.X. 8 749.)

CHRISTCHURCH DRAINAGE BOARD, December 13th.—Supply and installation of four electrically-driven automatically-controlled pumping plants, each consisting of two horizontal centrifugal pumps with direct-coupled electric motor (contract No. 29/420); and two horizontal type, 3 H.P. a.c. motors direct coupled with centrifugal sewage pumps (contract No. 29/421). (Reference A.X. 8 788.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, December 16th.—Supply and erection of electrically-driven pumping plant, with ironwork, crane and gantries, for Junee water supply. (Reference A.X. 8 740.)

VICTORIAN ELECTRICITY COMMISSION, December 16th.—Oscillograph equipment. (Reference B.X. 5 692.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Secondary batteries (schedule C. 505). (Reference B.X. 5 777.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Telephone fuses, heat coils and protectors (schedule C. 498). (Reference B.X. 5 784.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Loading coil pots (schedule C. 499). (Reference B.X. 5 785.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 27th.—Telegraph material, including g.i. tubular arms, insulators, upper tubes for poles, etc. (tender No. 175). (Reference A.X. 8 734.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, December 28th.—Supply and erection at site of Mankabad Barracks of three Diesel engine driven electric generators, and sinking of two wells. Specifications (£1 os. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, JANUARY 4th.—Supply and erection at site of Meadi Barracks, Cairo, of two Diesel engines to drive existing generators. Specifications (£1 os. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 6th.—Supply and erection of plant for supply of filtered and unfiltered water, including pumps, electric motors, etc. (Reference A.X. 8 746.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of testing instruments (schedule C. 504.) (Reference B.X. 5 786.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of timing clocks (schedule No. C. 507). (Reference B.X. 5 762.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of contact pressure testers (schedule No. C. 516). (Reference B.X. 5 821.)

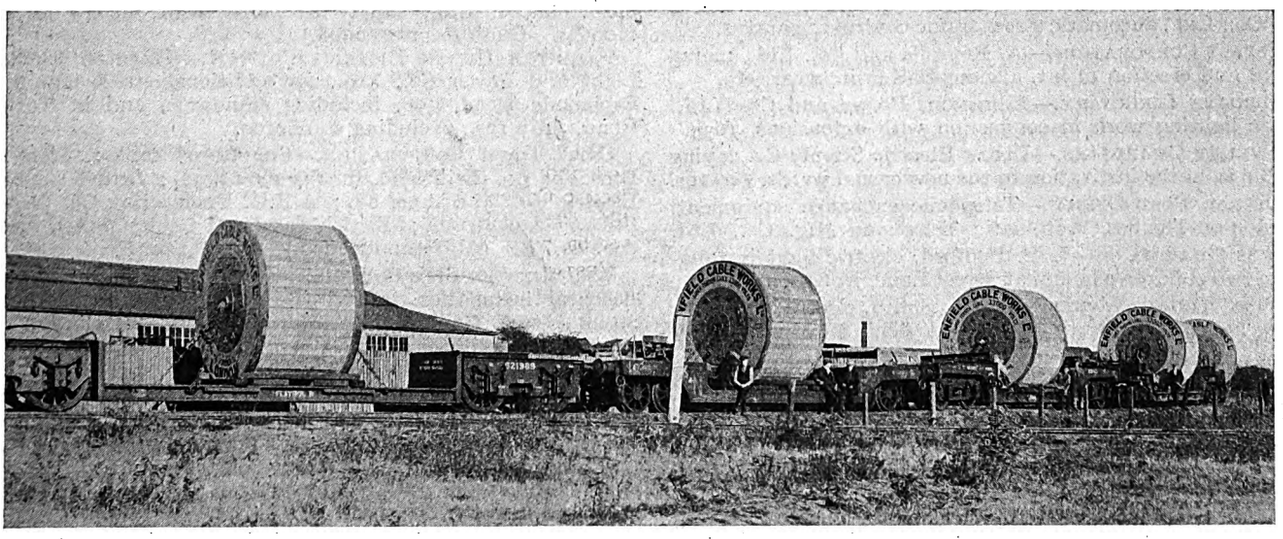
POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of telephone hand sets (schedule C. 526). (Reference B.X. 5 823.)

BLOEMFONTEIN MUNICIPALITY, January 10th.—Supply of automatic electric traffic signals (contract No. 5). (Reference B.X. 5 887.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 13th.—Supply of four-point jacks (P. and T. 151/1897). (Reference B.X. 5 840.)

VICTORIAN ELECTRICITY COMMISSION, January 13th.—Supply of 2 200 V switchgear and accessories (specification No. 30/2). (Reference B.X. 5 827.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of ringing motor-generator sets, for automatic telephone exchanges. (Reference B.X. 5 839.)



ON November 3rd, 5 drums were taken from the Enfield Cable Works, Ltd., Brimsdown, by the London and North Eastern Railway to King George Fifth Dock for shipment per s.s. "Ferndale" to Sydney. These drums each contained 700 yards of 3 by 0.25 sq. in. paper-insulated, separately lead-sheathed cables, laid up, double wire armoured and served, of the 33 000 V super-tension type. Each drum weighed over 28 tons and was 11 ft. in diameter. It is claimed that these are the heaviest lengths of cable ever made in Great Britain; they will be laid across Sydney Harbour. The special train, required for the transport by rail of these drums, consisted of 5 trucks, suitable for heavy machinery, an engine and brake van. Traffic on the down line was suspended while the train made the journey from the works at Brimsdown.

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POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of telephone indicators (schedule C. 518). (Reference B.X. 5 822.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 14th.—Two air compressors (capacity not less than 800 cu. ft. of free air per min.), and two electric motors. (Reference A.X. 8 784.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 15th.—Supply of automatic telephone exchange equipment for new station at Auckland. (Reference B.X. 5 841.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 16th.—Plug covers for telephone switchboard plugs. (Contract P. and T. 151/1 943.) (Reference B.X. 5 879.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 28th.—Supply of 50 kV oil-immersed circuit breakers, with current transformers and relays (section 299). (Reference B.X. 5 878.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

Tenders Accepted.

SOUTHEND CORPORATION.—Waygood-Otis, Ltd., reconstruction of cliff lift, £3 075.

MERSEY DOCKS AND HARBOUR BOARD.—British Insulated Cables, Ltd., electric cable, etc.

COLCHESTER CORPORATION.—Crompton Parkinson, Ltd., supply of spare transformers, £149.

YIEWSLEY-DRAYTON URBAN DISTRICT COUNCIL.—G. Taylor and Co., lighting of Falling Lane, £170 14s. 7d.

GLASGOW CORPORATION.—Belling and Co., 3 800 electric fires; Venner Time Switches, Ltd., 50 time switches.

ROTHERHAM CORPORATION.—A. Reyrolle and Co., Ltd., two pairs of switches, £256 per pair. (Recommended.)

JOHANNESBURG MUNICIPALITY.—Metropolitan-Vickers Electrical Co., Ltd., automatic street traffic control apparatus.

BELFAST CORPORATION.—A. Reyrolle and Co., Ltd., manufacture and erection of h.t. armour-clad switchgear, etc.

ARBROATH INFIRMARY.—Edmiston, Brown and Co., Ltd., electric lighting work in connection with extensions, £635.

NEWBURY GUARDIANS.—Urban Electric Supply Co., laying of cable from the institution to the new casual wards, £20 10s.

GENERAL POST OFFICE.—Telephone exchange equipment, Kingston-on-Thames, Automatic Telephone Mfg. Co., Ltd.

LEEDS GUARDIANS.—J. E. Bedford, electric light installation in two children's homes at Street Lane, Roundhay, Leeds.

HOUSE WIRING, WAKEFIELD.—H. Smith, electrician's work of new house at Horbury Road, Wakefield, for Mrs. F. Hofmann.

STAFFORDSHIRE EDUCATION COMMITTEE.—W. G. France, electric light installation at Wolverhampton schools, £369 6s. 7d.

WEST HAM GUARDIANS.—Andrew Miller, of Plaistow, installation of fire alarms at Whipps Cross Hospital, £246 10s. 6d.

FYLDE GUARDIANS.—Darbyshire, Ltd., electric wiring Children's Homes at Kirkham, £224 10s. (Highest tender was £398 18s.)

FARTOWN CONSERVATIVE CLUB, HUDDERSFIELD.—H. Grant, electrician's work in connection with alterations and additions to premises.

KINCARDINESHIRE EDUCATION AUTHORITY.—Andrew Mc Robb, electric wiring of new Mackie Academy, Stonehaven, £423 14s. 6d.

LONDON COUNTY COUNCIL.—Express Lift Co., Ltd., provision of electric lift at the boiler house of Greenwich power station, £696.

VENTNOR URBAN DISTRICT COUNCIL.—Isle of Wight Electric Light and Power Co., electric light installation in eight houses, eight points each.

HALIFAX CORPORATION.—Gath Electrical Engineering Co., electrician's work in connection with filter house, for waterworks department.

HUDDERSFIELD CORPORATION.—H. C. Stringer, electrical installation in thirty-five new houses on Towngate site, Newsame, Huddersfield.

ISLINGTON (LONDON) BOROUGH COUNCIL.—E. H. Finn, installation work in connection with wiring schemes. (Renewal for twelve months recommended.)

STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—A. R. Camidge and Co., installations, to be carried out under Council's assisted wiring schemes, 18/3 per point.

CENTRAL ELECTRICITY BOARD.—General Electric Co., Ltd., erection of 132 kV overhead transmission lines in connection with the Mid-East England Scheme.

NEWBURY GUARDIANS.—Urban Electric Supply Co., laying cable from the institution to the new casual wards, £20 10s., Toomer and Co., electric bells, etc., £16 10s. 11d.

WHITBY URBAN DISTRICT COUNCIL.—Sir W. G. Armstrong, Whitworth and Co., Ltd., construction of a lift for the cliff, £12 472 10s. 3d. Highest tender was £20 471 1s. 7d.

MANCHESTER EDUCATION COMMITTEE.—Electrical installations: R. Seddon and Sons, at North Manchester High School for Boys; and Brookes and Co., Ltd., at Birchfields Road school.

GLASGOW CORPORATION.—General Electric Co., Ltd., supply of street lanterns; Metropolitan Electric Cable and Construction Co., Ltd., and British Electrical and Manufacturing Co., supply of cable.

STEPNEY (LONDON) BOROUGH COUNCIL.—W. Lucy and Co., Ltd., distribution boxes, £237. Also tendered: British Insulated Cables Ltd., £262; Universal Electric Manufacturing Co., £275.

CAPE TOWN CORPORATION.—Worthington Simpson, Ltd., supply of steam operated air extraction plant, £140; Allenwest (S.A.), Ltd., for switchgear required for New Alhambra Cinema, £179 10s.

GRIMSBY CORPORATION.—Metropolitan Electric Cable and Construction Co., Ltd., supply of low pressure cables, £5 531; Holmes, Swinburn and Co., Ltd., one year's supply of troughing and lidding, £853.

GENERAL POST OFFICE.—Telephone exchange equipment, Hop (London, S.E.), and Smethwick (Birmingham), Automatic Telephone Mfg. Co., Ltd.; Didsbury (Manchester), General Electric Co., Ltd.

STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—Messrs. Lucy and Co., Ltd., supply of section pillars, £324 18s.; Measurement, Ltd., supply of prepayment meters for 12 months. (Both recommended.)

PAIGNTON URBAN DISTRICT COUNCIL.—Paignton Electric Light and Power Co., Ltd., for additional street lamps in Esplanade Road, £98, including standards, and in Totnes Road, £161 12s., excluding standards.

CAPE TOWN CORPORATION.—Supply of cable: Siemens Bros. and Co. (British), Ltd., £33 296 6s. 9d.; British General Electric Co., £1 676 9s. 8d.; A.E.G. Engineering Co. (S.A.), Ltd., £5 249 8s. 5d.; British Insulated Cables (S.A.), Ltd., £902 6s. 7d. (All recommended.)

WESTMINSTER CITY COUNCIL.—Gaillard, Robinson and Co., electrical installation to staircase at dwellings in Marshall Street, £26; Gaillard, Robinson and Co., installation of electric time switches at Schomberg House, Esher Street, £40; ditto at Admiral House, Willow Street, £40.

LONDON COUNTY COUNCIL.—Malcolm and Allan (London), Ltd., electric light wiring and fitting at Marvels Lane School (site 2), Twickenham, £179. Also tendered: Stegman and Co., £190; J. Briggs Electrical Contractors, Ltd., £193; H. J. Cash and Co., Ltd., £199; A. Dean and Co., Ltd., £217; Electrical Installations, Ltd., £226.

LONDON COUNTY COUNCIL.—Switchgear and Cowans, Ltd., supply and erection of switchgear at the Greenwich, Limehouse, Tooting and New Cross tramways sub-stations, £10 492; also tendered: Bertram Thomas, £11 972; English Electric Co., Ltd., £12 217; General Electric Co., Ltd., £12 266; Metropolitan-Vickers Electrical Co., Ltd., £12 266; Ferguson, Pailin, Ltd., £12 305; Johnson and Phillips, Ltd., £12 659; New Switchgear Construction Co., Ltd., £23 909.

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WORK IN PROSPECT.

ALLOA.—Erection of 36 houses at Ashley Terrace, including electrical installation, for the T.C. Particulars, J. Melvin and Son, architects.

ATTLEBOROUGH.—New church and schools, to cost £7 300. Particulars, Mr. J. T. Hood, architect.

BALLYNARRY.—Reconstruction of church. Particulars, Mr. V. Kelley, 87, Merrion Square, Dublin.

BEDLINGTON.—New Catholic Church, to cost £7 000, at Ridge Terrace. Particulars, Mr. Frank Coyle, architect, Consett.

BIRMINGHAM.—Maternity and child welfare centre at Allen's Cross Farm Estate, Northfield. Particulars, Messrs. Collier and Keyte, architects, 30, Paradise Street.

BLACKBURN.—194 houses on the Whitebirk Road and Hamilton Street sites. Particulars from Borough Engineer.

BLACKPOOL.—Rebuilding lower portion of Trocadero, including alterations to the hotel, restaurant and cinema. Particulars, Mr. H. Best.—Rebuilding shop and café at 31, Church Street. Particulars, Mr. H. Best.

BRIGHTON.—New maids' home at Borough Sanatorium, to cost £7 095. Particulars from Field and Cox, Ltd., contractors, Brighton.

CLEETHORPES.—Erection of building to contain filtration plant and bathing pool. Particulars, Mr. L. W. Pye, engineer.

CRANWELL.—New Air Force Cadet College, to cost £250 000. Tenders to be invited in about six weeks' time for main building. Particulars from Mr. J. G. West, architect to H.M. Office of Works.

CROSBY.—New church at Crosby. Particulars from Mr. Lionel A. C. Prichard, Liverpool.

CROYDON.—50 houses and garages at Hillcote Avenue, etc. Particulars from H. Macintosh, architect.—56 houses at Selsdon Park Road and two new roads. Particulars from T. H. Jones, Alexandra Road, Farnborough.—318 houses, Woodvale Avenue and other roads. Particulars from the Central Estates Co., Ltd., Kenton, Harrow.—Shop and showrooms at Crown Hill. Particulars from Times Furnishing Co., Ltd., High Holborn.—New school at Lodge Road, to cost £28 620. Particulars from Mr. J. G. Gray, contractor, Coventry.

DERBY.—Public baths in Queen's Street. Particulars, Mr. C. H. Aslin, borough architect.

DUDLEY.—Extensions to Guest Hospital and Eye Hospital, to cost £80 000. Particulars from A. T. Butler, Dudley.

EDINBURGH.—Conversion of Huntley House, Canongate, into a museum, to cost £9 000 to £10 000. Particulars, Mr. F. C. Mears and Mr. E. J. MacRae, city architect.—New school at corner of Prestonfield Road, to cost £25 000. Particulars from Education Authority.

EDMONTON.—20 houses in Monmouth and Exeter Roads. Particulars from Messrs. Stanley Parkes and Brown.—26 houses in Circular Road. Particulars from Messrs. Walters and Blake.

FARNBOROUGH.—First portion of new block, for nursing staff, at the Hospital, at Locksbottom. Particulars, Mr. F. Danby Smith, Parliament Mansions, Westminster, S.W.1.

GODALMING.—44 houses. Particulars, Mr. G. B. Hartfree, borough surveyor.

HALTON.—Church and school. Particulars, Messrs. Chorley, Gribbon, and Foggitt, architects, Leeds.

HAMMERSMITH (LONDON).—Extensions to Upper Latymer School. Particulars, Mr. James M. Kellett, architect.

HENDON.—32 houses, Deans Lane. Messrs. H. J. Hook and Sons.—24 houses, Elmsgate Garden Estate. Messrs. H. Boot and Son.—31 houses, Sunny Gardens. Mr. B. R. Evans.—22 houses, Hall Lane. Mr. W. Bagg.—7 shops and flats, Cricklewood Lane. Mr. C. J. Codrington.

HOVE.—New premises at St. Leonard's Gardens, for Messrs. E. J. Chadwick. Particulars from Messrs. Clayton and Black, architects.

HULL.—School at Finton Grove. Particulars from Mr. D. Harvey, city architect.

LLANDOUGH.—New hospital near Penarth Dock. Particulars, Messrs. E. C. Morgan Willmott and T. E. Smith, architects, 27, Park Place, Cardiff.

MORDEN.—200 houses on the St. Helier Estate. Particulars, Mr. G. T. Crouch.

NOTTINGHAM.—Public washhouses, at Noel Street. Particulars, Mr. T. Wallis Gordon, city engineer.

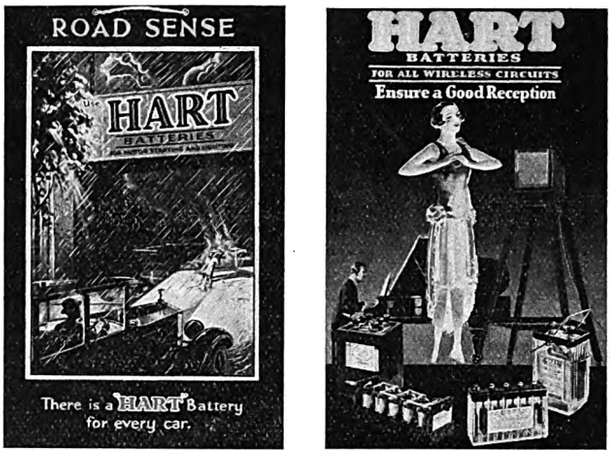
NOTTINGHAM.—School at Wollaton Park, to cost £13 124. Particulars from Mr. R. Hustwayte, Notts.—School at Aspley Lane, to cost £89 993. Particulars from T. Long and Sons, contractors.

TRADE PUBLICATIONS.

THE "Morris" electric lift is the subject of folder F.37, issued by HERBERT MORRIS, LTD., Loughborough.

A new lamp catalogue has been published by CRYSELCO, LTD., Kempston Works, Bedford.

The current stock list has been received from the A.E.G. ELECTRIC, LTD., 131, Victoria Street, London, S.W.1.



Two new showcards issued by the Hart Accumulator Co., Ltd.

L. G. HAWKINS AND CO., LTD., 30/35, Drury Lane, London, W.C.2, have prepared special literature in connection with Christmas gifts.

"Church Lighting" is the subject of publication C.L.510, issued by the EDISON SWAN ELECTRIC CO., LTD., 123, Queen Victoria Street, London, E.C.4.

The WANDSWORTH ELECTRICAL MANUFACTURING CO., LTD., has published a new catalogue relative to electrical accessories. The address of the firm is Imperial Works, Kenyon Street, Birmingham.

The PRITCHETT AND GOLD AND E.P.S. CO., LTD., 50, Grosvenor Gardens, London, S.W.1, has sent us a copy of a new showcard of the closed top type of cell. The card is a very faithful reproduction of the actual cell, and is believed to be the first card of its kind to be issued.

The MULLARD WIRELESS SERVICE CO., LTD., Mullard House, Charing Cross Road, London, W.C.2, has issued leaflet No. V.T.8/1a, describing the VO/150, to replace leaflet V.T.8; V.U.17/1a (V.U.7), to replace V.U.17; V.T.9/1a (VO/250), to replace V.T.9; V.T.10/1a (VO/500), to replace V.T.10; V.U.16/1a (U.8), to replace V.U.16; and V.T.21/1a (T.7A), to replace leaflet V.T.21.

We have received from J. H. TUCKER AND CO., LTD., King's Road, Tyseley, Birmingham, a copy of the company's latest publication G.5, being an abridged price list of popular lines in everyday demand, including tumbler switches (surface, flush and semi-recessed types), lampholders, fuseboards, plugs and sockets, ironclad gear, etc. Only descriptive matter which is absolutely essential is included, enabling the contents of the list to be understood at a glance. Discount is as indicated on a detachable discount slip inside the list.

The MIDLAND ELECTRIC MANUFACTURING CO., LTD., advise us of the building and equipment of a new extension to their works. The new department will be separate from the main works, and will be known as "Specials and Service Department." It is intended to deal with the erection of unit type control panels, variations of M.E.M. gear to suit special requirements, and the many other services which create difficulties and delays in a works specially laid out for standardised large scale production, but which are often essential to the installation engineer. List No. 178 gives full particulars of this new M.E.M. development.

The BRITISH THOMSON-HOUSTON CO., LTD., Rugby, has issued publication A.X. 171C*, which is an index to publications issued by the company for use in the British Isles, other than operating instructions, and cancels index A.G. 171B. Price list No. 5 100D*, dealing with d.c. starting rheostats, has also been published, and this cancels list No. 5 100C. Another new booklet is No. DS. 4 176-1, describing ironclad oil-immersed thermal circuit breakers. Other new issues are No. 2 144A* (squirrel cage motors); a supplement to D.L. 1 225B (air filters); No. 5 281 (auto-transformer starting equipments); No. 1 225B* (air cooling systems for turbo-alternators); and No. 2 420C*, dealing with rotary convertors.

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ELECTRICITY SUPPLY.

Developments at York—Conversion of Gas Lamps to Electric at Islington—Leicestershire Rural Electrification—Scheme for Supply in Cumberland—Canadian Electricity Developments—Lincolnshire Supply Project.

SHEFFIELD Electricity Committee is to extend mains at a cost of £5 199.

Gravesend Electricity Committee is to extend mains at a cost of £1 500.

Middleton-St.-George P.C. is to borrow £700 for the provision of electric street lighting.

Stanhope P.C. is to borrow £260 for electric street lighting in the village of Frosterley.

Huddersfield T.C. has applied for a loan of £60 000 for mains, services and transformers.

Stone (Staffs) U.D.C. has received sanction to a loan of £2 000 for an assisted wiring scheme.

Batley T.C. has applied for loans of £2 800 for e.h.t. mains extensions, and £5 000 for mains and services.

Guildford Electricity Committee is to extend mains at Chilworth at a cost of £1 000 and at Gomshall at a cost of £492.

Kettering U.D.C. has decided to apply for power to supply current to every parish in the area of the Rural District Council.

The Borough Electrical Engineer of Luton is to proceed with the erection of the lines for transmitting current to Toddington and Flitwick.

Maidstone T.C. is to carry out mains extensions in Linton Road at an estimated cost of £1 800, and to the village of Ditton at a cost of £1 735.

Islington (London) Electricity Committee is to convert street lamps from gas to electricity in Copenhagen Street, Isledon Road and Tollington Road, at a cost of £1 720.

Melton Mowbray R.D.C. has decided to support an application for a Special Order made by the Leicestershire and Warwickshire Electric Power Co. to supply current in the district.

Rugby U.D.C. has decided to carry out mains extensions at an estimated cost of £650, and has applied to the Commissioners for consent to meet the outlay out of revenue during the current year.

Billesdon R.D.C. has approved of an application by the Mid-East Leicestershire Electric Power Co., for an Order for supplying electricity in the area. The company is to carry out a scheme of rural electrification.

Dartford U.D.C. has received an application for a supply of current to Lawson Villas and Burnham Road by the agents for the "Daily Telegraph" paper mills. The Electricity Commissioner has voted £230 for laying the mains.

The Northampton Electric Light and Power Co. has withdrawn its application to the Commissioners for the use of overhead lines in High Street and Market Square, Olney. The use of overhead lines had been opposed by Olney P.C.

Cape Town Electricity Committee recommends that the charges for current to the Table Mountain Aerial Cableway Co., Ltd., be for the first 25 000 kWh per annum, 2½d. per kWh; for the next 75 000 units, 1.2d. per kWh and for all in excess of 100 000, 1d. per kWh.

Durham County Council has raised no objection to the Synthetic Ammonia and Nitrates, Ltd., laying a 6 600 V cable across the Stockton-Port Clarence main road near Eton Terrace, Haverton Hill, and across the Seaton Carew main road near Greatham Creek railway.

The Shawinigan Water and Power Co. is engaged on the preparatory work in connection with the expansion of its hydro-electric power developments on the Upper St. Maurice river in Quebec. The water powers of the upper stretch of this stream—one of the largest tributaries of the St. Lawrence, are believed to be capable of a total power development in excess of 600 000 H.P.

Mr. W. B. Woodhouse, for the promoters of the West Cumberland Electricity Order, has informed Wigton R.D.C. that the promoters are making application for an Extension Order to supply the whole of Cumberland where no other supply is available, and it is proposed to obtain a supply in bulk from the Central Electricity Board, and to utilise the waste heat at the collieries in the Cumberland coalfield.

The municipal electric plant at Melfort, Sask., is to be sold to Canadian Utilities, Ltd., a subsidiary of the International Utilities Corporation, which has recently been active in the purchase and linking-up of small power plants both in Saskatchewan and in Alberta. The company is to be granted a franchise to sell current in the town for 20 years. The price to be paid for the plant is $100 000, and the company proposes to spend an additional $500 000 on extensions.

The Cheshire County Surveyor, reporting to the Highways Committee upon the erection of overhead transmission lines in the parish of Poynton, states that the undertakers have agreed to lay certain lengths of cable underground, provided they are relieved from cost of reinstatement of road surface by the road authorities, involving a cost of £300 for main roads and £250 for district roads. The Committee has agreed that the cost of reinstatement be defrayed by the County Council.

The inhabitants of the Newtown district of Retford are strongly opposed to the overhead electric cables which are being erected in that part of the town. At a recent Council meeting, Ald. W. N. Brackett explained that the system had been adopted purely on account of cost. Underground cables would have cost £1 200, whereas overhead cables would be £360. The cost of service underground would also be considerably higher. Coun. Herrick hoped the Corporation would strongly counsel against the use of overhead lines in other parts of the town.

The Calgary Power Co. has entered into a contract with the City authorities at Edmonton (Calgary) for the supply of electricity from their new developments on the Ghost River. It has been decided to transmit the power to Edmonton over a 132 000 V line. This will be the highest voltage transmission line in Western Canada, and the voltage is exceeded in the Dominion only on the line between the Saguenay River and Quebec (165 000 V) and the new line of the Ontario Hydro-Electric Power Commission connecting the Gatineau River with the City of Toronto (220 000 V).

The Dominion Water Power and Reclamation Service of the Department of the Interior of Canada has recently issued volume 57 of the Water Resources Papers which deal with the surface water supply of Canada. It contains the results of investigations made by the Dominion Hydrometric Survey between October 1st, 1926, and September 30th, 1927, in the provinces of Alberta, Saskatchewan and Manitoba, and the extreme western part of Ontario. The report deals with stream flow and meteorological data. Copies may be obtained from the Director of the Service at Ottawa.

The City Electrical Engineer of York has prepared a scheme to raise the pressure of all new outgoing h.t. feeders from 3 300 V to 6 600 V. He proposes to remove the step-up transformers from individual feeders and place them in a common bank to be added to as circumstances required. To carry out the proposal it will be necessary to erect six feeder panels and to build a small switch house. The estimated cost of the scheme is £2 720. The Electricity Committee recommends approval of the scheme.—The Committee is to seek sanction to borrow £32 000 for mains extensions.

Lindsey (Lincs) County Council has been informed by Mr. R. Borlase Matthews that 28 towns and villages will be given a supply of electricity within the first two years after the making of the Orders by the Electricity Commissioners. These include the urban districts of Alford, Horncastle, Mablethorpe, and Sutton, Skegness, and Woodhall Spa, the parish of Hagworthingham in Horncastle rural district, 21 parishes in Spilsby rural district, and the parish of Burton in the Welton rural district. Mr. Matthews also hopes to be able to supply a number of villages in the neighbourhood of Lincoln within three years of the making of the Orders.

The City Electrical Engineer of Hull has reported that the five new boilers now being erected would be rendered more efficient in operation by the provision of a system of automatic combustion control. He recommends that the "Hagan" system be installed, the cost of which would be £3 189. He also advises that the boilers be equipped with re-heated secondary air to eliminate smoke when the boilers are being forced, at a cost of £900. The recommendations have been adopted.—The City Architect has prepared a preliminary scheme for the supply of electricity to the Tilworth Grange Estate, including the existing buildings, the pavilion in the course of erection, and the four further pavilions, hospital, class-room, working block recreation hall, etc., provided for in the scheme for the future enlargement of the institution, the total cost being £2 210.

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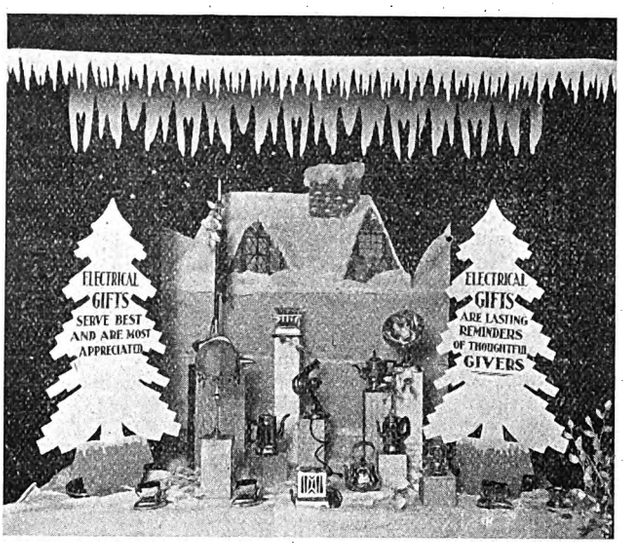
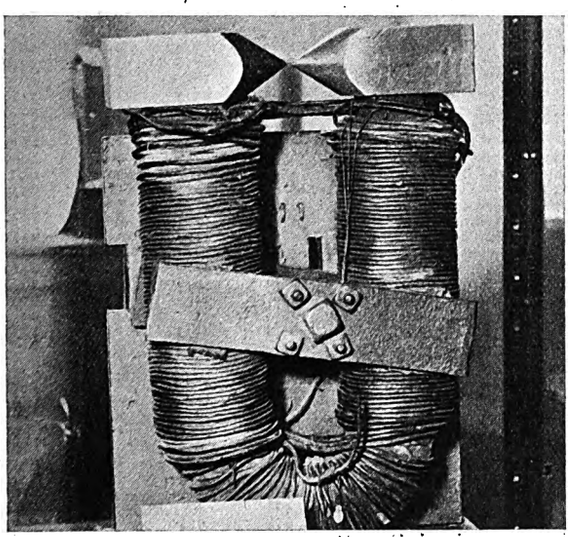
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

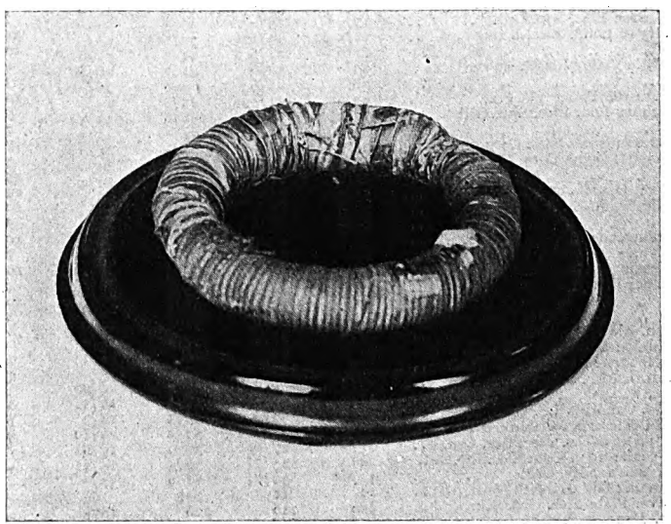
Members of the Association of Supervising Electrical Engineers and their guests at the dinner at the Mecca Restaurant, Ludgate Hill, London, on Saturday, November 16th. The dinner was followed by a whist drive and dance. See page 640.

Signor G. Semenza,. past President of the I.E.C., whose death is referred to on p. 640.



Two special window displays which have been designed by the Electrical Development Association in connection with Christmas selling. All the material necessary for the dressing of the windows can be obtained from the E.D.A., including the silver stars, holly and crêpe paper. Both windows utilise the cubes of other displays, and additional sets, where required, can be supplied.





Included in the apparatus exhibited by the Royal Institution at the Science Museum, South Kensington, are the ring with which Michael Faraday discovered in 1831 the laws governing the theories of electrical engineering. This ring, seen in the right-hand picture, will be the central feature of the international commemoration of Faraday's work which is to take place in London in 1931. The left-hand picture is of another Faraday exhibit and shows an experimental electro-magnet.

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COMPANY NEWS.

Electrical Manufacturers and Supply Companies' Shares Sagging—Gramophone Co.'s Radio Policy—Directors' Reports and Dividend Notices—New Companies.

ONCE again the changes shown in our list of electrical share quotations are for the most part downward, and though Hydro-Electrics at 35 are a few points higher, International Holdings have fallen from 7¾ to nearly 5¾. General Electrics, however, have steadied, and at 45s. are 1s. 3d. higher on the week. Other manufacturing shares have been weak, Henley's continuing their decline from 117s. 6d. to 112s. 6d., a fall of 12s. 6d. in a fortnight. Callender's Cable shares are unchanged, but British Insulated Cables and Enfield Cable Works ordinary shares are each half-a-crown down, at 75s. and 95s. respectively. Johnson and Phillips shares have given way 3s. 9d., from 38s. 9d. to 35s., and Associated Electrical Industries are nearly 2s. lower at about 28s. English Electric ordinary shares have changed hands as low as 6s. 3d., as against last week's price of 7s. 6d. Ever Readies are 6d. down at 18s. 3d.

Electricity supply shares have been uniformly depressed. County of London shares are nearly half-a-crown lower at a shade over 48s., and the lower-priced Metropolitans, at 36s. 3d., show the same decline. The ordinary shares of the Electric Supply Corporation have fallen 3s. 9d., to nearly 48s., and Bournemouth and Poole shares are nearly 4s. 6d. down at 56s. 3d. Scotch issues have shared in the general depression, Scottish Power ordinary giving way from 30s. to 28s. 6d., and Clyde Valley from 37s. 6d. to 35s., while Fife Tramway Light and Power issues have dropped, the ordinary from 13s. 9d. to 12s. 6d., and the 6% preference from 17s. 6d. to 15s. Newcastle-upon-Tyne Supply shares at 23s. 9d. show a fall of nearly 2s., Yorkshire Power ordinary at just under 32s., a fall of 1s. 7½d., and Electrical Distribution of Yorkshire at 39s., a decline of nearly 2s.

Midland Counties Supply shares have lost 1s., moving down from 28s. to 27s. Urban Electric Supply ordinary shares have changed hands at 34s. Victoria Falls Power shares have been marked down from £3 to 56s. 3d., and Calcutta Supply ordinary are half-a-crown lower at a shade under 52s.

Cables and wireless issues have weakened slightly; American Telephone and Telegraph stock has risen from 210 to 225; and Indo-European Telegraph stock from 47½ to 52½.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	21/6	22/6	19/9
6½	" " " C. Cum. Pref. ..	20/6	21/6	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	56/3	60/7½	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	51/10½	54/4½	56/-	32/6
5	" " 5% Cum. Pref.	21/3	21/3	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	35/-	37/6	41/6	26/6
8	" " " " 8% Pref.	28/6	28/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	24/4½	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	48/1½	50/6	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord.	48/1½	51/10½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	35/7½	45/-	26/9
4	Fife Tram. Lt. & P Ord.	12/6	13/9	23/6	10/-
6	" " " " 6% C.P. ..	15/-	17/6	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	89	89	92	80½
(e)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord.	27/-	28/-	32/9	22/10
6	" " " 6% C. 1st Pref. ..	27/-	27/-	28/6	24/9
7	" " " 7% Cum. Part. P.	28/-	28/6	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/-	27/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	97	97	104	95
10	Melbourne Electric Ord. Stk. ..	170	177½	180	150
1/9½	Metro. Elec. Sup. Ord.	36/3	(h) 38/9	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	27/-	(h) 28/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	34/4½	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	23/9	25/7½	30/3	19/3
6	N. Metro. Elec. Ord.	47/6*	50/7½	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(c)	St. James & P.M. Ord. (£1) ..	26/-	26/6	28/6	23/6
8	Scottish Power Ord.	28/6	30/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	26/6	26/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	20/-	20/-	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	92½	92	98½	86½
7	Urban E.S. Ord.	35/-	36/10½	46/6	18/-
5	Victoria Falls Power Ord. ..	56/3	6	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	81½	81½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	87½	87½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	122½	122½	152	117
7·67	" " " " 6% Pf. Stk.	124½	124½	133	103½
6	Calcutta Trams Ord.	15/7½	15/7½	24/-	14/6
5	" " " 5% Cum. Pf.	13/9	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb.	77	77	83	77½
5	City & S. London, Cons. Ord. ...	67	67	64	52
4	" " 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	74	74	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	60½	60	81	54½
3½	" " " 3½% Pf. Stk.	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	72½	73	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	83½	84½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	22/-	21/-	28/2	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	83½	84½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	28/1½	30/-	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " " 4% Mt. Deb.	75½	75½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	77/6	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	127½	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	21/3	21/3	22/9	21/-
4	" " 1st Mt. Deb. ..	66½	66½	75	68
20	Enfield Cable Works Ord. ..	95/-	97/6	82/-	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	6/3	7/6	15/9	5/-
—	" " 6% C.P.	8/9	8/9	18/9	7/-
5½	" " 1st Mt. Deb.	88	88	103½	86
6	" " Conv. Deb. ..	72½	72½	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	18/3	18/9	92/3	18/1
10	" 7% Partic. Pref. ..	29/-	29/6	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	45/-	43/9	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/-	25/-	27/9	22/9
7	" " 1st Mt. Deb. ..	103½	103½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	112/6	117/6	120/-	69/3
10	International Auto. Telephone Ord	35/-	35/-	50/6	35/-
10	Johnson & Phillips Ord.	35/-	38/9	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord. ..	27/6	27/6	36/6	24/9
10	" " " Cum. Pref.	32/6	32/6	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/3	21/3	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	225	210	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Tele. Ord. Stk. ..	60½	60	63½	56½
6	" " " 6% Prefd. Stk...	99½	98½	105½	91
1½	" " " Deferred Stk...	24½	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	21/3	20/7½	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	79½	81½	—	—
—	"B" Ord. Stk.	42½	47½	—	—
—	5½% Cum. Pref. Stk. ..	95½	97½	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	75	75	81½	74
4	Eastern Extension 4% Deb. Stk.	76	76	80	74½
22	Great Northern Telegraph (£10)	29	29	43½	26
10	Indo-European (£25)	52½	47½	48½	30
—	International Teleph. & Teleg. ..	$70	$75	161½	48½
15	Marconi Int. Mar.	41/3	42/6	90/-	16/6
4½	New York Tele. 4½ % Mt. Bds. ..	96½	96½	101	96
12	Oriental Telephone Ord.	38/9	38/9	65/-	41/-
4½	United R. Plate Tele. 4½ % Deb.	87½	87½	89½	82
4	Western Tel. 4% Deb. Stk. ..	76	76	82	76

(a) 19⅞d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. * Ex dividend. (g) 2s. 2½d. per share. (h) Ex. rights 11/11/29.

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Directors' Reports, etc.

MELBOURNE ELECTRIC SUPPLY CO., LTD.—Usual intm. div. of 10%, tax free, is announced.

HYDRO ELECTRIC SECURITIES CORPORATION.—Qrtrly div. of 50 cents p.sh. on common stk. will be payable on Dec. 14.

INTERNATIONAL POWER SECURITIES CORPORATION.—Div. of $1 p. sh. on common shs. for 1929 will be payable on Dec. 15.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Div. of 60 cents p. sh. for qrtr. endg. Dec. 31, less tax, has bn. declared.

MADRAS ELECTRIC SUPPLY CORPORATION, LTD.—Interim div. of 2½% on ord. shares, tax free, will be payable on Nov. 25.

BRITISH THOMSON-HOUSTON CO., LTD.—Div. on 7% pref. cap. for half-year ended June 30, 1929, less tax, will be payable on Dec. 14.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Transfer books and register of hldrs. of 5% deb. stk. are closed until Nov. 30 inclusive, preparatory to paymt. of int. due Dec. 2, 1929.

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—Directors have decided to increase the 5% deb. stk. from £286 000 to £400 000, redeemable in July, 1964, at par, on or before Dec., 1935, at 105%.

DELAGOA BAY DEVELOPMENT CORPORATION, LTD.—Div. on ord. shs. for year ended June 30 of 3%, agst. 2%, will be payable on Nov. 26, and a further div. of 6¼% on 7% cum. pref. and participatg. shs. is to be paid.

MEXICAN LIGHT AND POWER CO., LTD.—A half-year's int. on 5% 2nd mortgage 50 year bonds will be paid on and after Dec. 2 at the Bank of Scotland, 30, Bishopsgate, London, E.C., against surrender of coupon No. 36, dated Dec. 1. Coupons must be lodged three clear days previous to paymt.

BUENOS AIRES LACROZE TRAMWAYS CO., LTD.—Gross receipts for year to June 30, 1929, £688 816, agst. £696 117, and working exes. £444 953, agst. £453 954, leavg. £243 863, agst. £242 164. Int. charges, etc., £124 526, agst. £135 396; net pfts. £119 337, agst. £106 768. To res. £5 967, agst. £5 338; to directors £5 967, agst. £5 338; divs. £87 301, same to extra-ord. res., £17 460, same; fwd. £5 772, agst. £3 131.;

STOCK EXCHANGE NOTICES.—Official quotations have been granted to £750 000 5% deb. stock of the Atlas Light and Power Co.; 217 050 £1, fully paid, ord. shares of the County of London Electric Supply Co., Ltd., 150 000 £1, fully paid ord. shares, 100 000 £1, fully paid, 7% cum. pref. shares, and £192 700 5½% deb. stock of the Electrical Finance and Securities Co., Ltd.; 7 988 £1, fully paid, ord. shares of the Underground Electric Railways Co. of London, Ltd.

OSLO GAS AND ELECTRICITY CO.—Coupons of Oslo gas and electricity 6% loan 1924 fallg. due on Dec. 1, 1929, will be paid by Messrs. A. Keyser and Co., 31, Throgmorton Street, London, E.C.2, at the exchange of the day. Coupons to be left three clear days for examination. Advice has been received from the company that the reimbursemt. of that portion of the loan due Dec. 1 has taken place by purchase of the bonds.

BAHIA TRAMWAY, LIGHT AND POWER CO.—The receiver (Mr. B. H. Binder, River Plate House, London, E.C.2), is seeking the names of deb. holdrs. in order to assist the Court to decide on the method of procedure to be adopted in respect of a small distributn. to them. In May, 1929, negotiatns. were concluded for the settlemt. of the claim of the co. agst. Bahia Municipality on terms approved by the Court. It was estimated at the time that this settlemt. would result in the paymt. to deb. hldrs. over a period of about three years of about 30% of the nom. value of the debs.

METALS COATING CO., LTD.—Statement, issued for information only and not as invitatn. to subscribe for shs., gives following details: Authorised cap., £150 000; issued £125 000. Company incorporated Sept. 12, 1929. It is intended to acquire factory at Dudley, with plant, etc., and patents and patent rights relatg. to the metals coating process, and the whole of issued sh. cap. of Metallisation Sales, Ltd., giving company benefit for Great Britain, Northern Ireland, Irish Free State and Empire of India of all existg. letters patent covering process whereby any metallic or non-metallic surface can be covered with a coating from 1/20 mm. up to any desired thickness of any metal that can be drawn into wire or obtained in powder form: The process is in use by Siemens-Schuckert, A.E.G., General Electric Co. of New York, Westinghouse Electric and Mfg. Co., and others. The statement also contains a report by Dr. A. L. Mond, testifying to the obvious value of the process.

COMPANIES TO BE STRUCK OFF REGISTER.—The following companies will be struck off the register unless cause to the contrary is shown before Dec. 17: General Battery Co., Midland Radiotelephone Mfrs.; N.S. Battery and Equipment Co., and Winsum Electric Diffusers. The following will be struck off unless cause to the contrary is shown before Dec. 24:—B. Morris (Electrical Radio), Daily Signs, Deansgate Electric Radio (Manchester), Dur-a Electric Lamps, Electric Bulk, Everose Electrical Co., Garter Electrical Mfg. Co., Heath's Auto Electrical Co. The following will be struck off unless cause to the contrary is shown before Jan. 22: Electric Fans, Electro Arts, Eunice Wireless Cabinet Works, Hertz Radio Corporation, Local Electric Supplies Co., Metropolitan Electrical Contractors, Radiolicity, Wessex Power Producers, Westfield Wireless. The following will be struck off unless cause to the contrary is shown before Feb. 12:—Everbright Sign Co.; Light and Shade Co.; Multi Wiring and Instrument Co.; S. L. Electrical Co.

Company Meetings.

LISKEARD (CORNWALL) GAS AND ELECTRICITY CO., LTD.—Mr. W. H. Huddy, chairman, presiding at the annual meeting on November 15th, said, after writing off £1 400 for depreciation and paying for heavy repairs and renovations to plant out of current revenue, a profit had been made on the year of £1 215. The consumption of electricity in Liskeard had increased by 25% during the year, and there was also an increase in the use of gas. The report was adopted and dividends of 7% on the preference and 7½% on the ordinary shares were declared.

DELAGOA BAY DEVELOPMENT CORPORATION, LTD.—Mr. H. K. Heyland, presiding at the meeting on Tuesday, said, due to the new Companies Act, which came into force on 1st of this month, certain details appeared in the accounts for the first time relating to their subsidiary, the French Compagnie Générale d'Eléctricité de Lourenço Marques. The actual capital expenditure by the French Electric Lighting Co. was over £100 000, and provision had to be made, and was being made, for amortisation of the entire capital of this company, by December, 1945, when the property might be taken over by the Portuguese authorities at a valuation. Turning to profit and loss account, the all-important item was "Profit in Lourenço Marques," amounted to £51 449, showing a small increase on the previous year. The volume of business done, however, in water and electric light and power supplies showed a quite normal increase, which in net revenue would represent approximately a money value of over £3 000. On the other hand, the increase in loss on working the tramways and motor-buses, due to competition, was nearly £2 000 more, so that the trading profit was practicly the same as last year. The corporation had at present six motor-buses in operation, and its competitors have three, so that at present nine buses were running in competition with the electric tramways. Negotiations with the authorities were proceeding for closing down the tramways altogether and adopting in their place a modern up-to-date motor-bus service. The report and accounts were adopted.

GRAMOPHONE CO., LTD.—Mr. E. Trevor L. Williams, presiding at the meeting on November 13th, said since the last general meeting Mr. David Sarnoff and the Marchese Marconi had been added to the board. The trading profit for the year was £1 200 912, the highest figure yet attained. After provision for debenture service, directors' fees, interest on preference shares, etc., a net figure of £1 146 508 remained, or £2 105 155 after adding balance from last account. An interim dividend of 10% was paid in May, and a final dividend of 50% was now recommended. The Marconi contract was not yet completed, but would be shortly. In the meantime, they had been working in conjunction with the Marconi Company, so as, on completion, to take over their acquisition with the factories and business well forward upon their own lines. Many of the inventions which had made broadcasting possible had also been found to be useful in the gramophone field. The directors considered, therefore, that the company should become actively interested in radio. In March last, the directors acquired all the rights which the Marconi Co. possessed in the field of home entertainment, with their factories and sales depots and the whole of their interest in the M.O. Valve Co. In May of this year it was decided that the company utilise its experience and technique in sound reproduction by co-operating with others in the production of talking and sound films. The company arranged to co-operate with the British and Dominion Film Corporation in the taking of a number of new talking films. Four of these had now been completed and would be exhibited to the public shortly. The report and accounts were adopted.

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RADIOVISOR PARENT, LTD.

A New Industry—Promising Developments—Inquiries from Manufacturers Invited.

THE first annual general meeting of Radiovisor Parent, Ltd., was held on November 14th at the Hotel Victoria, Northumberland Avenue, London.

Lt.-Col. the Hon. A. C. Murray, C.M.G., D.S.O., chairman, who presided, said that the company was in a strong financial position, with cash resources amounting to £113 800.

One of the most remarkable technical developments of recent years had been the use of light-sensitive processes for various applications, especially in connection with talking films. The advent of the Radiovisor light sensitive bridge had placed the selenium cell in the forefront of light-sensitive devices. Having such a selenium bridge, a large field of activity was opened up, and the possible applications were numerous. To mention a few: the automatic switching on and off of street lights; the "invisible ray" burglar alarm; marine smoke alarm; control of water level in boilers and of smoke of factory chimneys, etc. The bridge should prove of use in many industries, and manufacturers and others were invited to communicate with the company.

It was not the board's policy to go in for manufacturing apparatus on a large scale other than the Radiovisor light-sensitive bridge, and they were prepared to co-operate with manufacturers and make arrangements with them to take over the manufacture and sale of appropriate applications. In cases where firms or individuals wished to make use of the bridge for some particular purpose or application of their own it was the policy to lend bridges and to assist them in developing their ideas.

The patent rights and trade marks for the world, excepting Great Britain, Northern Ireland, Isle of Man, and the Irish Free State, had been sold to Radiovisor Foreign and Colonial Ltd., in which the Parent company held a substantial interest. The "foreign company" had already made considerable progress, having concluded an agreement with the well-known firm of Siemens and Halske A.G. of Berlin for the exclusive rights to manufacture and sell throughout Europe. Intensive development work was already being carried out in their laboratories and workshops, which should lead to active business.

In conclusion, the chairman said that the company was financially strong, and, with the foundation already laid and the work that had been and was being carried out, they could look forward with confidence to the future.

The report and accounts were unanimously adopted.

METAL AND CHEMICAL PRICES.

		Tuesday, November 19th. Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£75 0 0	£1 0 0	—
Electro Wirebars	„	£83 10 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	„	11⅜d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2½d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet „	„	10⅛d.	—	—
Wire „	„	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig—				
English	per ton	£23 5 0	10s. 0d.	—
Foreign or Colonial	„	£21 17 6	12s. 6d.	—
Tin—				
Ingot	per ton	£180 10 0	£4 15 0	—
Wire, basis	per lb.	2s. 5d.	½d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£21 17 6	£1 7 6	—
Mercury	per bottle	£23 0 0	—	2 6

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10 0
„ Roll, „ £10 10 0 *Boric Acid* (Crystals) „ £20 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2¼d.
Sodium Bichromate—Per lb., 3½d.
Rubber—Para fine, 8½d.; plantation, 1st latex, 8½d.

∴ The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

The lead market, according to James Forster and Co., last week recovered 15s. per ton. The American price is unchanged at 6.25 cents.

Closing prices on November 15th were £22 for November, £21 18s. 9d. for December and January, and £21 17s. 6d. for February, 7s. 6d. to 5s. higher on the week.

NEW COMPANIES.

LOUTH ELECTRIC SERVICE, LTD.—Cap., £500. Electricians, electrical and mechanical engineers, etc. Solicitors: Falkner, Son and Roberts, Louth, Lincs.

W. H. BAKER (WALLINGFORD), LTD.—Cap., £1 500. Mechanical, electrical, wireless and general engineers, etc. Governing Director: W. H. Baker, Warborough, Oxford.

TELLUS ELECTRIC CLEANER CO. (SCOTLAND), LTD.—Cap., £10 000. To acquire the business formerly carried on by F. Smart and now by J. L. Smart, as Tellus Electric Cleaner Co. Reg. office: 33A, Gordon Street, Glasgow, C.1.

GUARANTEED ACCUMULATOR SERVICES, LTD.—Cap., £500. Manufacturers' agents and distributors of accumulators, mechanical, radio and musical apparatus and accessories, etc. Reg. Office: 7, Station Road, Wealdstone.

DEAN AND GOSLING, LTD.—Cap., £1 000. To acquire business of electrical and mechanical engineers and contractors, etc., carried on by A. P. Dean, A. R. Gosling and F. T. Gosling, at Colchester. Reg. office: 14A, Hospital Road, Colchester.

ACOUSTOPHONE, LTD.—Cap., £1 000. Manufacturers, erectors, installers, maintainers and repairers of and dealers in wireless, radio gramophones, radio receivers, radio wire, etc. Reg. Office: 82, Pelham Street, South Kensington, London, S.W.7.

MOTOR INVENTIONS, LTD.—Cap., £1 000. Motor, electrical and general engineers, manufacturers of, agents for and dealers in motor and other vehicles, lamps, batteries, accumulators, dynamos, magnetos, etc. Reg. office: 2, South John Street, Liverpool.

INTERNATIONAL TRADE AND INDUSTRIES, LTD.—Cap., £7 800. To adopt agreement with George Evans and Co., Ltd., and to carry on business of manufacturers of and agents for scientific instruments, electrical accessories, etc. Reg. Office: 35, Waterloo Road, London, S.E.1.

RESONANT FAST DRILLING CORPORATION, LTD.—Cap., £200. To acquire licence from W. R. Macdonald, and to carry on business of designers, inventors and manufacturers of and dealers in illuminated, mechanical, revolving, and other signs and apparatus and process for internal and external lighting, direction and other indicators, etc. Reg. office: 66, Finsbury Pavement, London, E.C.

DULRAE PATENTS, LTD.—Cap., £100. To acquire and turn to account inventions, processes or apparatus relating to electric panel warming of buildings, and other inventions, processes or apparatus relating to warming, ventilation or cooling of buildings, to carry on business of heating, ventilating, cooking and electrical engineers and contractors, etc. Reg. office: 4, Bloomsbury Place, London, W.C.1.

ALFOL INSULATION, LTD.—Cap., £1 000. To acquire business of dealers in insulating material sold under a trade mark incorporating word "Alfol" carried on at 3, Bramham Gardens, London, S.W.5, by N.V. Internationale Alfol Maatschappij of Amsterdam, by its agent L. G. Wilkening, and to adopt an agreement with the said company and Dr. E. Dyckerhoff. Solicitors: Slaughter and May, 18, Austin Friars, London, E.C.

METALS COATING CO., LTD.—Cap., £150 000. To acquire assets of Metallisation, Ltd., Dudley, and Metallisation (Sales), London. Company holds six months' option to acquire 91% of issued ord. sh. cap. of Metals Coating Co. of America, Inc., which controls Metallisator A. G. of Berlin and Metallisator A-G. of Hamburg, three companies which, with the British firms now being acquired, between them control the world rights for the manufacture, sales, and contracting licences of a metal-spraying pistol. The principal uses of the process are for coating metals against corrosion and erosion.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.

JUNILOG.—505 775. Class 8. Electric condensers for use in wireless telegraphy and telephony. Sydney Sam Bird, Cyldon Works, Sarnesfield Road, Enfield Town, Middlesex; manufacturing electrical engineer. September 3rd, 1929.

TORNADO.—500 356. Class 13. Electric incandescent lamps (ordinary). L. Benn and Co., Ltd., 8, Colonial Avenue, Minories, London, E.1; merchants. February 25th, 1929.

PREMAG.—505 396. Class 13. Filler rods and electrodes, being metal goods not included in other classes, for use in electric arc and acetylene welding. The Premier Electric Welding Co., Ltd., Harrow Manorway, Abbey Wood, London, S.E.2; manufacturers. August 19th, 1929. To be associated with No. 505 395 (2 687) i.

DEMON.—502 867. Class 6. Electric vacuum cleaning machines. L. Benn and Co., Ltd., 8, Colonial Avenue, Minories, London, E.1; merchants. May 17th, 1929.

SILOVIM.—505 145. Class 6. Electric vacuum cleaning machines. C.C.A. (Vacuum Cleaners), Ltd., Swinton House, 324, Gray's Inn Road, London, W.C.1; merchants. August 8th, 1929. To be associated with No. B505 143 and another (not yet advertised).

LE MIROIR DE LA VOIX (sign).—501 543. Class 8. Wireless telephonic and television apparatus and parts thereof, sound recording and amplifying machines and parts thereof. Compagnie Generale des Machines Parlantes Pathe Freres, 30, Boulevard des Italiens, Paris; manufacturers. April 5th, 1929.

HEART.—504 200. Class 8. Thermionic valves, battery eliminators, battery chargers, accumulators, dials, transformers, valve holders, and condensers, all for use in connection with wireless telephony. Adolf Knopf, trading as the Wholesale Guarantee Incandescent Supply Stores, 25, Waterloo Road, London, S.E.1; wireless dealer. July 4th, 1929. To be associated with No. 350 756 (1 839) and others.

TWIN CONE (sign).—504 679. Class 8. Philosophical and scientific instruments. Arthur Green, Wilga, Warwick Avenue, Coventry; engineer. July 22nd, 1929. Registration of this trade mark shall give no right to the exclusive use of the words "Twin Cone."

ORGOLA.—505 267. Class 8. Instruments and apparatus for radio signalling, thermionic valves, thermionic amplifiers and sound reproducers, gramophones, gramophone pick-ups and parts. The Mullard Radio Valve Co., Ltd., 45, Nightingale Lane, London, S.W.12; manufacturers. August 13th, 1929.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CAPLIN, Mr. F., 40, Downs Park Road, Dalston (trading as FRANKS), wireless dealer. £11 10s. 2d. October 2nd.

CASTLE RADIO CO., 161, Westminster Bridge Road, S.E., wireless dealers. £20 5s. 6d. October 2nd.

ENGLAND AND SON, Eynsham, electrical engineers. £17 18s. 1d. October 14th.

LUEN, A. E., Lanthorne House, 98/100, Queen Street (trading as LUEN ELECTRICAL SUPPLIES), Cardiff, agents and merchants. £20 13s. 4d. October 5th.

MAYFAIR ELECTRIC GRAMOPHONES, LTD., Friars House, New Broad Street, E.C., electrical engineers. £16 15s. 4d. October 12th.

SQUIRES AND CO., High Street, Billericay, electrical engineers. £15 15s. 6d. October 7th.

UNDERHILL, G., 8, Summer Street, Barbourne, electrical contractor. £13 18s. 7d. October 1st.

Deed of Arrangement.

BRICE, Mrs. Mary Ann Charlotte, trading as STEGMAN AND CO., Brighton Railway Approach, Clapham Junction, electrical engineer. Dated November 7th, filed November 14th. Trustee, W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., Certified Accountant. Liabilities unsecured, £3 526; assets, less secured claims, £1 500.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

HOUGH BROS., LTD., Nottingham, gramophone and wireless dealers.—Registered November 9th, £2 500 debentures; general charge. *Nil. December 10th, 1928.

TRUPHONIC RADIO LTD., London, S.E.—Registered October 31st. £15 000 debenture to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; charged on land in London, also general charge.

WOLF AND MORGAN, LTD. (late WAGNER ELECTRIC SUPPLIES, LTD., London, E.C.—Registered November 7th, series of £2 000 debentures present issue £1 000; general charge. *—. September 28th, 1928.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

ABBOTT, James William, trading as ELECTRICAL ENGINEERING AND SUPPLY CO., 26, The Bank, Barnard Castle, Durham, electrical engineer. The creditors were called together recently when a statement of affairs was submitted which showed liabilities of £580, of which £388 was due to the trade and £192 to the bank, the latter holding a third party guarantee to the extent of £100. The assets consisted of cash in hand, £6; stock, £60; book debts, £63, valued at £50; furniture, £5; plant, £200; and equity in freehold shop and house, £8, making a total of £329. After allowing £6 for preferential claims, the net assets were £323, or a deficiency of £257. It was stated that the debtor had recently suffered from ill-health, and a deed of assignment had already been executed in favour of Mr. H. Wood, C.A., of Newgate, Barnard Castle. The creditors decided to confirm the deed, and expressed the opinion that the trustee should continue the business for a period of six months, which would cover the busy season, and would also give him an opportunity of selling as a going concern.

BRITISH ELECTRICAL REPRODUCTION CO., LTD., Lee Valley Road, Ponders End, Middlesex. In pursuance of the provisions of the Companies (Consolidation) Act, 1908, a meeting of the creditors in this voluntary winding up was held on November 12th at the offices of Winney Smith and Winney, C.A., 4B, Frederick's Place, E.C., when Mr. R. L. Latimer, the liquidator of the company, submitted a statement of affairs which disclosed liabilities of £4,367, of which £2,803 was due to the trade, and there was a sum of £1,285 due to the directors for advances. In addition there were debentures and interest amounting to £538. The debenture holders held a floating charge on the assets of the company which were estimated to realise £260, leaving the debenture holders unsecured creditors for £276. There was a deficiency as regarded the unsecured creditors of £4,367. According to a trading and profit and loss account from July 17th, 1928, which was the date of the incorporation of the company, to September 6th, 1929, the purchases amounted to £3 710 and the sales were £1 412. After allowing for the expenses in carrying on the business there was a trading loss of £3 183. The liquidator said that there had been two preliminary meetings of creditors prior to the liquidation of the company. The debenture holder was willing to distribute to the trade creditors any proceeds he might receive under his debenture. The voluntary liquidation of the company was confirmed, and a vote of thanks passed to the debenture holder.

London Gazette, etc.

Bankruptcy Information.

BATES, Victor Harold, High Street, Linton, trading as THE LINTON RADIO SERVICE, wireless engineer. Receiving order, November 11th. Debtor's petition. First meeting, November 23rd, 11 a.m., Official Receiver's Office, 41, Sidney Street, Cambridge, Public examination, December 4th, 11 a.m., Guildhall, Cambridge.

PEACE, Ernest Everitt, 230, High Street, Erdington, Birmingham, trading as PEACE AND CO., manufacturing electrical engineer. Receiving order, November 12th. Debtor's petition.

Notice of Dividend.

[M] BRAYSHAW, Dunwell, 78, Granby Street, Liverpool, electrician First and final dividend, 4s. 7¼d. per £, payable November 21st. Office of the Official Receiver, Government Buildings, Victoria Street, Liverpool.

Notices of Intended Dividends.

HUNT, Sydney Everest, 8A, Torwood Street, Torquay, electrical engineer and contractor. Last day for receiving proofs, November 29th. Trustee, E. H. Hawkins, 4, Charterhouse Square, London, E.C.1.

PRICE, Frederick, and TARVER, Charles Reekes, 15, Working Street, Cardiff, electrical engineers, trading as FRED PRICE, TARVER AND CO. Last day for receiving proofs, December 4th. Trustee, E. Owen, 34, Park Place, Cardiff, official receiver.

RADCLIFFE, Harold Howe Delme, and HADDLETON, Frank, 51, Islington Row, Birmingham, trading as CITY ELECTRIC SERVICES, electrical engineers. Last day for receiving proofs, December 4th. Trustee, C. Hoult, 191, Corporation Street, Birmingham, official receiver.

Application for Discharge.

COHEN, George, 49, Newman Street, Oxford Street, London, W., electrical engineer. Hearing, December 11th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Order Made on Application for Discharge.

WHEELER, Frederick George, Wynchwood, Broadlands Avenue, Shepperton-on-Thames, Middlesex, electrical engineer. Discharge suspended October 18th, for 18 months.

Partnership Dissolved.

VAN RAALTE AND MURREY (Harry Alexander John Hoddesdon MURREY and Leonard VAN RAALTE), dealers in antiques, crystal fittings, and electrical sundries, 1, Gilbert House, Princeton Street, Holborn, W.C., by mutual consent as from July 1, 1929. Debts received and paid by H. A. J. H. Murrey.

Bankruptcy Proceedings.

CAMEROFF, Joseph, 147, Spencer Place, Leeds, electrical engineer. The public examination of this debtor was held last week at the County Court House, Albion Place, Leeds. A statement of affairs was returned showing liabilities of £351 and a deficiency of £335. The debtor ascribed his failure to lack of capital and loss on contracts.

GRAHAM, Frederick Henry, 14, Hilltop Avenue, Harehills, Leeds, electrician. The public examination of this debtor was held on November 12that the County Court House, Albion Place, Leeds, when the failure was attributed to ill-health and lack of capital. The debtor produced a statement of affairs showing liabilities of £245 and a deficiency of £205.

WILLIAMS AND GILL, 1, Station Road, Church End, Finchley, Middlesex, electricians. The public examination was held on November 14th at the Court House, Barnet. There was a statement of affairs returned showing liabilities of £1 132, against assets estimated to produce £14, a deficiency of £1 118. The separate estate of debtor P. J. Gill showed liabilities of £44 and assets of the estimated value of £3. The debtor P. M. Davidson had liabilities of £207 and no assets. It would seem that the debtors formerly traded together in partnership as WILLIAMS AND GILL, the business being started in 1914 by the debtor Gill and another. Davidson became a partner some years later and subsequently the other partner retired. In July, 1928, the debtor Davidson left the business. The debtors were closely questioned regarding their household furniture, both claiming that it belonged to their wives; and the examination was closed.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

317 711 L. Satchwell. Switches. (14/2/28.)
285 860 Federated Engineers Development Corporation. Methods of and apparatus for testing articles of magnetisable material. (23/2/27.)
288 988 International General Electric Co., Inc. Direct-current machines with shunt and series excitation. (16/4/27.)
317 715 G. H. Scholes, F. J. Pearce, and G. H. Scholes and Co., Ltd. Contacts for electrical switches and the like. (19/4/28.)
289 804 N.V. Philips' Gloeilampenfabrieken. Magnet systems for converting electrical into acoustic oscillations, and vice versa. (2/5/27.)
293 018 Dr. A. Scherbius and E. R. Ritter (trading as Scherbius and Ritter). Electric switches. (1/7/27.)
317 717 Berry, Wiggins and Co., Ltd., and H. H. Holmes. Electrical insulating and filling materials, more particularly liquid electrical insulating-materials, and processes for the manufacture thereof. (16/5/28.)
317 772 H. L. Guy and Associated Electrical Industries, Ltd. Evaporators. (19/5/28.)
317 745 Standard Telephones and Cables, Ltd., E. P. G. Wright, and J. H. E. Baker. Automatic and semi-automatic exchange systems. (21/5/28.)
317 746 H. Parker. Calculating device for use in connection with wireless receivers. (21/5/28.)
317 773 A. D.Windström. Electric baking and roasting ovens. (21/5/28).
290 984 Soc. de Recherches et de Perfectionnements Industriels. Musical instrument provided with a keyboard and working through the periodic illumination of a photo-electric cell. (19/5/27.)
317 749 K. E. Edgeworth. Tuned inductances and transformers. (21/5/28.)
317 873 T. A. W. Robinson. Holders for thermionic valves. (23/5/28.)
291 397 A. C. Hardy and F. W. Cunningham. Method of and apparatus for comparing and recording relative intensity of radiant energy. (1/6/27.)
294 872 Siemens and Halske Akt.-Ges. Arrangement for mounting telephone selectors and pole-changers used in long distance communication installations. (30/7/27.)
317 874 R. O. Kapp and C. G. Carrothers. Protective arrangements for electric power lines or the like. (23/5/28.)
317 817 Automatic Telephone Manufacturing Co. and P. F. Gunning. Telephone systems. (23/5/28.)
317 878 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Electrically driven vibratory devices, such as tuning-forks. (24/5/28.)
317 879 Standard Telephones and Cables, Ltd., E. P. G. Wright, J. H. E. Baker and A. H. Cameron. Automatic and semi-automatic telephone systems. (24/5/28.)
317 883 Siemens Bros. and Co., Ltd., and A. E. Foster. Inductive loading of electric cables. (24/5/28.)
317 884 H. W. Hamlett. Wireless installations. (24/5/28.)
317 885 H. W. Hamlett. Coin-actuated controlling devices for electrical circuits. (24/5/28.)
317 886 H. W. Hamlett. Coin-actuated controlling devices for electrical circuits. (24/5/28.)
317 887 H. W. Hamlett. Coin-actuated controlling devices for electrical circuits. (24/5/28.)
317 897 F. B. Dehn (Penberthy Injector Co.). Quick action electric switches. (25/5/28.)
291 400 Westinghouse Electric and Manufacturing Co. Thermionic cathodes. (1/6/27.)
317 901 H. G. Turnell. Switchgear for electric power purposes and the like. (26/5/28.)
294 166 Electrical Research Products, Inc. Electric telegraphs. (19/7/27.)
291 116 J. Carpentier. Electro-mechanical vibrators. (28/5/27.)
317 909 W. T. L. Becker and L. W. Oliver. Light sensitive films or carriers therefor. (26/5/28.)
317 920 P. H. Hull and Imperial Chemical Industries, Ltd. Effecting chemical reactions in gases by means of electrical discharges. (31/5/28.)
317 931 N. R. Davis, C. R. Burch, F. W. Capper and Associated Electrical Industries, Ltd. Control of the power factor and voltage conditions of electric induction furnaces. (5/6/28.)
296 364 M. Jacob. Switching devices. (30/8/27.)
317 944 Horstmann Gear Co., Ltd., and A. Horstmann. Gas controllers, electric time switches, and other timing devices. (18/6/28.)
319 947 R. J. Carruthers. Reciprocating and oscillating and like electric motors. (26/6/28.)
292 985 E. Schröder. Electric heating devices for welding, soldering and annealing. (28/6/27.)
303 825 Eclairage des Vehicules sur Rail. Means for charging storage batteries. (10/1/28.)
317 956 M. G. Scroggie. Radio apparatus. (11/7/28.)
293 842 A. C. Spark Plug Co. Ammeter. (13/7/27.)
294 213 Marconi's Wireless Telegraph Co., Ltd. Transmission system for use in electric signalling systems. (20/7/27.)
294 219 Schiele and Bruchsaler-Industriewerke Akt.-Ges. Releasing device for electric switches. (20/7/27.)
317 965 Tyer and Co., Ltd., and E. W. Baker. Electric locking of hand-levers for railway signalling systems and the like. (20/7/28.)
294 541 E. Kelsen. Process and apparatus for electrolytically manufacturing metal sheets and tubes. (25/7/27.)
294 666 International General Electric Co., Inc. Alternating current meters. (28/7/27.)
295 028 N. V. Philips' Gloeilampenfabrieken. X-ray installations. (5/8/27.)
295 285 British Thomson-Houston Co., Ltd. Electric switches. (8/8/27.)
318 000 W. A. Coates and Associated Electrical Industries, Ltd. Electric switches or circuit interrupters. (1/9/28.)
318 003 H. C. Willson. Radio receiving apparatus. (4/9/28.)
297 033 Bosch Akt.-Ges. R. Electrical switch boxes. (12/9/27.)
297 056 R. Unzeitig. Electric regulator. (13/9/27.)
311 264 Forges et Ateliers de Constructions Electriques de Jeumont. Mechanism for producing step-by-step movement particularly applicable to the switches of electrical control systems. (8/5/28.)
318 031 Wolseley Motors (1927), Ltd., and O. Boden. Method of mounting and driving dynamos or electric generators of motor vehicles. (5/10/28.)
299 880 Siemens and Halske Akt.-Ges. Method of and apparatus for determining the amount of heat given off by a heating body. (3/11/27.)
318 045 J. A. Crabtree and B. G. Harrison. Electric switches, bell-pushes, and the like. (31/10/28.)
318 064 Siemens Schuckertwerke Akt.-Ges., H. Richter and M. Dieterlen. Cross-field direct current dynamo with adjustable short circuit current strength. (5/12/28.)
307 875 E. Musy. Miners' electric lamps. (15/3/28.)
303 884 Soc. Nouvelle de L'Orfevrerie d'Ercuis. Chromium plating of conducting bodies. (12/1/28.)
318 075 G. E. Lloyd and Electroflo Meters Co., Ltd. Direct current electrical measuring instruments. (7/1/29.)
304 281 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Devices for sorting articles of different weight. (18/1/28.)
287 877 Akt.-Ges Brown Boveri et Cie. Mercury-vapour rectifiers. (28/3/27.)
318 160 W. E. Beatty (Bell Telephone Laboratories, Inc.). Television and like systems. (26/4/28.)
318 117 O. Fulton. Electrical picture or other representation transmission or reception apparatus. (28/4/28.)
318 118 O. Fulton. Electrical apparatus for the transmission or reception of pictures or other representations. (28/4/28.)
318 119 L. Fulton. Electrical apparatus for the transmission or reception of pictures, diagrams, or other representations. (28/4/28.)
318 120 O. Fulton. Electrical apparatus for the reception of pictures, diagrams, or other representations. (28/4/28.)
318 121 O. Fulton. Electrical systems for the reception of pictures, diagrams, or other representations. (28/4/28.)
318 306 K. Higginson and R.I. and Varley, Ltd. Wireless receiving apparatus. (5/5/28.)
290 985 K. Brodowski. Rectifiers for alternating currents. (21/5/28.)
318 122 English Electric Co., Ltd., and A. M. Pooley. Metallic boxes for electric fuses. (24/5/28.)
318 162 L. Mellersh-Jackson (Siemens and Halske Akt. Ges.). Alternating-current-actuated arrangements for indicating or measuring purposes in an electric circuit. (24/5/28.)
291 354 L. Levy. Electron-discharge tube and connections therefor. (30/5/27.)
299 443 Electrical Research Products, Inc. Submarine cable telegraph systems. (28/10/27.)
318 189 A. H. Symondson and J. W. Walker and Sons, Ltd. Electrical fuse devices. (30/5/28.)
318 273 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Electric wave signalling systems. (31/5/28.)
296 077 Westinghouse Brake and Saxby Signal Co., Ltd. Apparatus for rectifying alternating currents. (25/8/27.)
318 278 J. L. Baird and Television, Ltd. Loud speaking telephone applications for use in connection with television apparatus and the like. (31/5/28.)
318 279 F. W. Lanchester. Moving coil microphones. (1/6/28.)
318 284 British Thomson-Houston Co., Ltd., L. Griffiths, and C. J. Morton. Electric ignition devices for use with internal combustion engines. (1/6/28.)
291 414 I.G. Farbenindustrie Akt.-Ges. Manufacture of lead or lead peroxide electrodes for accumulators. (1/6/27.)
318 291 J. Stone and Co., Ltd., and S. C. Davey. Electric heaters. (2/6/28.)
318 292 W. B. Whitney, E. B. Wedmore, and British Electrical and Allied Industries Research Association. Circuit-breakers or switches. (2/6/28.)
318 293 H. Coates. Protective systems for multiphase alternating-current electric apparatus. (2/6/28.)
318 294 S. Melton. Power factor control for power systems. (2/6/28.)
318 295 J. L. Baird and Television, Ltd. Television apparatus and the like. (2/6/28.)
318 308 Electroflo Meters Co., Ltd. (Republic Flow Meters Co.). Means for the control of temperature. (5/6/28.)
318 313 C. L. Daun. Electric motors and dynamo machines. (5/6/28.)
318 316 British Insulated Cables, Ltd., and W. C. Handley. Closing and opening of electrical circuits at pre-determined time intervals. (6/6/28.)
318 317 A. F. Harmer and Drake and Gorham, Ltd. Circuit-controlling devices. (7/6/28.)
318 320 W. E. King and Gas Meter Co., Ltd. Gas or electricity controllers and the like. (9/6/28.)
308 750 Soc. Electrometallurgique de Montricher. Electrodes for electric furnaces. (31/3/28.)
318 328 J. B. Laidlaw. Means of wireless reception. (21/6/28.)
318 331 C. E. C. Roberts. Television and telephotographic apparatus. (22/6/28.)
318 340 J. A. Reavell. Electrically-heated self-circulating apparatus for evaporating, distilling, and the like. (6/7/28.)
318 351 W. Haddon and J. A. Fullilove. Method of and means for casting large accumulator plates. (23/7/28.)
318 356 A. F. J. Wright. Supporting arms for electrical pick-ups for gramophones and the like. (27/7/28.)
318 357 English Electric Co., Ltd., J. E. Calverley, and W. Donnelly. Dynamo-electric machines. (28/7/28.)
318 361 Greenwich Cable Works, Ltd., and J. H. W. Brooking. Manufacture of insulated electric conductors. (1/8/28.)
295 393 F. Fabinger, and Ceskomoravska-Kolben-Danek Akciova Spolecnost. Electric transformers. (12/8/27.)
318 368 W. T. Henley's Telegraph Works Co., Ltd., and H. C. Hoban. Electric circuit-testing device. (13/8/28.)
318 370 H. Akroyd. Portable stands for electric lamps. (16/8/28.)
318 378 G. H. Crook. Operation of electrical illumination or indication lamps by alternating current. (23/8/28.)
318 397 B. Anderson and Allmanna Svenska Elektriska Aktiebolaget. Expansion vessels for transformers. (11/9/28.)
297 057 Electrolux, Ltd. Absorption refrigerating apparatus. (13/9/27.)
298 646 Siemens-Schuckertwerke Akt.-Ges. Arrangement for preventing the corona on the slot sleeves of high-voltage electrical machines. (13/10/27.)
318 412 J. Y. Johnson (I.G. Farbenindustrie Akt.Ges.). Manufacture and production of insulated articles for electrical engineering purposes. (15/10/28.)
299 730 British Thomson-Houston Co., Ltd. Electron-discharge devices. (29/10/27.)
305 458 Aluminium Industrie Akt.-Ges. Electrolytic production of aluminium. (4/2/28.)
318 423 W. V. Butterfield, A. W. Butterfield, and S. Butterfield (trading as Mycromet Manufacturing Co.) Electric lampholders. (2/11/28.)
301 456 H. Halperin and K. W. Miller. Methods of and means for bonding together electric cable sheaths. (30/11/27.)
300 242 International General Electric Co., Inc. Annealing furnaces. (9/11/27.)
300 650 International General Electric Co., Inc. Explosion pots for oil switches. (17/11/27.)
318 431 Vereinigte Aluminium-Werke Akt.-Ges. Electrolytic production of aluminium. (3/9/28.)
301 045 British Thomson-Houston Co., Ltd. Control systems for arc welding-machines. (23/11/27.)
318 439 W. S. Smith, H. J. Garnett, and H. C. Channon. Electric cables. (5/6/28.)
301 912 E. Bornand and H. A. Schlaepfer. Electric furnace. (8/12/27.)
303 809 Marconi's Wireless Telegraph Co., Ltd., and R. H. Ranger. Picture and the like telegraph apparatus. (9/1/29.)
304 660 Siemens-Schuckertwerke Akt.Ges. Long distance communication cable. (23/1/28.)
308 826 British Thomson-Houston Co., Ltd. Restraining-devices for bogie trucks of railway and like vehicles. (31/3/28.)
318 299 J. E. Pollak. (Associated Telephone and Telegraph Co.). Photo-electric plates. (1/6/28.)
313 534 Tchoubritch, Derval et Cie. Automatic circuit-selectors for telephony. (11/4/27.)
318 300 R. O. Kapp and C. G. Carrothers. Protective arrangements for electric power-lines or the like. (23/5/28.)

Applications for Patents.

August 7th.

24 141 Raytheon, Inc. Gaseous conduction apparatus. (24/8/28, U.S.)
24 174 J. L. Routhin. Wireless apparatus. (7/8/28, Germany.)
24 013 N. F. Sheppard. Rotary a.c. induction machine.
24 159 A. A. Thornton (Radio Frequency Laboratories, Inc.). L.f./circuits.

August 8th.

24 248 J. L. Baird and Television, Ltd. Television, etc., apparatus. (12/10/28.)
24 215 N. M. Bell and A. Bell and Co., Ltd. Gas and electric fires.
24 280 British Thomson-Houston Co., Ltd. Control circuits. (8/8/28, U.S.).
24 281 Elektrizitats Akt.-Ges. Hydrawerk. Manufacture of electric condensers. (9/8/28, Germany).

(*Continued on page* 656)

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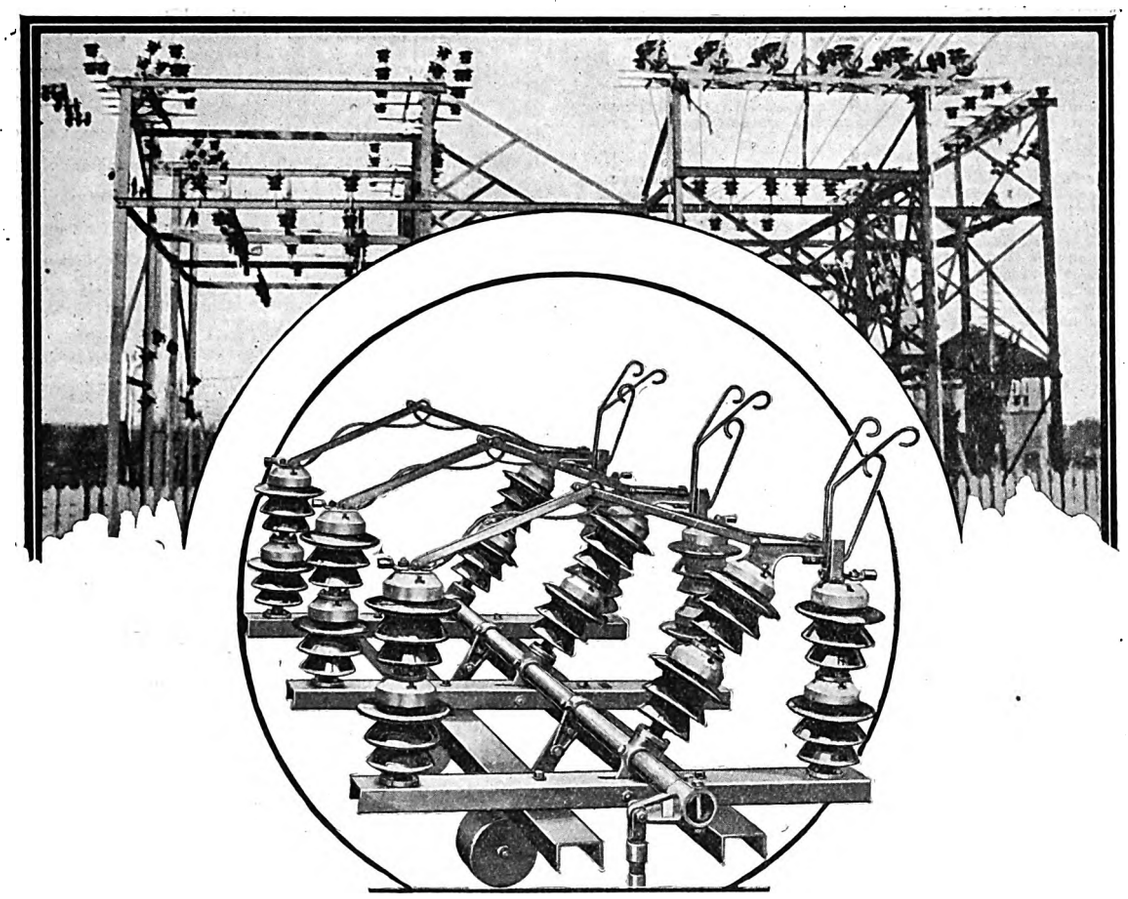

OVERHEAD LINE EQUIPMENT

IN "Empire" overhead line equipment, manufactured by Electric Control Ltd., the highest standard of design and construction are maintained.

The illustration shows a horizontal disconnecting switch, which has many special features.

Each single-phase unit is specially arranged for self-alignment, with fixed and moving insulators and rocker bearings.

This considerably facilitates erection, since each unit is erected independently, the three single-phase units being connected by inserting a coupling rod after erection.

THE INSULATORS ARE BEST BRITISH PORCELAIN, THE CAPS AND PINS BEING JIG-FITTED AND CEMENTED UNDER STEAM-SET PROCESS.

ALL CURRENT CARRYING PARTS ARE SURFACE PLATED, AND ALL STEEL PARTS HOT GALVANISED AFTER ALL MACHINING AND DRILLING PROCESSES ARE COMPLETE.

ELECTRIC CONTROL

LIMITED, BRIGHTON

EMPIRE ELECTRIC CONTROL

RAYMOND

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24 235 W. Fairweather (Singer Mfg. Co.). Electric motor.
24 294 N. V. Philips' Gloeilampenfabrieken. Installations for irradiation of substances with ultra-violet light. (8/9/28, Holland.)
24 237 R. C. Prince, and Radiovisor Parent, Ltd. Means for operating light sensitive apparatus.
24 310 J. H. T. Roberts. Electrical apparatus.
24 316 Siemens-Schuckertwerke Akt.-Ges. Tube switches. (17/8/28, Germany.)
24 052 Siemens and Halske Akt.-Ges. Maintaining constant speed of motors. (6/8/28, Germany.)

August 9th.

24 423 Automatic Telephone Mfg. Co., Ltd., and C. Gillings. Telephone systems.
24 424 Automatic Telephone Mfg. Co., Ltd., and A. E. Flenley. Automatic switches for use in telephone systems, etc.
24 346 J. and W. L. Ball, and E. Reader. Cell having photoelectric properties.
24 348 N. M. Bell and A. Bell and Co., Ltd. Gas and electric fires.
24 435 British Thomson-Houston Co., Ltd., and E. H. B. Martin. Coupling sources of a.c. energy.
24 433 A. M. H. R. Brown and S. G. Brown, Ltd. Electric switching apparatus.
24 401 S. G. Brown. Dynamo-electric machines.
24 427 Bucyrus-Erie Co. Controlling electric motors. (20/8/28, U.S.)
24 440 S. Cassani. Electrical apparatus for medical use.
24 391 Electrical Research Products Co., Inc. Devices for damping mechanical vibrations. (25/8/28, U.S.)
24 338 H. M. Genese and Pritchett and Gold and E.P.S. Co., Ltd. Electric cells.
24 354 Ges. fur Elektrische Apparate. Ships' telegraphs. (9/8/28, Germany.)
24 453 C. G. H. Hallett, and Morgan Crucible Co., Ltd. Electric radiators.
24 457 A. T. M. Johnson. Electric signalling apparatus.
24 409 J. Y. Johnson (I.G. Farbenindustrie A.G.). Electrical apparatus.
24 335 F. A. Lindemann. Device for regulating accelerating potential applied to photoelectric cells.
24 366 C. H. Poupard. Means for controlling electrical pick-up devices.
24 442 Radio Frequency Laboratories, Inc. Amplifier circuits. (8/6/29, U.S.)
24 447 Soc. d'Electro Chimie d'Electro-Metallurgie et d'Aciéries Electriques d'Ugine. Extraction of tin from ores, etc. (22/6/29, France.)
24 441 A. A. Thornton (Grigsby Grunow Co.). Electrical condensers.
24 369 W. W. Triggs (Preferred Electric Co.). Electric heating elements.
24 361 Walker, Hunter and Co., Ltd., and J. Walker. Electrically heated ovens.
24 363 Walker, Hunter and Co., Ltd., and J. Walker. Automatic cut-outs for heating appliances.

August 10th.

24 510, 24 512, 24 514. E. Brontman. Thermo-electric batteries.
24 517 Dubilier Condenser Co. (1925), Ltd. Means for receiving electrical signals. (10/8/28, Germany.)
24 540 H. C. Holmes, J. A. A. Taylor, and A. Warwick. Reception and distribution of electrical signals.
24 476 F. Ingham. Voltage regulation of current from main to amplifiers, etc.
24 516 C. Lorenz Akt.-Ges. Voltage regulating devices for electrical machines. (11/8/28, Germany.)
24 535 Soc. de Prospection Electrique Procidés Schlumberger. Electrical prospecting apparatus. (26/10/28, France.)
24 493 Walker, Hunter and Co., Ltd., and J. Walker. Toasting, etc., attachment for electric or gas fires.

August 12th.

24 566 G. E. Adams and Constant Potential Transformer Syndicate, Ltd. Means for power production.
24 598 Associated Electrical Industries, Ltd. Transformer cooling systems. (30/8/28, U.S.)
24 553 W. L. Colassi. Electrical sound reproducing apparatus.
24 554 S. O. Cowper-Coles. Sound recording.
24 622 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Sealing objects to electrical material.
24 629 Ferranti, Ltd., and J. Turner. Insulator bushings.
24 571 R. Hutchings. Electric lamp cartons.
24 580 A. G. S. Sandison. Means for governing electric motors.
24 581 A. G. S. Sandison. Fluid operated relay mechanism.
24 582 A. G. S. Sandison. Electrical liquid rheostats.
24 583 A. G. S. Sandison. Alternating current ampere-hour meters.
24 625 Siemens Schuckertwerke Akt.-Ges. Electric arc extinction apparatus. (20/8/28, Germany.)
24 578 Standard Telephones and Cables, Ltd. Remote control systems, etc.
24 602 Telefunken Ges. fur Drahtlose Telegraphie. Circuit arrangements for connecting aerial, etc., load to a high frequency source. (11/8/28, Germany.)

August 13th.

24 740 J. L. Baird and Television Ltd. Television, etc., systems. (26/10/28.)
24 660 A. P. Brown and Callender's Cable and Construction Co., Ltd. Insulating support for electric conductors.
24 723 A. W. Brown. Wireless direction finding systems.
24 733 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Amplifying alternating voltage variations.
24 705 English Electric Co., Ltd., and F. Morris. Motor control apparatus.
24 715 General Electric Co., Ltd. Incandescent lamps. (17/8/28, Germany.)
24 716 General Electric Co., Ltd. Manufacture of incandescent lamps, etc. (20/8/28, Germany.)
24 743 C. Lorenz Akt.-Ges. Alternating current synchronous motors. (6/5/29, Germany.)
24 665 L. M. McLeod. Electrical water heaters.
24 720 Soc. des Etablissements Pericaud. Five-electrode valves. (13/8/28, France.)

August 14th

24 827 Associated Electrical Industries, Ltd., and E. Y. Robinson. Thermionic cathodes.
24 828 Associated Electrical Industries, Ltd., and L. H. A. Carr. Alternating current dynamos.
24 863 Autom-Spezial Machinen Ges. and H. A. Bumke Ges. Production of carbon dollies for galvanic cells. (26/7/29.)
24 766 R. Blakoe. Device for producing thermoelectric effects.
24 763 L. Blundell and W. H. Curtis. Electrical sound reproducing and transmitting apparatus.
24 829 British Thomson-Houston Co., Ltd., and R. L. Chantrill. Oil immersed electrical apparatus.
24 830 British Thomson-Houston Co., Ltd., and R. D. Parry. Vibratory electric regulators.
24 802 B. Brown, H. J. Charlton, and W. D. Dick. Hygienic fitting for telephone mouthpieces, etc.
24 861 C. E. Cruttwell. Fusible cut-outs.
24 853 Electrical Research Products, Inc. Loaded copper conductors. (24/11/28, U.S.)
24 810 R. H. Favell. Distributing block for electric circuits.
24 803 J. H. O. Harris. Electric signalling.
24 831 International General Electric Co., Inc. Electric rectifiers. (15/8/28, Germany.)
24 858 N. N. Ladefoged. Thermionic valves.
24 823 Landis and Gyr Soc. Anon. Time switches, etc. (11/9/28, Switzerland.)
24 812 H. A. Moore. Regulating devices for dynamos.
24 765 R. Pearson. Electric switches.
24 850 Siemens-Reiniger-Veifa Ges. für Medizinische Technik. Vacuum tubes. (26/10/28, Germany.)
24 786 A. E. Williams. Electric cut-outs for looms.

August 15th

24 950 Associated Electrical Industries, Ltd., and G. E. Bailey. Insulated bushings for electrical apparatus.
24 983 J. L. Baird, and Television, Ltd. Television, etc., apparatus. (26/10/28.)
24 958 H. H. Berry. Electric fires.
24 985 A. M. H. R. Brown and S. G. Brown, Ltd. Safety devices for electrical apparatus.
24 995 H. Caddick and G. A. Harvey and Co. (London), Ltd. Oil tanks for electrical apparatus.
24 980 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Lighting installations.
24 981 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Thermionic amplifiers.
24 872 H. F. Duffell and W. R. Parkinson. Means for simultaneously operating electric switches.
24 917 General Electric Co., Ltd. Luminous electric discharge tubes. (21/8/28, Germany.)
24 956 Graham Amplion, Ltd., and W. Staff. Microphones.
25 925 C. Lorenz Akt.-Ges. Telegraphic systems. (6/2/29, Germany.)
24 960 F. P. McBerty. Electric welding machines.
24 893 J. Nathan. Security cabinet for automatic telephonic instruments.
24 926 Patent Treuhand für Elektrische Gluhlampen. Electric discharge devices. (25/8/28, Germany.)
24 987 Siemens and Halske Akt.-Ges. Telegraphic installations. (28/8/28, Germany.)
24 920 C. H. Smith. Variable impedances.
24 973 Standard Telephones and Cables, Ltd. (Western Electric Co.). Electron emitters. (13/6/28.)
24 966 A. A. Thornton (Grigsby-Grunow and Co.) Electronic devices.
24 910 W. W. Triggs (Hart Manufacturing Co.). Electric switches.
24 990 H. Wade (H. A. F. Nash). Electric insulators.
24 991 H. Wade (H. A. F. Nash). Overhead transmission systems.

August 16th.

25 096 Allgemeine Elektricitats Ges. Apparatus for testing compensation for earth leakage currents. (1/8/29, Germany.)
25 073 Associated Electrical Industries, Ltd. Automatic synchronising apparatus. (22/8/28, U.S.)
25 104 J. L. Baird, and Television, Ltd. Television, etc., systems. (26/10/28.)
25 039 T. H. Forde and N. W. Mellars. Operation of X-ray tubes. (16/8/28, U.S.)
25 115 C. S. Franklin. Thermionic valves.
25 070 Graham Amplion, Ltd., and W. J. Rickets. Radiogoniometers.
25 093 H. H. Mactaggart, Mactaggart Scott and Co., Ltd., and R. G. Scott. Air loaded accumulators.
25 120 Marconi's Wireless Telegraph Co., Ltd. Pyro recording paper, etc., for pictures, etc., telegraph receivers. (20/8/23, U.S.)

COMING EVENTS.

Friday, November 22nd.

Physical Society.—Imperial College of Science, Imperial Institute Road, South Kensington. Papers by Mr. D. P. Dalzell on "Heaviside's Operational Methods," Mr. E. T. Hanson on "The Dynamical Theory of Resonators," and Mr. E. C. Atkinson on "Escapement Errors of Pendulum Clocks." 5 *p.m.*

Birmingham Electric Club.—Grand Hotel, Colmore Row. Lecture by Mr. J. D. Morgan on "Dust Explosions." 7 *p.m.*

Monday, November 25th.

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Wooden Poles for Overhead Transmission Lines, and their Preservation." (Opened by Mr. C. Wade.) 7 *p.m.*

E.L.M.A. Lighting Service Bureau.—15, Savoy Street, Strand, London. Twentieth Illumination Design Course. Lecture VI by Mr. R. W. Maitland on "Architectural Lighting." 7.30 *p.m.*

Tuesday, November 26th.

Electrical Trades Benevolent Institution.—Savoy Hotel, Strand, London. Annual festival. Dinner followed by dance.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Falcon Café. Ordinary meeting.

Institution of Electrical Engineers (Scottish Centre).—Grosvenor Restaurant, Gordon Street, Glasgow. Annual dinner. 6.30 for 7 *p.m.*

Institution of Electrical Engineers (East Midland Sub-Centre).—University, Nottingham. Paper by Messrs. E. H. Smythe and E. G. Weeks, on "Low-Temperature Carbonisation of Fuel, with special reference to its combination with the production of Electricity." 6.45 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Faraday Lecture on "Broadcasting by Electric Waves." 7 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, Leeds. Lecture by Dr. H. Norringer on "Surges and Over-voltage Phenomena on Transmission Lines Due to Lightning and Switching Disturbances." 7 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Engineers Club, 17, Albert Square, Manchester. Joint meeting with the Manchester Association of Engineers. Paper by Lt.-Col. S. E. Monkhouse and Mr. L. C. Grant on "The Heating of Buildings Electrically by Means of Thermal Storage." 7 *p.m.*

Electrical Power Engineers' Association.—Junior Institution of Engineers, 39, Victoria Street, London. Paper by Mr. P. E. Rycroft on "Protective Apparatus." 7.15 *p.m.*

Wednesday, November 27th.

Institution of Electrical Engineers (Mersey and North Wales, Liverpool, Centre).—University Club. Annual dinner.

Electrical Contractors' Association (Croydon Branch).—Ordinary meeting.

Electrical Association for Women.—46, Kensington Court, London. Lecture by Mr. E. E. Sharp on "Some Electrical Experiences in Australasia." 3 *p.m.*

Electrical Contractors' Association (Belfast Branch).—3, Bedford Street. Ordinary meeting. 3.30 *p.m.*

Royal Society of Arts.—John Street, Adelphi, London. Dr. Mann Lecture by Mr. C. Norman Kemp on "The Examination of Coal and Coke by X-Rays." 8 *p.m.*

Thursday, November 28th.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. H. W. Taylor on "Voltage Control of Large Alternators." 6 *p.m.*

Friday, November 29th.

Institution of Electrical Engineers (South Midland Centre).—Grand Hotel, Birmingham. Annual dinner.

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. Open debate on "The Registration of Reliable Tests of Power-Plant Machinery." 6 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London. Informal meeting. Lecture by Mr. W. C. Freeman on "Modern Welding Systems and Applications." 7.30 *p.m.*

Saturday, November 30th.

Association of Mining Electrical Engineers (South Wales Branch).—Official visit to Engineering Exhibition. 3.30 *p.m.*

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THE ELECTRICIAN, November 29, 1929.
RAW MATERIALS, MANUFACTURERS' AND INDUSTRIAL EQUIPMENT NUMBER.
THE ELECTRICIAN
Vol. CIII.—No. 2687. Friday, November 29, 1929. [Registered at the General Post Office.] One Shilling

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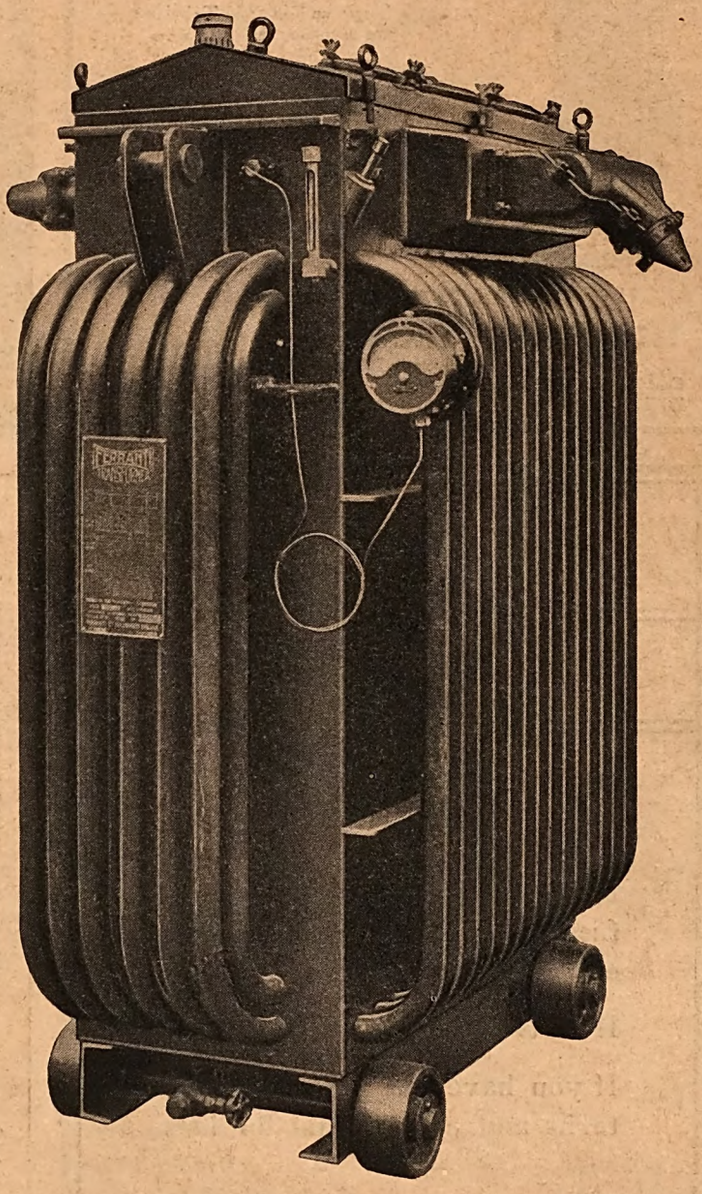

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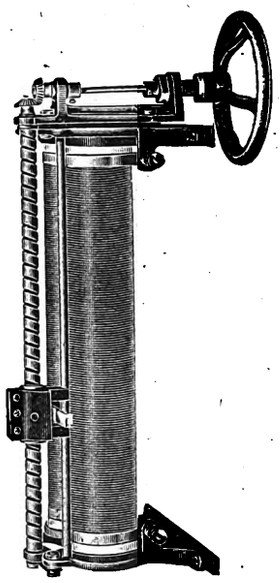

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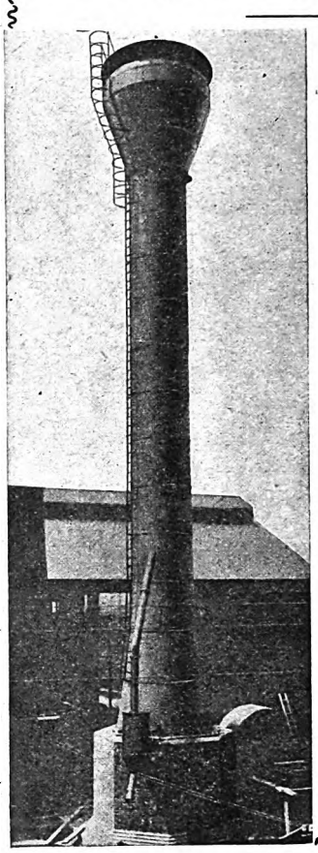

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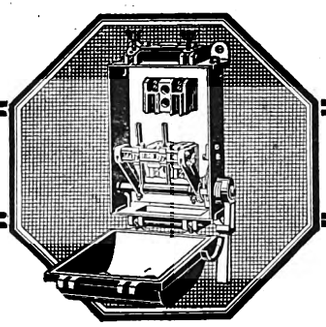

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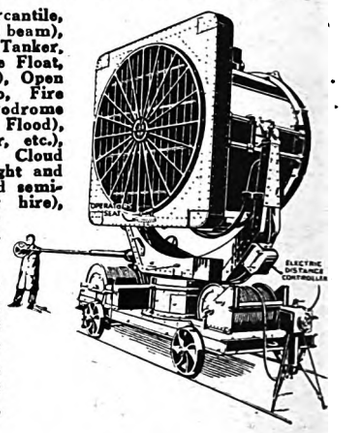

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

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Current Topics.

Raw Materials.

EXACTLY a year ago THE ELECTRICIAN announced its intention, in the first of a series of specialised issues, to undertake a thorough survey of the raw materials of the electrical industry. The issue in which this policy was first inaugurated was rapidly sold out, and keen interest has been shown during the past twelve months in the many interesting aspects of the raw materials field—most of them based on original research—that have been explored in our monthly raw materials section. The scope for further inquiry and discovery is immense, for few industries come near to the electrical industry in the catholicity of its demands upon the world's resources of materials. It may also be noted that many of the electrical raw materials are the finished or semi-finished products of another industry, a factor which adds to the range of our investigations, and complicates the costs side of electrical manufacturing.

Already we have dealt with such insulating materials as papers, fabrics, pressboards, and varnishes, and an important contribution on insulating oils is presented on a later page of this issue. Other subjects which have received attention include the electrical uses of iron, steel, and ferrous alloys, non-ferrous metals, insulated magnet wires, laminated synthetic resin products, bakelised asbestos and vitreous products.

Our second annual Raw Materials issue contains, in addition to the article on Insulating Oils, a variety of articles concerning materials and processes of direct interest to electrical manufacturers. In forthcoming issues special attention will be paid to such materials as bitumens, cellulose products, fibre, mica, timbers, moulded compositions, porcelain, glass and earthenware, slate, marble and soapstone, and arc-resisting non-ignitable and self-extinguishing materials.

Insidious Propaganda?

THE work of the Electrical Association for Women has always commanded our admiring support, but it has now been found by one of the gas journals to be indulging in "an insidious form of propaganda" and "a cunning attempt to prostitute the national education system for the benefit of a commercial ideal." Seeking the reason for these epithets we find that the E.A.W. scheme for the teaching of electricity in schools has aroused the ire of the gas interests, who consider it most unfair. All we can say is the gas people should be good practical judges, as they have for years past supplied gas apparatus for the use of cookery classes in educational establishments and have not found occasion to condemn their efforts in this direction as insidious propaganda. We could also remind them of the ingenious tactics employed to obtain Harley Street's approbation of the gas fire. Leaving aside such obvious *tu quoques* we fail to see anything insidious in the E.A.W. plan. The generation now at school will use electricity to an extent which only those in the electrical industry itself can at present visualise. It is quite legitimate for a non-trading organisation to offer, and the educational authorities to accept, assistance in teaching children something that will be of real use in after life.

Proposed Telephone Reform.

WHATEVER may be felt about the propriety of the recent attack on the Post Office by the late Assistant Postmaster-General, there is undoubtedly a growing body of opinion in favour of Lord WOLMER'S latest suggestion that the telephone service should be taken out of the hands of the Civil Service and treated purely as a business proposition and public utility service. Within limitations which they are powerless to break down, our telephone engineers and administrators are performing splendid work, but the impression is abroad that they would do far better if their activities could be removed beyond the dictates of Treasury finance. The only real attempt to develop the use of

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telephones in this country is at present being made by an association representing manufacturing interests, and not by the Post Office, which seems to find difficulty in reconciling the growing demand with the limited capital resources placed at its disposal. Special interest therefore attaches to the decision of the London Chamber of Commerce to ask the Government to institute an inquiry into the advisability of establishing an independent statutory authority to administer the internal telephone and telegraph services of the country. Such an inquiry would be favoured by telephone manufacturers, who would doubtless be willing to place before the Government the conclusions reached in the recently concluded investigation undertaken by the Telephone Development Association.

Standardised Page Sizes.

THE advantages of standardising the page sizes of technical journals have been fully debated in our correspondence columns in recent months, and as the result of these and other discussions definite means for putting the proposals into effect are now being considered by the Incorporated Society of British Advertisers. The main considerations upon which these suggestions are based are set out in a letter in our correspondence columns this week. As, however, these views are solely those of I.S.B.A. members we shall be glad to hear the opinions of advertisers who are not members of this Society.

A Broadcasting Defect.

FIVE chords played on a pianoforte. And then a voice: "I have just played 'Humoreske'" by someone or other. This was heard by every "broadcatcher" receiving the 2LO radio programme just after the second news bulletin last Saturday night. It was not an isolated example. The same sort of thing happens most nights. Surely it is time the B.B.C. programme experts called in some of the engineering staff to devise means for warning the interludial pianiste of the conclusion of the announcements, and of the necessity to start playing. There are many possible ways of doing this, the simplest of which would be a light signal at the piano which could be operated by a switch at the announcer's desk in the other studio. Trivial as it may seem, this defect can at times be distinctly irritating to listeners, and as it is technically inexcusable, we hope better synchronisation will be provided in the future.

Faraday's Diaries.

OF the diaries of MICHAEL FARADAY, which are expected to be published in about eighteen months' time, Sir WILLIAM BRAGG gave some interesting preliminary glimpses in a lecture the other day at the University of Manchester. "I do not believe," Sir William said, "speaking of them collectively, that there is in the scientific world a diary quite like it in its fullness and completeness." Most of the work FARADAY did has, of course, been described in his "Experimental Researches," but the attraction of this, as of most other diaries, is that it reveals something of the man himself, the workings of his mind, his directive ideas, and his attitude towards the great problems of physical science which he set out to investigate. The notes cover about six volumes of foolscap, each of several hundred pages, all written in FARADAY'S very neat, small hand. They are to Sir WILLIAM BRAGG, as they will be to others, so human and interesting, because "all the time you see what he is trying to do." One innocent remark recorded when the diarist was nearing his sixtieth birthday, and when he had spent a lifetime in the most fruitful observation and experiment, might well be the first rule of every electrical man—"I must learn to observe."

The Prime Minister and the Downs.

IN his reception of the deputation of "anti-pylonists" on Monday, the PRIME MINISTER gave an excellent exhibition of tact and good sense. He very properly acknowledged the duty which is incumbent on every one of us to avoid causing preventible disfigurement of the amenities of the countryside, but he also gave to these reactionaries who decline to see any sort of compensating feature in the electrical scheme a clear and unequivocal ruling on the matter. He told them that as regards Sussex "the proposal which has been sanctioned must, of course, go on." With the Premier's definite confirmation of a decision that is obviously for the common good, we hope that the Sussex "martyrs" will now turn their attention to the hideous bungalows and other similar blots on their landscape.

Treatment of Sulphur Fumes.

THE two interim reports dealing with the treatment of sulphur fumes in connection with the proposed new Battersea power station, extracts from which are given on a later page of this issue, go very far towards confirmation of the hope that concentrated effort on the problem would very quickly indicate a practicable solution. As will be seen from the extracts which we give, the Power Co.'s advisers take an unreservedly optimistic view of the large-scale possibilities of the process which has been tried for some months on an experimental scale. As was only to be expected, the Government Chemists' Committee is a little more guarded in its opinions, though, on the whole, its report may be taken as encouraging. The economic side of the question does not seem to have been considered by either of the reporting bodies, but as the remedy must be applied whatever the cost, this aspect is not of prime importance at the moment.

The E.T.B.I. Festival.

THE Festival Dinner of the Electrical Trades Benevolent Institution on Tuesday night was a real record-breaker, for which all concerned—and notably the president, Mr. HOWARD MARRYAT—deserve cordial congratulations. In the first place the amount raised for the Institution's fund reached a new peak at £9 000, a sum £2 000 greater than has ever previously been raised in one year. Then the attractiveness of the programme was enhanced by a dance, which, though the first of its kind, seems likely to become a regular feature. We were very glad to see the practical recognition which was given to Mr. F. B. O. HAWES for his many years' work as honorary secretary of the Institution. It is, of course, no reflection on the honorary secretary that the ever-growing work of the Institution necessitated the appointment of a full time secretary, a departure which has, we think, been fully justified by results. Faced last year with the task of arranging the second Festival Dinner in that year—the 1927 event being held in February, 1928—Capt. KEEPING was largely instrumental in producing results which were second only to the record set up during SIR HUGO HIRST'S presidency, while this year the collection is by far the largest yet made.

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THE PROPERTIES OF SHEET MAGNETIC MATERIALS.

Essential Knowledge for the Designer—Permeability of Steels—Effect of Silicon Content—Hysteresis Loss Under Alternating Magnetisation.

By B. G. CHURCHER, M.I.E.E.

THE fundamental importance of high-grade magnetic materials in electrical engineering is well recognised at the present time. Such materials are required in the manufacture of almost all classes of electrical apparatus, although their influence on the performance of the apparatus varies considerably from one class to another. Many years of experience in the design of generating and transforming apparatus, coupled, in recent years, with systematic research by modern technical methods, have brought the art of design to a state approaching finality. This is especially true of transformers, in which the properties of the materials at present available for the construction of the magnetic circuits form a limit to progress in the improvement of such apparatus. A complete and accurate knowledge of the properties of such materials is therefore necessary to the designer in order that the materials may be used to their utmost advantage.

In discussing the magnetic materials in general use in the construction of modern electrical engineering apparatus, it is convenient to group the materials according to whether they are intended for use with alternating or static fluxes. With materials for alternating fluxes, the need for lamination gives rise to an important class of material, namely, the magnetic sheet steels. In this article we shall confine our attention to sheet materials.

In designing an electrical machine or apparatus the designer desires, in general, to set up the required alternating flux in the smallest possible space with the minimum expenditure of excitation and energy loss. Thus the two most important properties are the permeability and the energy loss. The permeability of a material or the ratio of B, the static flux

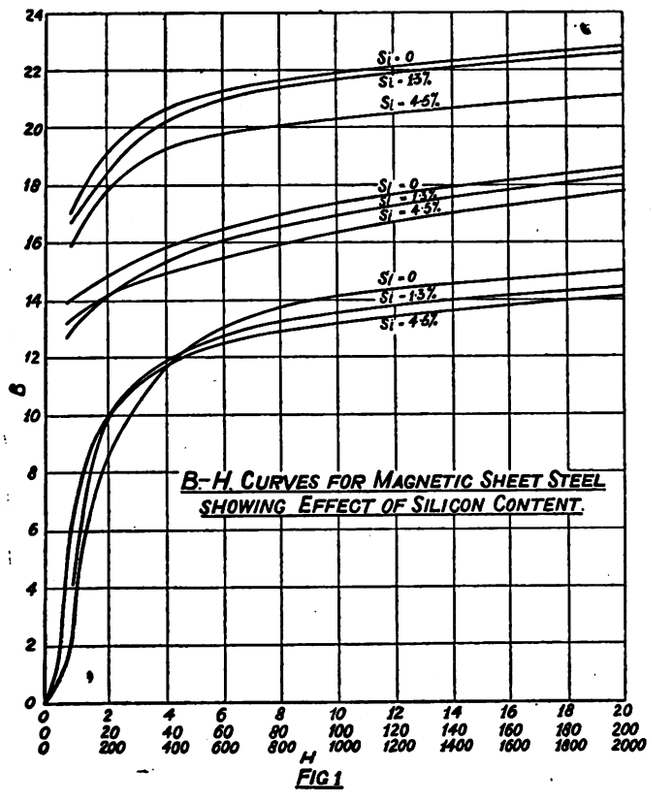

FIG 1

Relative permeability curves of steel.

density to H, the static magnetising field, requires some qualification before its value for engineering purposes can be judged. Thus a material may have a very high maximum permeability, but it is clear that the lower the value of B at which this occurs, the more limited will be the use of the material on account of the greater volume required to set up a given flux. Thus the designing engineer is more interested in the values of H required to produce certain values of B than in the ratio B/H. Instances of this will be given later. It may here be noted that the alternating fluxes involved in the operation of electromagnetic apparatus are not necessarily set up by alternating magnetising forces. In d.c. generators and motors, a.c. synchronous generators and motors and rotary convertors the alternations of the flux are produced by the relative mechanical motion of the laminated core and the field magnet, and the magnetising

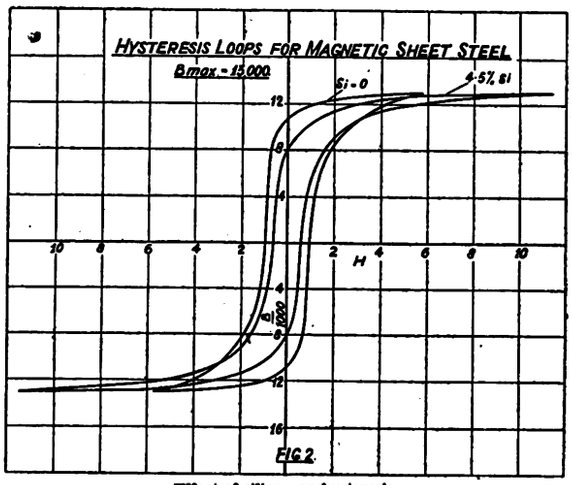

FIG 2

Effect of silicon on hysteresis.

force is supplied by windings carrying direct current. No material error is introduced by using a static B-H curve for calculating the magnetising force for the core in such machines. In the case of transformers, where the magnetising force is supplied by an alternating current, the magnetising current required for the core can still be calculated approximately from a static B-H curve, but the process is very laborious. The r.m.s. magnetising force, determined under alternating magnetisation, is more convenient for magnetising current calculations. Nevertheless, the static B-H curve is very convenient for use in making a general comparison of the merits of different grades of sheet steel.

In the design of certain classes of electromagnetic apparatus, especially rotating machines, an important quantity associated with the B-H curve is the saturation value, which is a measure of the maximum flux that can be contributed by the material, given a sufficiently high value of H. If I is the intensity of magnetisation, then $B=H+4\pi I$. As H is generally increased, I increases, first rapidly and then at a decreasing rate, until it finally becomes constant for very high values of H. Thus B may be considered to consist of two parts: the "air flux" density, which is equal to H, and the flux density contributed by the material, which is equal to $4\pi I$. When the limiting values of $4\pi I$, or the saturation value, is reached, any further increase in B is due to increase in "air flux." As $4\pi I=B-H$, we have a ready means of estimating the magnetising field required to produce high values of B. Thus, if the saturation value of a material is equal to 20 000 c.g.s. lines per sq. cm., the magnetising field necessary to produce $B=25\,000$ is equal to $H=5\,000$.

Although the permeability and saturation value of a material may be satisfactory, the amount of alternating flux that can be set up in a given cross section, or the flux density, may be limited by the expenditure of energy necessary to maintain that density. This energy loss consists, as is well known, of two parts, hysteresis loss and eddy current loss. The factors upon which the loss depends are best indicated by the following expression for W, the loss in watts per kilogram of steel, which holds for power frequencies where the skin effect is unimportant.

$$W=\frac{k\,B^n f+1.33\,t^2 f^2 F^2 B^2\times 10^{-4}}{\rho}$$

In the first term, which represents the hysteresis loss, k is a constant depending mainly on two magnetic properties of the steel—viz., the remanent flux density after magnetising

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to a given maximum density and removing the magnetising force and the magnetising force required to remove the remanent magnetism. These properties in turn depend upon the composition of the material and on its physical condition. B is the maximum flux density during the cycle of magnetisation and f the frequency. The second term represents the

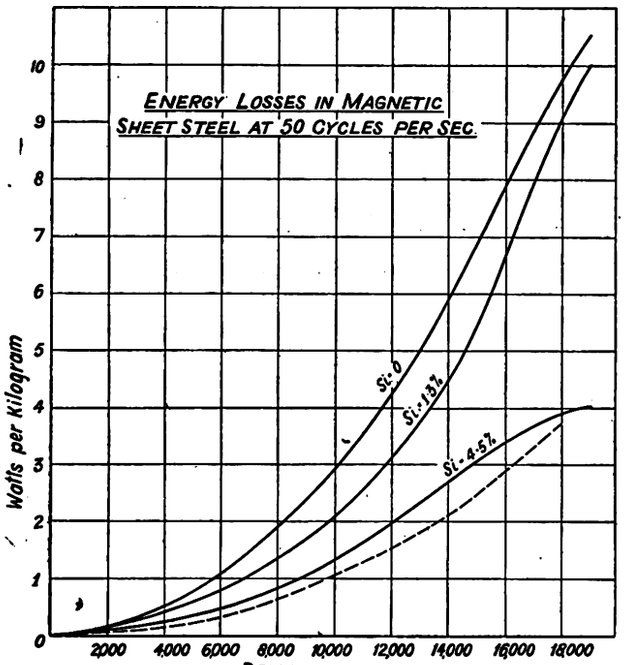

FIG.3.

Illustrating the total energy losses with increasing silicon content.

loss of energy due to the circulation of eddy currents in the sheets. The thickness of the sheets is denoted by t, ρ is the resistivity of the material and F the form factor of the applied voltage wave form. The form factor is equal to the ratio of r.m.s. to the mean value of the voltage, which for a sine wave form is equal to 1.111. The amount by which the form factor departs from this value is a measure of the wave form distortion present, which in testing work is always kept as small as possible. These will be discussed later.

Some General Considerations.

There are a few general points which must always be borne in mind when considering the properties of sheet magnetic materials and when testing them. The quantity B is equal to the total flux divided by the net cross sectional area of the core, the flux density being uniform over each section and equal at every section of the portion of the magnetic circuit formed by the specimen. If this condition is fulfilled, then, as far as this factor is concerned, the permeability and energy loss have only one value for a given value of B, whereas if the flux density is not uniform, the total flux divided by the net section gives only the average density and the permeability or energy loss deduced from the tests will depend upon the degree of non-uniformity of the flux distribution, which gives rise to undesirable complications. Hence magnetic leakage in permeability and energy loss apparatus must be kept to a negligible amount. It has already been mentioned that the hysteresis loss is influenced by the physical condition of the material. The permeability is influenced thereby to an even greater extent. In preparing sheet specimens for test, the cutting of the strips hardens the material at the cut edge. This reduces the permeability and increases the hysteresis in the neighbourhood of the edge of the strips. Hence, the narrower the strips, the greater will be the proportion of material affected by the cutting. Since the object of the test is, in general, to ascertain the properties of the material in bulk, the effect of a narrow test specimen will be to make the permeability appear lower than it is and the hysteresis higher. The effect on permeability is very great. Strips 1 in. wide cut with ordinary care may give results 30% in error in the region of maximum permeability. The effect on the total energy loss is much smaller, being of the order of 2% for a 1 in. strip. However, in the purchase of sheet steel for engineering purposes, the energy loss is usually the factor which determines the price of the steel, and is therefore subject to a much closer scrutiny than the permeability. Therefore tests which have any pretensions to accuracy must be carried out on reasonably wide strips. A satisfactory compromise for commercial purposes is to use strips 4 in. wide. Another effect which must not be overlooked is that any constraint caused by the clamping of the specimen in a testing apparatus affects the permeability considerably and the hysteresis to a smaller extent.

Early Troubles.

In the early days of electrical engineering, the only material available for the cores of transformers and rotating machines was sheet iron—that is, iron in which other constituents were present in small quantities only as impurities. The permeability of this material was reasonably good, but the energy loss was large. The most unsatisfactory feature was that a progressive increase in the energy loss with time, or "ageing," took place. This was specially evident in transformers. A progressive increase in the core temperature took place, resulting in extreme cases, in the burn-out of the transformer. In 1906 Hadfield and Barrett produced silicon sheet steel and drew attention to its many advantages over sheet iron. In the intervening years the use of silicon steel extended widely until at the present day almost all transformer cores are constructed of this material and also the cores of many types of rotating machines.

The introduction of a small percentage of silicon (up to 5%) has a marked effect on the properties of steel. The permeability is increased at low densities and decreased at high densities; the hysteresis loss is reduced; the resistivity is increased, thereby inducing the eddy current loss; ageing is virtually eliminated. Fig. 1 shows the relative permeabilities of steels containing zero, 1·3 and 4·5% silicon. Other materials—viz., carbon, sulphur and phosphorus, are present as impurities, and, in general, should be kept as low as possible. This is especially the case with carbon, small amounts of which have a very deleterious effect. It is desirable that the amount of carbon present should not exceed 0·08%. Manganese is added intentionally in small quantities as the mechanical properties of the steel are unsatisfactory without it. Referring to the curves, it will be seen that at moderate and high flux densities, the effect of the introduction of silicon is to decrease the permeability, while at low densities the addition

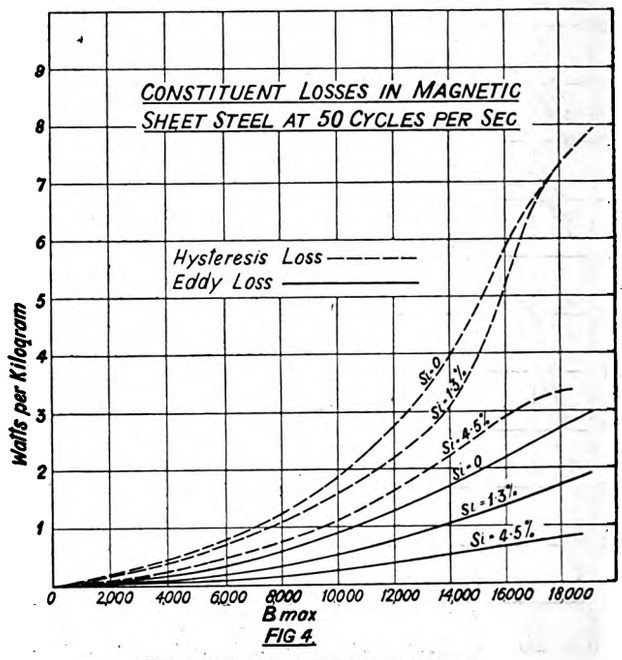

FIG 4.

Effect of silicon content on constituent losses.

of silicon increases the permeability. The saturation values obtained from the curves are as follows:—Si = 0, B-H = 20 950, Si = 1·3% B-H = 20 700, Si = 4·5, B-H = 19 200. Thus the reduction in saturation value from Si = 0 is approximately proportional to the silicon content. The saturation value of pure iron is 21 650. The difference between this and the value 20 950 for Si = 0 is to be ascribed to the other constituents present as impurities. If these impurities were absent, the proportionality of silicon content and reduction in saturation value would be much closer. The maximum permeabilities of these steels, which occur in the region of

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B 4000 to B 7000, are Si=0, μmax.=4 400, Si=1·3%, μmax. =5 800, Si=4·5%, μmax.=7 100. In considering these saturation values and maximum permeabilities, it should be borne in mind that they are typical values only. In a given grade of steel the permeability at high densities and the saturation value vary with the exact amount of silicon present, which is not always strictly of the nominal amount, and with the amount of the impurities. The permeability at moderate and low densities is even more variable, and is influenced not only by the constitution of the steel, but by its physical condition—i.e., by its hardness, which is increased by cutting and bending. In measuring permeability at low densities the effect of any mechanical constraint on the specimen caused by clamping it to a test yoke, is very large.

Fig. 2 shows the effect on the hysteresis of the introduction of silicon. It is seen that the remanent flux density is reduced from B 10 400 to B 8 000, and the coercivity from H 0·95 to H 0·6. The hysteresis loss under alternating magnetisation depends on the amount of work that has to be expended in taking 1 cu. cm. of the material through a cycle of magnetisation. The amount of work is proportional to the areas of the loops. For S=0 and a maximum flux density of B 13 000, we obtain 4 770 ergs per cu. cm. per cycle, and for Si=4·5% and the same density, 3 060. For Si=1·5% the figure is approximately 3 900.

Fig. 3 shows the total energy losses of the same three steels. The reduction in total loss with increasing silicon content is very marked, especially in the region of flux density in which transformers operate, viz., B 11 000 to 14 000. The full-line curves represent steel of average quality. Recent improvements in the manufacturing process have enabled steel of the quality shown by the dotted curve to be produced commercially in this country. The effect of the silicon content on the constituent losses is shown in Fig. 4, in which the hysteresis and eddy current losses are shown separately. If the hysteresis loss is represented by the equation $Wh = k f B^n$, it can be seen from the shape of the curves that as the flux density increases, n at first increases and then decreases. At densities below B 10 000, n has a value of between 1·4 and 1·6 for all three grades of steel. The fact that 1·6 is a common value was pointed out by Steinmetz many years ago, but from this there seems to have arisen an erroneous idea that 1·6 is an universally applicable constant. Actually, n varies considerably with density, a sample of 4·5% silicon steel giving 1·6 at B 5 000, 1·8 at B 10 000, 2·1 at B 15 000, and 0·7 at B 19 000. A sample of 1·3% silicon steel gave a value as high as 3·7 for B 15 000, falling to 1·2 at B 19 000. That n must decrease at high densities is evident from the following considerations. As the flux density is raised to high values, the material becomes saturated and the area of the hysteresis loop, i.e., the hysteresis loss, becomes constant. Hence, if the above equation is to hold for the condition where Wh is constant and B is increasing, it is clear that n must continually decrease. The resistivities of the three grades of steel are approximately 14 $\mu\Omega$ per cm. cube for o Si content, 28 for 1·3% Si, and 60 for 4·5% Si. The eddy current losses are seen to be approximately inversely as the resistivities. The silicon content also affects the temperature coefficients of resistance, the values being 0·0042 per deg. C. for o Si, 0·0019 for 1·3% Si, and 0·00055 for 4·5% Si. In combination with the fact that the hysteresis loss has a positive temperature coefficient, the resistance temperature coefficients cause the total loss to vary with temperature according to whether the increase in hysteresis loss or the decrease in eddy loss preponderates. Thus, for o Si the coefficient of total loss is −0·0013, for 1·3% Si −0·00043, and for 4·5% Si +0·0005.

Mechanical Properties.

From an engineering standpoint, the mechanical properties of sheet steels are of the very greatest importance, as they often limit the application of certain grades of steel. The introduction of silicon has the effect of increasing the tensile strength, but it also reduces the ductility. In general, the higher the silicon content, the less easy it is to shear or punch the material satisfactorily. It might be thought profitable to increase the silicon content above 4·5%, and so reduce the losses still further. However, apart from the further decrease in permeability which would take place at high densities, mechanical deficiencies would become apparent. Too high silicon content leads to hardness and brittleness, which gives rise to difficulty in shearing and punching the sheets. The wear on the shears and dies is increased, and in extreme cases the material may shear with a ragged edge or may break at narrow sections, such as at the roots of the teeth of armature punchings.

Uniformity in thickness in different parts of a sheet is of the greatest manufacturing importance. If the sheet varies in thickness in different parts, especially if it tapers from one end to the other, it is impossible to obtain a uniform core and a sufficiently high space factor. The space-factor is the

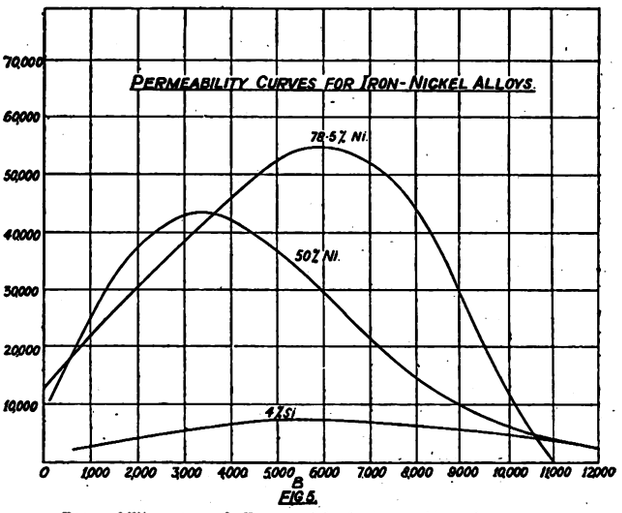

FIG 6.

Permeability curves of alloys used for instrument transformers.

ratio of the net steel cross-section to the gross core section. It is obvious that a low space factor offsets the advantage gained by using a high grade steel, since if a core is made to given dimensions the real flux density in the steel will be higher than the nominal density, and hence the energy loss will be higher than it would otherwise be. Want of flatness in the sheets also causes difficulty, especially in the manufacture of the cores of rotating machines.

We can now consider briefly the uses to which the different grades of steel are put. Where the iron loss is not of great importance, the high saturation value, good mechanical properties, and low cost of o Si material are points in favour of its use. Thus in low frequency alternators or low speed d.c. machines, where the iron loss would not be large in any case, this material can be used with advantage. It is also used in induction motors, where it is necessary to keep the no load current low. On account of the need for a high efficiency and due to the large output of the machine in proportion to its dimensions, a low iron loss is necessary in large turbo alternators. On this account a medium grade of steel, such as the 1·3% Si, is used, and occasionally the 4·5% grade. These grades are also used on totally enclosed motors where it is necessary to keep the amount of heat generated in the machine to a minimum.

Transformer Cores.

In the case of power transformers, two important considerations arise. First, the sheets can be sheared instead of being punched, except for the small amount of punching required for core bolt holes. Secondly, the demand for extremely high efficiencies in transformers and the fact that the only losses are the copper and iron losses makes it necessary to keep the latter at the lowest possible value. As a result, power transformer cores are made almost exclusively of steel containing about 4% Si. In the manufacture of current transformers, the highest permeability is required in order that the magnetising ampere-turns, and hence the phase angle of the transformer, shall be kept within the desired limits with a core of moderate dimensions. Referring to Fig. 1, it will be seen that 4·5% Si steel has a considerably higher permeability at low densities than the other two grades, and this makes it suitable for constructing the cores of current transformers. While energy loss, as such, does not enter into the performance of the transformer, the component of magnetomotive force which is associated with the energy loss affects the ratio error of the transformer. The low energy loss of 4·5% steel is therefore an additional advantage.

Silicon sheet steel is also used in the manufacture of a.c. watt-hour meters. A medium grade is found most suitable for such work, as a punching operation is involved.

We have seen that the hysteresis loss varies as the first power of the frequency, whereas the eddy loss varies as the square of the frequency. In the construction of high frequency apparatus, it is therefore necessary not only to use magnetic

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material of high resistivity, but to use thin sheets in order that the eddy loss may not be excessive. This has led to the production of very thin silicon steel ribbon only one or two thousandths of an inch thick for the manufacture of transformers for use in wireless sets. Thin sheets are also required in the manufacture of high frequency alternators. It is of the greatest importance that sheets used for such work should be as smooth and flat as possible, and the thinnest insulation should be used between sheets, otherwise a poor space factor will be obtained, which will largely nullify the advantage gained by using thin sheets.

We now turn to the consideration of magnetic sheets made from other alloys. The addition of moderate amounts of nickel to iron renders it much less magnetic. As the percentage of nickel is increased, a progressive reduction in permeability takes place until at 30% nickel the alloy is almost non-magnetic. As the nickel content is further increased, the magnetic properties gradually increase again until at 78·5% nickel, an alloy of exceptional properties is obtained. This is the material known as "Permalloy." Its maximum permeability, which occurs at about B 6 000, is of the order of 60 000, that is, eight times that of 4% silicon steel. The permeability in low magnetising fields is such that the material is practically saturated in the earth's field. In testing Permalloy, means have, therefore, to be employed to neutralise the earth's field at the region in which the specimen is placed.

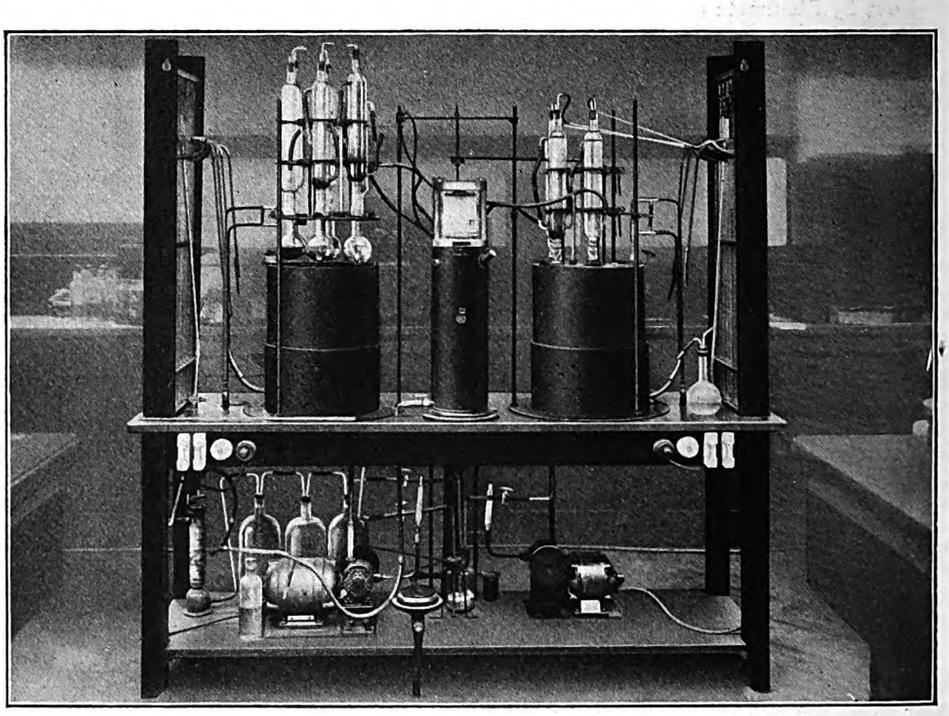
In Fig. 4 are plotted curves of permeability at various flux densities, which are more convenient for studying such alloys than B-H curves. A curve for 4% Si steel is given for comparison. It will be seen that in the 78·5 Ni alloy, a remarkably high permeability is maintained over a wide range of flux density. The material has a saturation value of about 10 500 lines per sq. cm. The hysteresis loss is remarkably small. The resistivity is about 16·5 $\mu\Omega$ per cm. cube. The total energy loss with a thickness of 0·0062 in., is as low as 0·29W per kg. at B 10 000 and 50 cycles, compared with about 1·1W per kg. for the best silicon steel. However, the alloy is very susceptible to mechanical treatment, the permeability being greatly reduced by what would be considered reasonably careful handling for ordinary materials. The mere winding of a magnetising coil on to a ring specimen is sufficient to cause a considerable alteration in its properties. On the other hand, a tensile stress has the curious property of largely increasing the permeability, provided the stress is not too large. Permeability values of 280 000 have been obtained experimentally. An alloy which is used increasingly is one appearing under various trade names and containing 50% iron and 50% nickel. The permeability is shown in Fig. 4. It will be seen that while the maximum permeability is not as high as that of the 78·5% Ni alloy, a figure about six times that of 4% Si steel is reached. The saturation value is approximately 15 000 lines per sq. cm. The resistivity is 45 $\mu\Omega$ per cm. cube, and this, together with a low hysteresis loss, gives a total energy loss of about 0·72W per kg. for a thickness of 0·014 in. The material is not unduly sensitive to handling. This combination of qualities makes it very suitable for the construction of instrument transformers in which excellence of performance is important. It is also used for audio frequency transformers for wireless work and in the construction of choke coils where a large inductance is required in a small space. Both the 78·5% and the 50% Ni alloys have been used in ribbon form in connection with the loading of long distance submarine cables, enabling greatly increased operating speeds to be attained.

Several other sheet materials, such as those having a constant permeability over a wide range of magnetisation, have been developed, but with these we have not space to deal. There is a great need for better magnetic materials in the electrical industry. There is also every reason to suppose that such materials will be available in due course, since out of all the alloys that are possible, only a small fraction have been studied for their magnetic properties.

SLUDGE TESTING APPARATUS FOR INSULATING OILS.

THE greater or less tendency of insulating oils to form sludge under service conditions is a most important consideration with regard to these materials, since any sludge which is formed not only reduces the insulating value of the oil but also, by silting up the circulating ducts, seriously interferes with its function of cooling the apparatus.

An important development in this connection is that of special apparatus devised by the Metropolitan-Vickers Electrical Co., Ltd., for determining the relative sludge-forming tendencies of various classes of insulating oils under conditions designed to represent, so far as is compatible with testing requirements, those obtaining in service in transformers and switchgear. This piece of apparatus is now being regularly employed in the carrying out of routine tests in accordance with the British Engineering Standards Association requirements. The equipment is the outcome of several years development and investigation into the relative influences of the several factors which combine to cause the sludging of insulating oils.



The test consists in submitting a measured quantity of oil for a standard time to the combined influences of heat, contact with air and a catalyst. Accurate control of the details of the test is essential to precision and accurate repetition. For example, the control of the air supply is a very important factor, it being imperative that the same specified volume of pure air shall be supplied at an equal and constant rate to each of the oils under test. The method of air-flow control and measurement now employed for testing essentially consists of a calibrated capillary tube which is so arranged that the pressure drop across its ends when air is passing through it can be readily measured by a manometer, and adjusted. The same close attention has been given to the control of other factors which may influence the result of the test.

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ASBESTOS.

Manufacturing Process of Asbestos Papers—Tests for Electric Strength—Loss in Weight by Ignition.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR, D.S.O., M.C., B.Sc.

ASBESTOS has long exercised a fascination over the human mind because though it can easily be fashioned to resemble the common fabrics of cotton and wool it is practically unaffected by fire.

In spite of its familiarity in various manufactured forms, probably few users of the material would recognise it in its natural form, as illustrated in Figs. 1 and 2. Asbestos is a mineral, probably the only fibrous mineral, and in its various forms it is a decomposition product of amphibole (hornblende) or serpentine, two minerals common in igneous rocks and consisting largely of silicate of magnesia. The original minerals contain no water, but the different varieties of asbestos contain combined water in varying proportions and the suitability of the varieties for electrical purposes is largely determined by the amount of water content and also by the amount of iron oxides present. The ordinary white asbestos of commerce is a serpentine asbestos called "chrysotile." Its chemical composition may be considered as $3MgO$, $2SiO_2$, $2H_2O$ and its average composition is given as: Magnesia, 41%; silica, 40%; combined water, 14%; metallic oxides, chiefly of iron and aluminium, 5%. The crystals of chrysotile are usually silky, long (1–4 in.), flexible and strong, and lend themselves readily to the weaving of fabrics.

Blue asbestos, technically known in different varieties as "crocidolite," "tremolite," etc., is a hornblende asbestos.

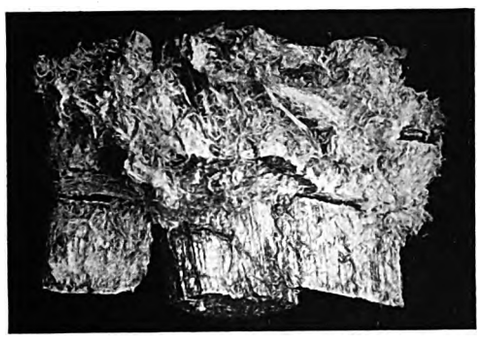

Fig. 1.—Rock chrysotile asbestos in its natural form.

Apart from colour it is similar in general appearance to white asbestos, but its fibres tend to be harsh and wiry, and in chemical composition and properties it is very different from chrysotile. The chemical composition of crocidolite is given as $Na\ Fe\ (SiO_3)_2$, $Fe\ SiO_3$, H_2O and its average composition as: Silica, 51%; iron oxides, 37%; sodium oxide, 6%; magnesia, 2%; other metallic oxides, 1%; combined water, 3%.

It will be noted that the proportion of iron oxides is high. This results in poor electrical insulating properties. On the other hand, the water content is low, and this results in good heat resistance. Blue asbestos finds extensive application where harsh, springy fibres can be employed, and, apart from the electrical industry, where it is required to resist strong mineral acids. It may be noted also that it has a lower actual fusing point than white asbestos, and it is used as a fluxing agent in oxy-acetylene welding.

Table I sets out the chief varieties of asbestos with their principal places of origin and some of their properties and uses.

TABLE I.—VARIETIES OF ASBESTOS.

Derivation	Serpentine		Amphibole			
	White Asbestos		Blue Asbestos			
Varieties	Chrysotile	Crocidolite	Tremolite	Anthophyllite	Antinolite	
Source	Canada, Russia, South Africa	South Africa	Italy, Russia	U.S.A.		
Colour	White, brown or blue	Blue	White		Green	
Fibres	Soft and fine	Harsh and springy				
Uses	Long fibres—woven fabrics; Medium fibres—millboards	Asbestos Cement Boards				
Temperature Limit	300 to 500° C.	1 000–1 200° C.				
Critical Temperature	400° C.	300° C.				
	Non-Acid Resisting	Acid-resisting				

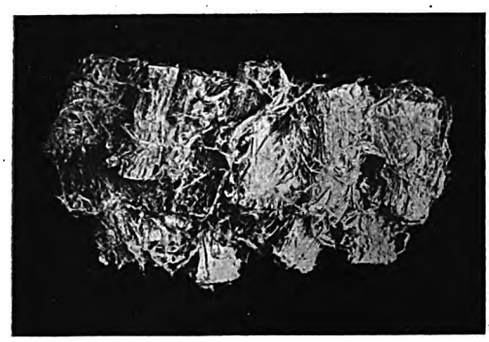

Fig. 2.—Another formation of natural asbestos, this being rock crocidolite.

For electrical purposes, the main forms and uses of asbestos may be summarised as follows: (1) Asbestos papers for insulation between copper strip field coils and for the build up of laminated synthetic resin products, bakelite asbestos boards, tubes and cylinders; (2) woven asbestos fabrics in the form of tape for wrapping conductors and coils or in large sheets for building bakelised asbestos blocks such as are used for supporting the end windings of turbo-alternator rotors; (3) fine asbestos yarns for insulating magnet wires and for insulating cables and the asbestos-protected wires used on switchboards to reduce the fire risks of clustered connections; (4) asbestos fibres and powders used as fillers or binders in bakelite or bitumen compound mouldings and as fillers for arc-resisting paints; (5) asbestos in various fibre forms for bonding with portland cement to form arc-resisting or self-extinguishing boards or mouldings.

The manufacturing process for asbestos papers is very similar to that for ordinary papers. Asbestos fibre can be used alone but vegetable fibres are usually added to give strength. One of the main difficulties in making good asbestos paper is to eliminate metallic impurities, chiefly the oxides of iron contained in the mineral. Attempts are made to eliminate these impurities by the use of magnetic separators and by "sand-traps" inserted in the flow channels down which the pulp passes on its way from the beaters to the paper-making machine

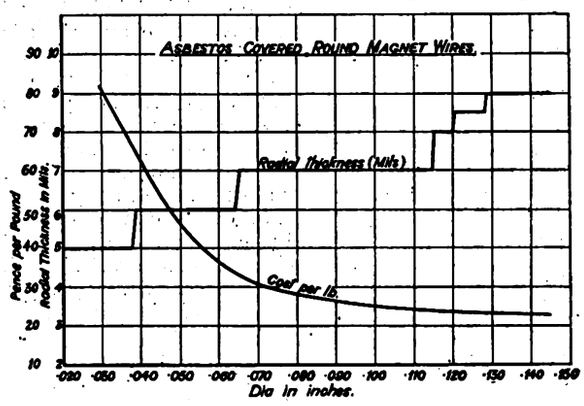

Fig. 3.—Indicating the cost and insulation thickness of asbestos-covered magnet wires.

felts. Another method is to treat the fibres with oxalic acid, but while this is effective in improving the insulating value, it has the disadvantage of weakening the mechanical strength of the fibres.

The usual thicknesses of paper employed for electrical purposes range from 5 to 25 mils. The general characteristics of the papers and of the millboards built up from them are shown in Table II.

Due to the affinity of asbestos for moisture, the tests for

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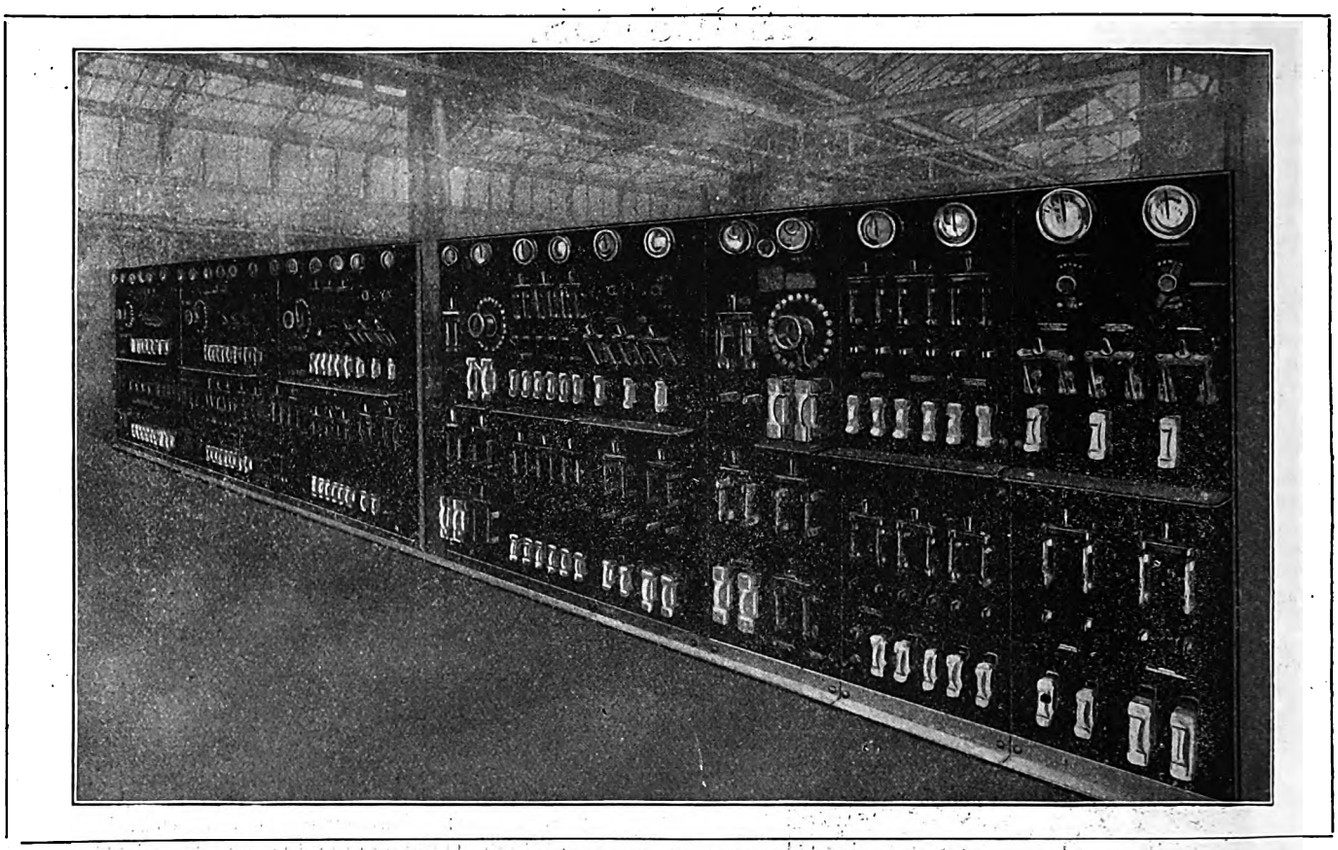

Fig. 4.—View of switchboard with panels of "Ebony Syndanyo."

electric strength are usually made after drying out at a temperature of 105–110 deg. C. The loss in weight by ignition of asbestos papers is generally about 18–20% but may in some instances be as great as 30%, the amount being determined by the greater or less proportion of cotton fibre present in the mixture.

TABLE II.—PROPERTIES OF ASBESTOS PAPERS AND MILLBOARDS.

Test.	Thickness (inch) 0·007	0·010	0·015	0·020	0·025	1/16	1/8
Tolerance in thickness—mils ..	±1	±1	±2	±3	±3	±5	±10
Tensile strength lb./in. width ..	3	4	5	5·5	6·0	—	—
Bursting strength before and after ageing at 110° C. for 24 hours* (Ashcroft)	3	5	9	13	18	—	—
Elec. strength, volts/mil—							
At 20° C.	150	125	100	75	50	60	40
„ 80° C.	200	165	125	105	95	100	70
„ 180° C.	180	150	120	90	80	90	60

* Bursting strength should not be affected by a temperature of 110° C.

It is not yet fully realised in the electrical industry what excellent asbestos fabrics are now available and that it is possible to obtain asbestos cloth in almost any thickness ranging from superfine varieties of approximately 10 mils thickness to heavy materials, resembling canvas, of 40 mils or more. The fabrics are all woven from finely spun long fibred asbestos, to which a small percentage of cotton is added to facilitate manufacture. The proportion of cotton should not exceed 15% and when specially selected long, silky fibres of asbestos are used, the proportion of cotton can be reduced as low as 7%. For good electrical strength it is important that the fibres used should be specially selected, with the iron content reduced to an absolute minimum. A few years ago, before the special selection of fibres was insisted upon it was almost impossible to use asbestos tapes for electrical purposes owing to their high content of conducting impurities and it was common practice to ascertain roughly the suitability of a tape by observing if it could be influenced or even picked up by a magnet.

Electrical Tapes and Cloths.

The asbestos tapes and cloth commonly used for electrical purposes are shown with their tensile strengths in Table III. It should be noted that the reduction in tensile strength after ageing is influenced by the percentage of cotton present.

Where electric strength is important the presence of conducting particles can be rapidly detected by subjecting a 3-in. sample of the tape or fabric to a stress of 1 000 V a.c. 50 cycles, applied by electrodes on the surface at the ends of the sample. Even at this low voltage considerable sparking will be detected in materials of poor quality.

A considerable use is now made of the superfine variety of asbestos tape for insulating the conductors of large turbo-alternators, and a more extensive use would immediately result if it were possible to obtain his material in a thickness of not more than 7 mils. Asbestos cloths are commonly used for the manufacture of hard thick synthetic resin varnish laminated boards, which are produced by subjecting fabric impregnated with a varnish similar to bakelite to pressure between steam or electrically heated plates inserted between the platens of heavy hydraulic presses. This produces an exceptionally hard, heat-resisting material which is extensively used for spacing and supporting the end windings of turbo-alternator rotors.

Insulating Windings.

Improvements in the art of insulating both round and ribbon conductors have resulted in the extended use of this material for windings which have to withstand high temperatures. Typical instances in which the adoption of this material has resulted in improved service include welding transformers, tramway and railway motors and arc-lamp solenoids.

TABLE III.—ASBESTOS TAPES AND FABRICS.

	Thickness (inch)	Width (inch)	Tensile strength before and after ageing at 330° C. lb./inch width.	
Superfine Woven Tape	.. 0·010	½ to 6	30	25
Ordinary Woven Tape	.. 0·015	½ to 6	33	20
Asbestos Fabric ..	.. 0·062	36, 40, 42	60	40

An interesting example is given in the "Electrical World," January 29th, 1927, which describes how a motor for 50 H.P. rating was built in the frame ordinarily used for a 20 H.P. motor, with the exception of bearings and shaft, which were strengthened. With asbestos insulation the motor proved satisfactory for 50 H.P. rating and actually carried a load of 70 H.P. successfully. Temperatures as high as 260 deg. C. with a 50 H.P. load, and 350 deg. C. with a 70 H.P. load were reached, with no apparent damage to the insulation. The stator winding was of the bar type with asbestos insulation, and the rotor was of the indestructible cast-aluminium type. As first built the motor was equipped with bakelised wedges, but, these proving unsatisfactory, wedges of slate were adopted. It is quite possible that bakelised asbestos would have been equally as good. At the time of the report the motor had been in actual service for two years, operating at very nearly

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its 50 H.P. rating. The example suggests interesting possibilities, especially for motors for service involving heavy overloads or high ambient temperatures.

The limitation on the use of asbestos-insulated conductors is largely one of costs, the price being from 33 to 50% higher than for d.c.c. In the construction of tramway motors, for instance, it has been proved that the use of asbestos insulated magnet wire gives a better life, but competitive prices have greatly restricted its adoption. It is a hopeful sign, however, that the engineers of some of the largest systems now tend to favour this material, recognising that the saving in upkeep and the greater reliability justify the somewhat higher initial cost.

With regard to space considerations, it is important to note that asbestos-insulated wires can now be obtained with a radial thickness of insulation equal to or only slightly exceeding that of ordinary d.c.c. The electric strengths at normal temperatures are equal to those of cotton, but at 180 deg. C. they are far superior. Recent test results have shown that round wires of 0·036 in. diameter insulated with asbestos of 4·5 mils radial thickness are capable of withstanding more than 400 V between conductors. Some typical results are given in Table IV. Fig. 3 shows the radial thickness of insulation and the cost per lb. of asbestos covered wires.

TABLE IV.—TYPICAL ELECTRIC STRENGTH TEST RESULTS ON ASBESTOS-INSULATED WIRES.

Conductor diam. (inch)	Radial thickness of wall (inch)	Electric strength between twisted conductors*—(volts)	
		at 20° C.	at 180° C.
0·081	0·004	780	750
0·081	0·0065	1 400	1 200
0·036	0·0051	580	560
0·036	0·0053	670	820

* Tested between two 12-in. lengths twisted tightly together.

As a rule the comparison between d.c.c. and asbestos-insulated conductors shows the following relationship: (1) Under normal conditions the electrical strength is almost similar for similar radial walls; (2) under humid conditions some impregnated asbestos-insulated conductors are less affected than natural d.c.c.; (3) under hot conditions where the temperature reaches 160 deg. C. or 180 deg. C. the asbestos-insulated conductors are much superior.

Apparently the minimum size of conductor which can be commercially insulated with asbestos is 0·036 in. Where small radial thicknesses are desired the asbestos insulation consists of a mass of fibres mixed with a suitable bonding agent, the resulting felt being smeared on the conductor and smoothed to a uniform coating by drawing through dies. The insulation is usually black or white according to the bonding agent used, and is often reinforced by a spaced winding of single cotton strand. In cases where heat resistance is important and thickness of insulation not necessarily reduced to a minimum, a more reliable insulation can be obtained by an overlapped wrapping of asbestos paper. Since, however, it seems impossible to obtain good asbestos paper less than 5 mils thick, such a winding with one-third overlap necessarily approximates to a thickness of 10 mils.

Examples of superfine asbestos tape.

Arc resisting boards, although essentially intended for electrical purposes, cannot be regarded as good electrical insulators, especially in the natural condition, although considerably improved electrical properties exist in the black varieties. There are a large number of different makes on the market known under a variety of different names, such as Syndanyo, Ebony Syndanyo, Siluminite, Arcovite, etc. These have all been classified by the E.R.A. under the term "non-ignitable" or "self-extinguishing," and most likely will be eventually more clearly classified under various grades. They are virtually all asbestos cement in which the cement is reinforced in a very effective manner by an intricate network of asbestos fibres.

The black varieties now becoming popular in switchboard design represent in many cases the natural asbestos cement board which has been subjected to a thorough impregnation with asphalts, and, in its final form, makes an excellent substitute for slate or marble. Fig. 4 shows a large switchboard, installed by the Metropolitan-Vickers Electrical Company, the panels being of Ebony Syndanyo supplied by Messrs. Turner Brothers' Asbestos Co., Ltd.

By virtue of the impregnation, the electrical properties of the ebony variety is greatly superior to those of the natural, especially under humid conditions.

Table V. shows a comparison between a "natural" asbestos cement board and an "Ebony" grade, and serves to emphasise the good electrical properties of the impregnated variety and the good arc-resisting properties of the natural grade.

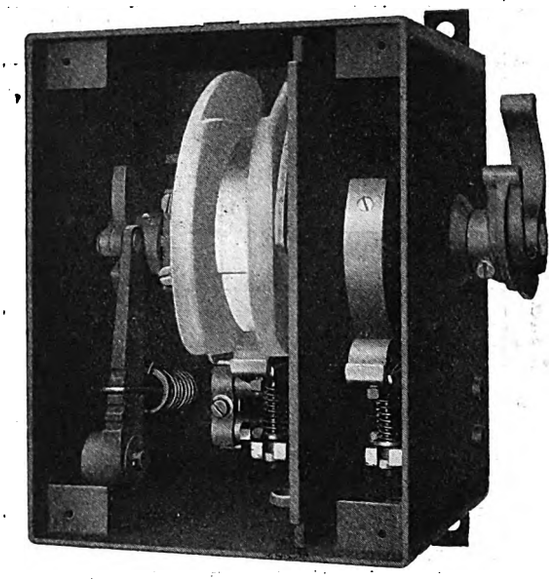

Fig. 5.—A limit switch with moulded asbestos arc chute.

TABLE V.—COMPARATIVE PROPERTIES OF EBONY AND NATURAL ASBESTOS CEMENT BOARDS.

Test	Ebony	Natural (Grey)
Elec. strength minute Values volts/mil.		
Normal conditions	36	4
Tropical conditions	26	conducting
Hot (180° C.)	35	20
Surface breakdown over 1½ in.-kV—		
Normal	19	10
Tropical	24	6
Hot	20	12
Tensile strength, lb./sq. in.	1 500/1 700	2 000/3 000
Shearing strength, lb./sq. in.	4 700/6 000	4 000/4 500
Water absorption (per cent)—		
24 hours	0·41/0·42	18
6 days	0·90/0·92	25
Arc resistance	Fair	Very good
Fuse Wire explosions	Poor	Good

For arc chutes and similar applications asbestos is sometimes moulded with cement to form special shapes. An example is illustrated in Fig. 5. A more extensive use is made, however, of the arc-resisting and non-ignitable boards already referred to. It is hoped to deal specially with the development and characteristics of these materials in a later article.

The authors are indebted to Messrs. Turner Brothers' Asbestos Co., Ltd., for Figs. 1, 2 and 4, to Mr. R. E. Forbester, of that company, for technical information regarding the raw materials, and to the Metropolitan-Vickers Electrical Co. for Fig. 5 and for permission to publish information obtained by research.

The British Engineerings Standards Association has issued a Standard Specification for Solid and Split Taper Pins.

The specification embodies requirements for the quality of material and appropriate tests, and gives a table of standard sizes for both solid and split taper pins.

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INSULATING OILS.

Origin of Mineral Oils—Manufacture of Transformer Oils—Asphaltic and Soap Sludges—Gas Formation in Oil Switches.

By ALLAN MONKHOUSE, M.I.E.E., M.Amer.I.E.E., A.M.I.Mech.E.

THE oils used as insulating oils in commercial work are almost exclusively refined from crude mineral petroleum. The origin of mineral oils is still obscure. Two eminent theories may be quoted—one organic and the other inorganic. The organic theory is the one now most generally accepted, particularly since recent discoveries, referred to below, have revealed the process of metamorphism in all its stages, from

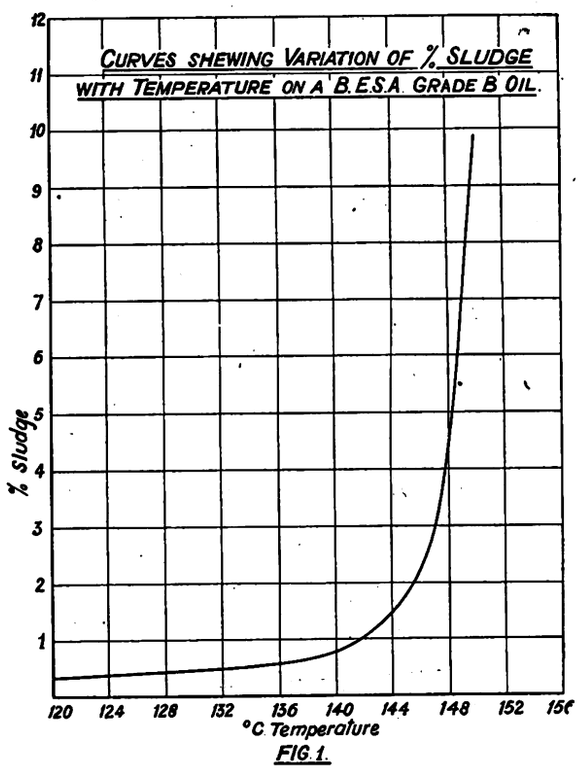

Fig. 1.—Results of sludge tests on oil which has shown good results in 115 000 V transformers.

animal and vegetable matter to the oil-bearing sludges. According to this theory the slime produced in stagnant waters by the putrification of elementary animal and vegetable life is the first stage in the formation of mineral oil. During putrification the non-fatty constituents (albumens and cellulose) disappear and grey-green purulent slime is deposited, which becomes buried under subsequent deposits and forms a polymerous bitumen, which in turn decomposes under the influence of pressure and heat and produces petroleum.

Recent researches made under the Soviet Government in Russia have shown every step in the above transformation, from the living vegetable plant Botrycoccus Browni, a very elementary water vegetable growth of the green pond slime order—containing a considerably greater proportion of fat than is associated with higher forms of vegetable life—to oil-bearing (bituminous) shale deposits.

Recent slime from the bottom of certain lakes including Balkash in Turkestan has been "refined" to produce the majority of the products usually distilled from crude petroleum.

The inorganic theory of the origin of petroleum was first put forward by Mendeleieff, and assumes that metallic carbides (formed by the action of carbon with iron and other metals) have been decomposed under water at high pressures and temperatures, resulting in the production of hydrocarbons. A subsequent rearrangement of the molecules of these hydrocarbons has been shown by various experimenters to be capable of producing hydrocarbons homologous to those found in petroleum.

It may be emphasised that the optical activity of mineral oils is not compatible with an inorganic origin.

It is not necessary here to enumerate the ever increasing number of oil producing centres of the world, but in considering transformer oils it should be borne in mind that broadly the crude oils can be classified into two general groups. The first comprises crudes which are largely paraffinoid hydrocarbons with certain smaller amounts of benzol hydrocarbons (cyclic compounds). Pennsylvanian oils and the oil from the Grosni district of the Caucasus can be cited as examples of such crudes. The second group may be typified by the majority of the oils obtained from the oil fields of Azerbajian (Baku District) which are chiefly cyclic combinations such as naphthenes (C_nH_{2n}), cyclo-paraffine, etc., which are derived from cyclo-pentane) and aromatic hydro-carbons of composition C_nH_{2n-6}. Insulating oils produced from the crudes of the former group can only with difficulty be made into transformer oils which are free from the tendency to form sludge at high temperatures. On the other hand, transformer oils made from crudes of the second group, such as the so-called Russian oils from Baku, have been proved by thirty years' experience to be singularly free from any tendency to form sludge.

The processes employed in the preparation of transformer oils and other products from crude mineral oils differ, largely depending on the nature of the oil, and on which of the various products obtainable is regarded by the refiner as of the greatest importance. In general, however, the crude is "cracked" on the oilfields. Cracking consists of heating in a cracking still, and separating the distillate which comes off at different temperatures. Under the influence of heat the complex hydrocarbons constituting the mineral oil are broken down into less complex volatile and aromatic hydro-carbons, which become liberated at various temperatures, according to their boiling points.

Baku crude oil, for instance, when subjected to this process produces (1) Up to 150 deg. C.—Crude benzines or petroleum naphthas, specific gravity 0.75 to 0.77, which is capable of being further distilled into gasolene (specific gravity, 0.655), benzoline (specific gravity 0.705), and benzine (specific gravity 0.737); (2) 150 deg. C. to 300 deg. C.—Kerosenes or illuminating oils (specific gravity 0.87); and (3) Above 300 deg. C.—Residium (Russian ostatki) remaining in the still. This product forms the base from which lubricating and transformer oils are distilled by blowing superheated steam through the mass in the stills and collecting the distillate at various temperatures, as instanced in the following figures (applying to Russian ostatki)—

Name of Oil.	Distilling at deg. C.	Sp. Gr.	Colour.
Solar Oils	150–170	0.840–0.860	Pale yellow
Insulating Oil or Light Spindle Oils ..	170–200	0.870–0.880	Yellow
Heavy Spindle and Light Machine Oil ..	200–250	0.895–0.900	,,
Engine Oil	250–300	0.908–0.912	Reddish Brown
Cylinder Oil	300–320	0.915–0.920	Red
Fuel Residue	—	0.950	Black

From the above, it will be seen the fraction, from which insulating oils are made, comes off between 170 and 200 deg. C.

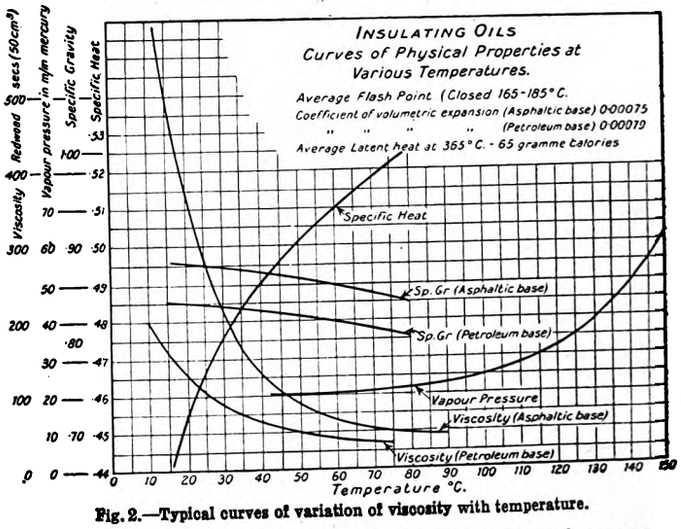

Fig. 2.—Typical curves of variation of viscosity with temperature.

This distillate is then "washed" by passing through concentrated sulphuric acid (66% H_2SO_4) to remove unsaturated hydrocarbons and bases, followed by caustic alkali to remove traces of the acid; and also litharge to remove all traces of sulphur. It is then carefully dried and filtered, either by passing through blotting-paper type filter presses or centrifugal separators.

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The rapid increases in the size of transformers and in the rupturing capacities of oil circuit-breakers has made necessary the enforcement of the strictest supervision over the production and use of insulating oils. Specifications of the properties of which such oils should be possessed, have been drawn up by the B.E.S.A. and similar bodies in other countries; and Table I represents an effort to compare the requirements of a number of such specifications which have been issued in recent years. The most undesirable property, which unfortunately characterises many insulating oils, is their tendency to form sludge under working conditions and, therefore, the specification of the minimum permissible amount of sludge in insulating oils when tested, and the method of determining sludging characteristic occupies the first place in Table I. Sludging in insulating oils may be due to a number of causes, and it is necessary to differentiate between three different types of sludge.

Asphaltic sludge is the most common sludge found in transformers in which poor quality oil has been used, and is an oxidation product forming primarily on the hot parts of the windings and core. This sludge is not a bad dielectric, but is a poor conductor of heat, so that its presence gives rise to hot spots and not infrequently so "sludges up" transformers as almost completely to prevent oil circulation; with the result that insulation failures occur. Sludge of this type can be washed off the affected parts of a transformer with petroleum spirit, etc.

Researches made by the A.S.E.A. of Vesteras, Sweden, and others, have shown that the formation of sludge of this kind is, particularly pronounced where the oil is in contact with parts of apparatus, and transformers, which are under dielectric stress. One series of tests made by the A.S.E.A. showed that after a test of six months' duration at 90 deg C. an oil which had been during that period subjected to a stress approximately that obtaining in e.h.t. transformers showed 100% more sludge and 33% more acidity than oil of the same sample similarly tested, but without a dielectric field.

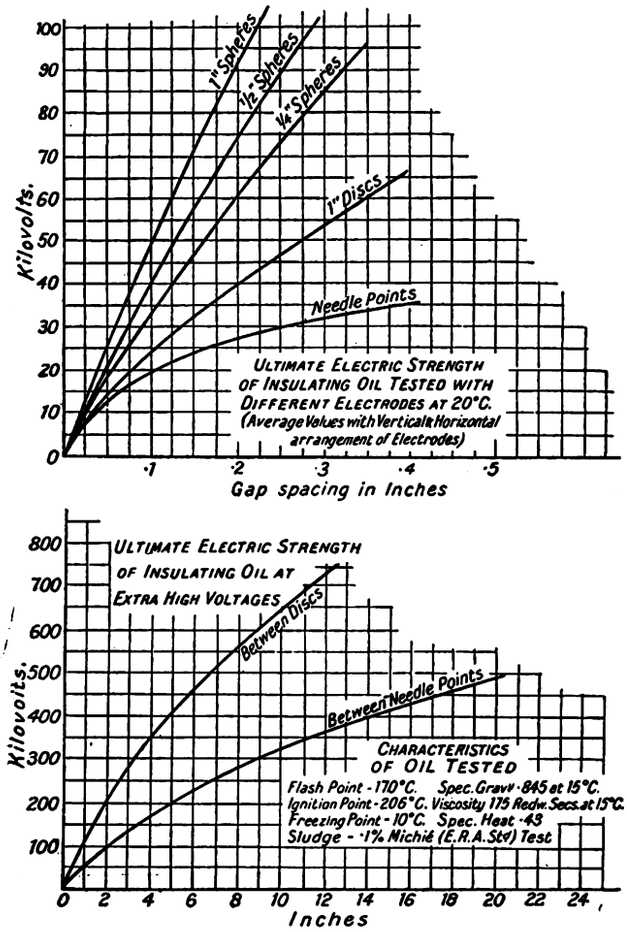

Fig. 3.—Average electric strengths of commercial transformer oils at 20 deg. C.

Soap type sludges take the form of a yellowish, sometimes dark brown, flakey precipitate which floats in the oil and settles on the surfaces of cooling pipes, tank sides, etc., as a slime. It is a "soap" and is probably formed due to impurities introduced into oil with the transformer core and windings. This sludge has a very low dielectric strength and its danger lies in its great affinity for moisture which it absorbs from the transformer oil. Bare copper conductors appear to accelerate the formation of this particular sludge.

Carbonaceous sludges are the result of an electric arc having been formed in the oil. The carbon particles formed by an extra high tension are very fine, and are almost pure amorphous carbon, and differ from the flakey deposit of more nearly graphitic carbon which occurs as the result of a low tension arc being formed in the oil. This form of sludge is a frequent cause of trouble in e.h.t. oil switches, because after such switches have interrupted a number of heavy short

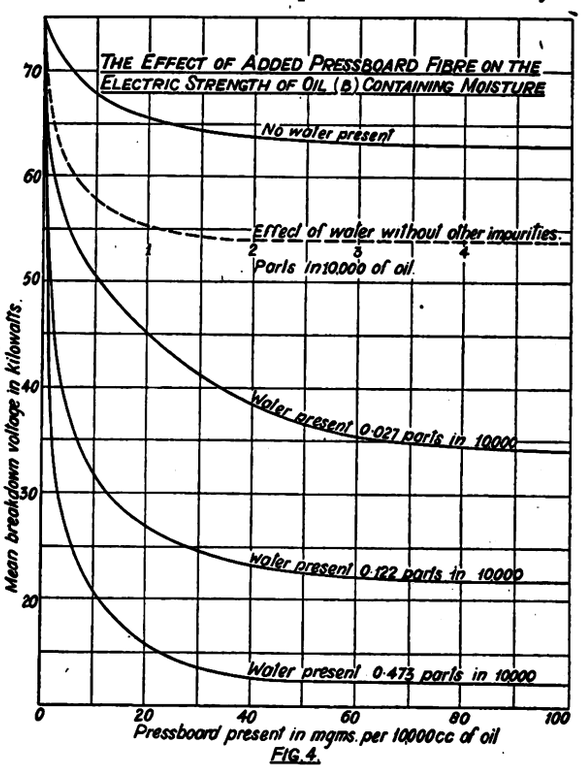

FIG. 4.

Illustrating the effect of impurities on the electric strength of insulating oil.

circuit faults, the amount of finely-divided carbon present in the oil may be sufficient to make itself dangerous, by reason of the fact that it is drawn into the dielectric field and becomes a conducting deposit on bushings and other insulation surfaces.

The first-named sludge, i.e., asphaltic sludge, is by far the most serious, because it is a characteristic of the oil which cannot be removed by filtering and cleaning. The International Electrotechnical Commission has endeavoured to coordinate the efforts of research workers in various countries, and prepare a common specification for determining the sludging characteristics of insulating oil. The reports of a number of investigating sub-committees were presented at the Bellagio meeting of the I.E.C. in October, 1927, but opinions were at that date so diverse that no agreement could be reached as to what form a suitable standard test should take. The Michie sludge test adopted by the B.E.S.A. undoubtedly gives an indication of how any given oil is likely to behave with regard to sludging when used in transformers, but it is liable to criticism, in that the high temperature of 150 deg. C. lies too near to the critical sludge-forming temperature of many oils (including the oils made from Azerbajanian crude) to allow consistent results to be obtained. The curves in Fig. 1 show what is meant by this statement, and are the results of tests made on oil which has shown the most excellent results in large 115 000 V transformers. It will be seen that at 150 deg. C., a difference of half a degree in the average temperature at which the oil was maintained during test may result in a 25 to 30% increase in sludge content. This critical temperature varies for different oils.

The quantity and temperature of the air passed through the sample during the Michie test also play a most important rôle, and should be most accurately controlled. It would almost seem reasonable to preheat the air by circulating it through tubes in the heating bath before passing it through the sample. Irregular results are obtained by the oil of the heating bath forming a heat insulating coating over the test flask. For this reason the temperature should, it has been suggested, be recorded inside the test flasks.

(*Continued on page* 670)

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COUNTRY	GRADE OF OIL.	SLUDGE TEST. Details of Test.	Min. % Sludge permissible.	VISCOSITY. The equivalent Redwood figures are based on average viscosity curves in B.E.S.A. Spec. 148–1927 *	ELECTRIC Test arrangement.
GREAT BRITAIN B.E.S.A. Spec. 148–1927	A o A 10 A 30	*Sample*, 100 grams. *Temperature*, 150° C. *Duration*, 45 hours. *Catalyst*, Copper cylinder *Quantity of Air* 2 litres per hour Oil heated in reaction flask. Sludge washed with petroleum spirit and weighed. Per cent. sludge=weight of deposit in grams.	0·1	200 Redwood secs. at 15·5° C.	Horizontally arranged hard brass spheres, diameter 13 m/m spaced 4 m/m apart, with min. head of oil over electrodes 50 m/m
	B o B 10 B 30		0·8	200 Redwood secs. at 15·5° C.	
U.S.A. American Bureau of Standards. 1922.		*Sample*, 1000 cc. *Temperature*, 150° C. *Duration*, Until first traces sludge appear. *Catalyst*, none. *Quantity of Air*, 40 litres per hour. Sludge separated by centrifugal extractor. *Quantity of Sludge* measured by volume.	Trace.	SAYBOLT. 95–100 secs. at 37° C. *Equivalent* to 180–225 Redwood secs. at 15·5° C.	Horizontally arranged copper or brass flat disc electrodes, diameter 25·4 m/m spaced 2·54 m/m apart with min. head of oil over electrodes 20 m/m.
GERMANY. V.D.I. Rules. 1923.		*Sample*, 150 grams. *Temperature*, 120° C. *Duration*, 70 hours. *Catalyst*, none. *Quantity of Air*, 2 bubbles per second. Sludge precipitated with caustic soda and hydrochloric acid and weighed.	0·2%	ENGLER. 8 at 20° C. *Equivalent* to 300 Redwood secs. at 15·5° C.	Horizontally arranged copper, sector form electrodes; radius overall diameter spaced 1·5·10 m/m with min. head of oil over electrodes 12 m/m.
FRANCE. 1923.		*Sample*, 20 cc. *Temperature*, 150° C. *Duration* heated in test tube for various periods 5–50–125 hours. *Quantity of Air*, no circulation. *Catalyst*, none. *Quantity of Sludge* determined by weight.	5 hours, No sludge. 50 hours, Trace. 125 hours, 0·15%.	ENGLER. 2·5 at 50° C. *Equivalent* to 300 Redwood secs. at 15·5° C.	Horizontally arranged brass spheres 12·5 m/m diameter spaced 5 m/m apart. Test cup holds min. 200 cc. of oil.
ITALY. Associazione Elettrotecnica Italiana. 1927.	Transformer	*Sample*, 40 grams. *Temperature*, 110° C. *Duration*, 300 hours. *Catalyst*, Copper gauze, The tensile strength of cotton yarn after being heated for 300 hours at 110° C. should be at least 60% of what it was prior to test. *Quantity of Air*, no circulation.	0·05%	ENGLER. *Transformer*, 8 at 20° C., 2·5 at 50° C., 1·5 at 75°C. *Equivalent* to 300 Redwood secs. at 15·5° C.	Horizontally arranged brass spheres 10 m/m diameter spaced 5 m/m apart. Test cup holds min. 333 cc. of oil.
	Switch.			*Switch*, 10 at 20° C. *Equivalent* to 390 Redwood secs. at 15·5° C.	
SWITZERLAND. 1925.		*Sample*, 1 000 cc. *Temperature*, 150° C. *Duration*, 168–334 hours. *Catalyst*, Copper. *Quantity of air*, no circulation. Sludge separated by centrifugal separator and measured by volume. The tensile strength of cotton yarn after 160 hours at 150° C. should not be reduced more than 20%.	168 hours, No trace. 334 hours, 0·3%	ENGLER. 8 at 20° C. *Equivalent* to 300 Redwood secs. at 15·5° C.	Horizontally arranged spheres 12·5 m/m diameter spaced 5 m/m apart.
SWEDEN. 1925.	A	*Sample*, 150 grams. *Temperature*, 120° C. *Duration*, 70 hours. *Catalyst*, none. *Quantity of Oxygen*, 2 bubbles per second. Sludge precipitated with caustic soda and hydrochloric acid and weighed.	0·12	ENGLER. 8 at 20° C. *Equivalent* to 300 Redwood secs. at 15·5° C.	Vertically arranged spheres 12 m/m diameter spaced 5 m/m apart.
	B		0·25		
NORWAY.		SAME AS FOR SWEDEN.	0·15 to 0·30	ENGLER. 8 at 20° C. *Equivalent* to 300 Redwood secs. at 15·5° C.	Horizontally arranged brass flat disc electrodes 25·4 m/m diam. with corners rounded, 1 m/m radius, spaced 2·54 m/m
U.S.S.R. 19th Session Dec., 1925.	A	*Sample*, 100 cc. *Temperature*, 120° C. *Duration*, 70 hours. *Catalyst*, Copper strip *Quantity of Air*, 3 litres per hour.	0·2%	ENGLER. 1·8 at 50° C. *Equivalent* to 150 Redwood secs. at 15·5° C.; 2·3 at 50° C. *Equivalent* 250 to 15·5 Redwood secs. at 15·5° C.	Horizontally arranged flat disc electrodes, 25 m/m diam. with corners rounded 2 m/m radius (metal unspecfied) spaced 2·5 m/m with min. head of oil over electrodes 15 m/m.
	B	Sludge washed with petroleum, ether and weighed.			
SPAIN Spanish Committee International Electrotechnical Commission.	Transformer	——	——	SAME AS ITALY.	Horizontally arranged brass spheres 10 m/m diameter spaced 5 m/m apart, with min. head of oil over electrodes 50 m/m.
	Switch				
BELGIUM. Association Belge de Standardization Comité Electrotechnique Belge. May, 1926.		*Sample*, 40 cc. *Temperature*, 170° C. *Duration*, 5 hours. *Catalyst*, none. *Quantity of Air*, no circulation. Heating to be done in glass vessel—diameter 50 m/m, 37 m/m deep.	No trace.	SAME AS ITALY.	Vertically arranged brass spheres 10 m/m diameter spaced 2 m/m apart with min. head of oil over electrodes 100 m/m.

* Prior to 29th November, this

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STRENGTH.			FLASH POINT.	EVAPORATION.		COLD TEST.		SP. GR.	ASH %
Voltage.	Temp.	Minimum B.D.V. for oil as supplied.		Method of Test.	%	Method of Test.	Min. temp.		
25–100 ~ ed as idly as sistent reading ruments.	15·5° C. to 20° C.	30 000 for one minute.	PENSKY-MARTINS (closed) 145° C. 145° C.	20 cc. of oil heated in glass beakers, diam. 38 m/m, depth 38 m/m (weighing 10-15 grams) for 5 hours in toluene vap. bath.	1·6% 1·6%	A test tube 152 m/m long 19 m/m diam. containing 15 cc. of oil shall be reduced to temp. specified and held horizontally and oil shall "flow."	0 −10° C. −30° C. 0 −10° C. −30° C.	—	—
ge. 50 ~ ed at 3 kV second.	20° C. to 30° C.	22 000	CLEVELAND (OPEN) 143° C.	———	—	A test tube containing oil at the temperature specified when revolved horizontally for 5 secs. should not have oil adhering to walls.	−6·7° C.	—	—
——	15° C. to 25° C.	17 000 with 3 m/m spacing 60 000 with 10 m/m spacing.	MARCUSSON (OPEN) 145° C.	———	—	When test tube containing oil at temperature specified is tilted oil should not adhere to its walls.	Transformers −5° C. Oil switch −15° C.	0·85 to 0·95 at 20° C.	0·01%
at ply luency.	—	40 000	LUCHERE 160° C. Tolerance −10° C.	150 grammes of oil heated at 100° C. for 5 hours in vessel 60 m/m diam., 100 m/m. deep.	0·2%	Not specified.	−5° C.	0·85 to 0·92 15° C.	—
40–60 ed as idly as sistent 1	20° C.	After at 110° C. for 6 hrs. and filtering 40 000.	PENSKY-MARTINS (closed) 140° C. MARCUSSON (Open) 150° C.	150 cc. of oil heated at 100° C. for 5 hours in vessel 60 m/m diam., 100 m/m deep.	0·4%	The rules describe a test in which the flow of oil in a prescribed vessel during 10 minutes in an inverted position at the temperature specified is observed.	Transformers 0° C. and −5° C. Oil switches (outdoor). −20° C.	0·85 to 0·90 at 15°C. 0·88 to 0·92 at 15° C.	
——	—	30 000 for 30 minutes	MARCUSSON (Open) 145° C.	———	—	5 cc. of oil are cooled in a test tube 15 m/m diam. 150 m/m long for 10 minutes. On inverting tube oil should occupy 10 cc. of tube volume in 10 secs.	−25° C.	—	—
——	15° C. to 20° C.	30 000 but after drying and filtering 60 000.	PENSKY-MARTINS (Closed) 145° C. Tolerance −5° C.	Details not specified.	2%	Not specified.	−5° C. −30° C.	0·85 to 0·92 at 20° C.	—
——	—	22 000	MARCUSSON (Open) 145° C. Tolerance −5° C.	———	—	Not specified.	Transformers −5° C. I.D. Switch −5° C. O.D. Switch −30° C.	0·85 to 0·92 at 20° C.	
ge d 2 kV id.	15° C. to 20° C.	22 000	PENSKY-MARTINS (Closed) 140° C. 155° C. both with tolerance −5%.	———	—	Test tube with oil maintained at −18° C. for 10 minutes is tilted to 45° C. and oil shall not adhere to its walls.	−18° C.	—	0·008%
ge d l.	—	40 000	PENSKY-MARTINS (Closed). 160° C. 150° C.	150 grammes of oil heated at 100° C. for 5 hours in vessel 60 m/m. diam., 100 m/m deep.	0·2%	Not specified.	−5° C. −20° C.	0·85 to 0·92 at 20° C.	—
~ ge l nd.	25° C.	18 000	PENSKY-MARTINS (Closed) 145° C.*	40 cc. of oil heated at 145° C.* for 3 hours in vessel 50 m/m diam., 37 m/m deep.	1·5%	Not specified.	−15° C. but for indoor transformers −5 ° C.	0·85 to 0·92 20° C.	—

s 170° C.

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The sludge test equipment made by the A.S.E.A., of Sweden, includes provision for subjecting the oil to dielectric stress of 10 000 V per cm. during test, and also including as catalysers mild steel and transformer iron, in addition to copper as specified in the B.E.S.A. specification. This company recommends the test being made at a temperature of 100 deg. C., using one

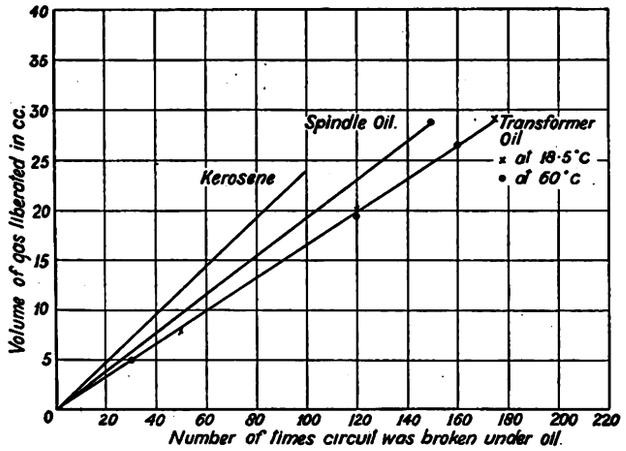

FIG. 5.

Indicating the little difference in gas formed with different oils under test.

litre per hour of oxygen instead of air. Messrs. Brown, Boveri and Co.* have employed a sludge test worthy of note, since it takes into consideration the colour of the oil in contact with the copper after prolonged periods of heating.

The main disadvantage of all these tests is the time and laboratory accuracy which they require. Many large power systems are situated in parts of the world where such tests are not feasible, and much time is lost in transferring samples to testing authorities. It may therefore be of interest to repeat here a quick test, which has been suggested by Mr. W. H. Nuttall, of the Ioco Rubber and Waterproofing Co.† This short test depends in principle on the fact that oils containing large amounts of unsaturated hydrocarbons (and therefore having a strong tendency to sludge) exhibit a much stronger interfacial tension towards water than that shown by oils which contain no unsaturated hydrocarbons. This is due to the affinity unsaturated hydrocarbons possess for water. The test consists of allowing a known quantity of oil to rise in " drops " through distilled water from a standard orifice, The " drops " are expelled from the orifices under a definite head of oil. Oil which contains large amounts of unsaturated hydro-carbons will rise through the water in small " drops." The number of " drops " per unit volume of oil is claimed to afford a direct measure of the sludge properties of the same.

The figures in the following table, quoted from Mr. Nuttall's results, indicate the wide difference between various oils which only differ within comparatively small limits when the sludge value is expressed in accordance with the B.E.S.A. specification. In these tests a 40% solution of sulphuric acid was used instead of water, in order to produce a wider difference in the results obtained with good and bad oils.

Oil No.	Drops per 100 cc. of oil.	Drop Volume in cc.	Sludge Value by Ordinary Test No. 36.
1	802	0·1247	nil
2	731	0·1368	0·05%
3	752	0·1329	0·05%
4	798	0·1253	0·08%
5	1 616	0·0619	0·70%
6	1 733	0·0699	0·86%
7	1 790	0·0558	0·97%
8	1 742	0·0574	1·10%

An even quicker and more practical test based on the same idea can be made by allowing one drop of the oil under test to fall gently from the end of a clean glass rod on to the surface of distilled water in a breaker. The drop should remain on the surface of the water as a slightly flattened drop not more than approximately 5 to 8 millimetres diameter. If it spreads over the surface of the distilled water, it indicates an oil which should most certainly be subject to laboratory tests before use.

Table 1 indicates the range of viscosities which various authorities have considered it necessary to specify for insulating oils. Unfortunately, the figures given in the specification are not easily comparable, due to the fact that different methods of determining and expressing viscosity are employed. For this reason equivalent figures at 15·5 deg. C. have been inserted in making up the Table 1. Fig. 2 includes some typical curves of variation of viscosity with temperature.

The curves in Fig. 3 show the average electric strengths which it is reasonable to expect in commercial transformer oils at 20 deg. C. Much has been published from time to time in dealing with the methods of determining the electric strength of insulating oils and the relative advantages of various forms of electrodes and arrangements of test cups. It is the author's personal opinion that the half-inch diameter spherical electrodes standardised by the B.E.S.A. and spaced 4 m/m apart, form as good a method of commercially comparing insulating oils as there exists. Whether the electrodes are arranged vertically or horizontally appears to make comparatively little difference, so long as spherical electrodes are employed, and the oil is reasonably dry and of good quality. With flat disc electrodes and a small spacing the breakdown figures would appear slightly lower with the electrodes arranged vertically than with horizontally arranged electrodes.

The electric strength of insulating oils is almost entirely a question of moisture and impurities being present in the oil. At the recent International Conference on Large Electrical Systems, in Paris, a paper was presented by Mr. J. E. T. Cogle showing the effect of various measured quantities of impurities (including moisture, vegetable fibres, atmospheric dust, carbon, etc.) on the electric strength of oil. The curves shown in Fig. 4 have been prepared from the information in Mr. Cogle's paper, and may be taken as typical of the effect of impurities on the electric strength of insulating oil.

Impurities having a specific inductive capacity greater than that of oil, will naturally become drawn into the space between the electrodes where the dielectric field is most intense. As vegetable fibres, when perfectly free from moisture, have a high dielectric strength, their presence, even though drawn into the gap, does not greatly lower the break-down strength. On the other hand, when particles of water are similarly drawn into the gap, considerations of relative specific gravities and surface tensions of the water and the oil present difficulties to the water particles lining up between the electrodes, so that their presence, although seriously affecting the electric strength of the oil, does not result in the extremely low breakdown which occurs when both moisture and vegetable fibres are present.

In testing oil for electric strength the B.E.S.A. specification states that " the oil shall be passed if two out of three tests, each on a separate filling, give results not lower than the limit fixed (30 kV)." This clause is of importance, because repeated tests on the same sample often result in an improvement in electric strength being shown after five or six tests have been made consecutively. This is due to the heat of the arc actually drying the oil in the neighbourhood of the electrodes.

Disastrous fires in the early days of transformer work resulted in insurance authorities demanding the use of transformer oils having very high flash points. Since high flash point can only be obtained in oils of proportionately greater viscosity resulting in poorer circulation and cooling, it has been appreciated that such a demand was not technically sound, and the tendency of recent years has been to decrease flash point values, and secure less viscous oils. The development of open air sub-stations calling for oils which will withstand a cold test at —30 deg. C. has itself necessitated a lowering of viscosity, and hence of flash point.

It is a significant feature of oil switch failures that the serious results which not infrequently occur during such failures are not due to the explosion which occurs when the initial arc is broken, but are due to secondary explosions of liberated gases. Dr. Bauer* and other investigators have developed formulæ for the quantities of gases formed in relation to the " breaking energy " of oil switches. The question immediately arises as to how far different oils differ from one another in the quantity of gas they may liberate under such conditions. The curves in Fig. 5 show the results of numerous tests, and indicate a surprisingly little difference in the amount of gas formed with different oils, even including kerosene, when a controlled electric circuit is broken under the oil.

Acknowledgements are made to Sir Isaac Pitman and Sons, Ltd., for the use of Figs. 2 and 3, which are reproduced from the author's book, " Electrical Insulating Materials," and to the Metropolitan-Vickers Electrical Co., Ltd., for permission to publish information gained in research work and manufacturing experience.

* " B.B.C. Review," Vol. IX, No. 8, August 1922.

† " World Power," August 1924, pages 92-96.

* " Bull. S.E.V.", 1915, No. 8, page 158.

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ANTI-VIBRATORY PROPERTIES OF RUBBER.

Report on an Investigation for the Rubber Growers' Association.

WE have received from the Rubber Growers' Association a report on the anti-vibratory properties of rubber. While the investigation was primarily undertaken in connection with the use of rubber for isolating wireless sets, the results are applicable in a wider field, and will appeal not only to wireless manufacturers but to consulting engineers, manufacturers of scientific instruments, gramophone manufacturers, dynamo manufacturers and others interested in the elimination of vibration and noise.

The purpose of the investigation was to determine under various conditions the ability of rubber cushions placed under broadcast receiving sets to isolate them from vibration.

This research was carried out on behalf of the Association by Messrs. Digby and Fairthorne, consulting engineers, Queen Anne's Gate, London.

Five different types of rubber were submitted for examination, as follows:—

Sample "A," sponge rubber; "B," special compound containing 95% pure rubber (unreinforced); "C," sole crepe rubber; "D," cellular or expanded rubber (gas filled); "E," special compound containing 95% pure rubber (reinforced with fibre core).

The pads were placed in turn on a special platform that could be made to oscillate at any required frequency and used to support a base 11½ in. by 8½ in., on which was mounted the instrument which recorded the movements of the base. The weight of the base and instrument together was 21½ lb. As a result of inquiries previously addressed to the makers of various receiving sets, it was found that 21½ lb. was a good average for the weight of the usual set, and 11½ in. by 8½ in. for the size of the base. When undergoing test, the pads were placed beneath the corners of the base, and therefore supported it in the same manner as they would a wireless set. The conditions were, therefore, as close an approximation to actual working conditions as it was possible to get.

The method employed in testing a set of pads was first to keep the platform oscillating at a known frequency, and place on it the base and instrument, without the pads. The instrument then recorded in a greatly amplified form the actual movement of the base by means of a spot of light moving to and fro on a ground-glass screen.

The pads were then inserted beneath the base, and the movement of the spot of light again observed at the same known frequency. The difference in amplitude of the movement of the spot of light before and after the insertion of the pads was a direct measure of the amount of movement absorbed by the pads. Permanent records were obtained by substituting a piece of gaslight paper for the ground-glass screen, and records capable of photographic reproduction by using specially rapid orthochromatic plates which give negatives from which any number of positives may be obtained.

Recording Shock Absorption.

The absorption of shocks was also obtained by arranging for a weight to fall from a given height on to the bench carrying the special platform, and records were taken in the same manner as in the previous experiments, except that the gaslight paper records were impossible owing to the intermittent nature of the vibration.

Tests were carried out at a speed of 550 cycles per minute adopting different sizes and thicknesses of samples. The sizes of the samples were as follows, 2 in. square, 2 in. by 1 in. and 1 in. square, and the thicknesses varied from ¼ in. to 1 in. Experiments were also carried out with perforated samples by which the area of the pad was reduced by 20%. The result of all these tests indicated that the absorption increases as the size of the pad is reduced in area and increased in thickness.

Further tests were then taken at 720 cycles per minute with different amplitudes. It was found that the absorption was greater for vibrations of small amplitude than for large, and, as in the previous set of experiments, the absorption increased as the size of the pad was reduced and the thickness increased.

Experiments to test the phenomenon of resonance were carried out. In every case the amplitude of the movement was increased by inserting the rubber pads. Those that gave the greatest absorption at higher frequencies gave the greatest increase in amplitude.

In the impact experiments the results showed very clearly that the rubber pads absorbed intermittent jars and shocks to the same extent and with the same facility as they did steady vibrations. The intrinsic value of rubber pads in absorbing sudden shocks would appear to be even greater than that indicated by the results, as a steep-fronted wave is transformed into a wave with a sloping front, thus converting an impact into a gentle movement. The risk of injury therefore to any apparatus receiving the shock is reduced.

The appearance of the vibration is similar to the vibration obtained in any house when fast, heavy traffic passes over a bad patch of road surface in front of the house.

Tables are given of results of tests at 550 and 720 cycles per minute.

The Theory Outlined.

The theory of the action of a rubber pad absorbing horizontal vibration is outlined as follows:—

The forces exerted on the pads when absorbing vibration in a horizontal plane are shear forces, as the under surface of the pads has to move to and fro while the upper surface remains stationary. The strain to which the rubber is subjected depends entirely on the amplitude of the oscillations of the vibrating support, and the greater the stress produced by this strain, the greater will be the horziontal force exerted by the pads on the base of the wireless set they support, and the greater will be the amount of vibration transmitted.

It will be clear, also, that this stress can be measured in so many pounds per sq. in. of the surface of the material, so that reducing the area of support decreases the amount of movement transmitted through the pads. Also, doubling the thickness of the material doubles the strain required to produce the same shear stress. The above reasoning indicates that the best results are to be expected with pads of soft flexible rubber, in pieces which are small in area and relatively thick. This is verified by the experiments carried out.

The best results were obtained with the following materials: (*a*) Pads, 1 in. thick, of sample "C" in pieces 1 in. square perforated with small holes; (*b*) pads, ½ in. thick, of sample "D" in pieces 1 in. square; (*c*) pads, ⅝ in. thick, of sample "B" in pieces 1 in. square.

The sample "C" was the only material perforated and built up to a thickness of 1 in.; the other materials were used only in thicknesses up to ⅝ in. From their nature, however, they would show increased absorption if perforated and the number of layers increased.

The various features incidental to the absorption of vibration in the case under consideration are summarised in the report as follows:—

(*a*) That the material must be elastic.

(*b*) That it must be soft and flexible and used in the form of relatively thick pieces of small area. Annular rings of rubber will probably be the best form to employ in these cases.

(*c*) That the pads being made as small as possible will be heavily loaded, and the best results are to be expected when the load is made as heavy as the material will bear. It is suggested that the *yield point* of the rubber under compression should be obtained, and the pads designed so that when in use the compression stress will be about half the stress at the yield point. This would necessitate pads of various sizes for sets of different weights.

(*d*) That rubber pads absorb vibrations of small amplitude much more readily than large movements.

(*e*) That they absorb vibrations of high frequency to a greater extent than those of low frequency.

(*f*) Following from (*d*) and (*e*) the pads are effective in absorbing jars and shocks of a normal character, but tend to magnify slow movements when resonance occurs.

(*g*) That when resonance occurs the pads tend to magnify movements. In this respect, the pads share the properties of any other intervening medium of a non-rigid character.

(*h*) That for the purpose of this investigation, the best all-round absorption was that given by ½ in. thick pads of sample "D"; perforated samples of material "C" ranking next.

(*i*) That for general utility purposes perforated samples of material "C" are to be recommended on the score of cheapness. The proportioning of the diameter and spacing of the perforated holes to the thickness of the material will require investigation.

F

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HARDNESS TESTING.

Features of the Constant Size Impression Method.

OF the various machines developed for the testing of hardness by the indentation method, the Brinell machine is perhaps the most popular and the most widely used, for it allows of the test being quickly and conveniently carried out, and the values obtained can be related in some measure to tensile strength. Various forms of the machine are in use, and it is customary to use hardened steel balls of 1 to 10 mm. diameter as indenter elements, machines using the 1 mm. ball having been designed for testing the hardness of small specimens and thin material. One of the chief limitations of this method of hardness testing arises from the deformation of the ball when testing hard materials.

For measuring the hardness of hardened steels and heat-treated tool steels, the Rockwell machine, where a constant load is used and the depth of penetration measured, is now quite commonly employed. With the development of extremely hard materials for use in the form of tools and dies (such as the tungsten carbide alloys, for example), the need for a satisfactory method of effecting hardness measurements is becoming more necessary. The difficulty of deformation of the indenting tool when measuring high hardness values is overcome by the use of diamond indenters in place of steel, and in various machines this material has been used.

In a recent paper by A. F. Shore read before the American Society for Steel Treating, and printed in "Heat Treating and Forging" for May, 1929, the desirability, in hardness determinations, of reading pressures required to produce a standard impression is dealt with, and the author has designed a machine known as the Monotron hardness indicator in which this principle is employed. This principle overcomes the objection which is sometimes raised against the constant load method, that with soft metals the degree of penetration is relatively large as compared with harder metals, that is, the amount of deformation which the soft metal undergoes is greater, and the result is thereby affected.

The Monotron Method.

Even with the constant size impression method the degree of penetration adopted is of importance, for it is possible that metals having similar elastic limit hardnesses will give very different results with greater penetration if they behave differently under extreme cold working. The errors in measuring high hardness values, due to deformation of the steel ball, as in the Brinell machine, are overcome to some extent by the use of a diamond pointed indenter in the Monotron machine.

With a machine embodying the constant size and varying pressure principle, one of the chief difficulties in the way of obtaining accurate measurements of the depth of penetration is due to the elastic shortening of the penetrator element when under load. It is not practicable to make allowances for this factor for different hardness values, and in the Monotron machine the depth micrometer is held in a compensator, and so given a retractile movement equal to the elastic shortening of the diamond point when under pressure. The load required to produce a standard penetration, and the depth of the penetration, are read off on two dials which form part of the instrument. For universal application a 0·75 mm. diamond ball point is used, the standard depth of penetration being 0·0018 in., which is 6 % of the ball diameter. With this penetrator the entire hardness range encountered in metals from lead to tungsten carbide alloys can be satisfactorily measured.

No special difficulty attaches to the carrying out of the test, irregular shaped pieces of metal being satisfactorily accommodated by a tilting table which can be replaced by a V-block for cylindrical specimens. The values read off on the dial recording pressure are in kilograms and pounds, but other scales can be substituted such as are giving diamond ball Brinell values direct. The modulus of elasticity of the material under test does not affect the result, since the depth of the penetration, or hardness value, is read while the load is applied. A protecting cap for the diamond point acts as a contact for operating the depth gauge, and, since the latter moves relative to the position of the cap, it has the advantage that any yielding (say of a hollow piece under test) does not affect the result. The depth scale is divided into nine divisions each representing 0·0002 in. or 0·005 mm.

As already indicated, the development of extremely hard metallurgical products has led to increasingly exacting demands being made on hardness testing machines. Of these, surfaces hardened by the nitriding process and tungsten carbide alloys may be cited, the hardness of some of the alloys in this class being twice as much as that of quenched high-carbon steels. Such materials are well beyond the range of hardness which can be satisfactorily determined by hardened steel balls or indenters, and only carefully selected diamonds can be used. Even these must be used with caution on the harder grades of tungsten carbide alloys. The Monotron instrument with its spherical diamond indenter, which gives a straight increment line, can be used to advantage in determining the hardness of these extremely hard products.

Depth of Penetration.

In testing materials of this kind, it is advisable to use a depth of penetration corresponding to three divisions only, which does not impose an unduly severe strain on the diamond and yet is quite satisfactory for the purpose. With hardened steel a penetration equal to three divisions requires a pressure of from 35 to 38 kilograms, which when multiplied by three gives the value needed for the standard penetration of nine divisions or 0·0018 in. With superhard steels this value to yield the standard penetration might be as high as 120. With nitrided steel it is of the order of 117, or 39 kilograms for a penetration equal to three divisions.

Values on tungsten carbide alloys vary considerably, one of the softer but tough grades recording 45 kilograms with a depth of three divisions, or 135 when calculated to the standard, a harder and more brittle sample yielding corresponding figures of 65 to 75 and 195 to 225 kilograms. On hardened steel, the diamond will last for thousands of tests taken to the full depth of nine divisions, but is not capable of being used on tungsten carbide to this depth.—M. C.

CHROME PLATING.

Growing Applications in the Electrical Manufacturing Industry.

THE next few years will in all probability see something like a revolution in domestic and indoor appointments and fittings.

Polished brass, so loved by the industrious housewife, has long ago disappeared from most houses, and "labour-saving" is the slogan of the new generation. Oxidised silver, and other finishes, more or less successfully simulating the effects of age and wear, have had a brief interregnum, but undoubtedly the modern house (and office) will soon be dependent almost exclusively on chrome-plated metallic fittings.

Chrome-plated taps and bathroom fittings attracted the public notice some time ago, and their cleanliness, durability and beauty have led to a steadily increasing demand for this delightful and serviceable finish in every department of the house.

The supreme virtue of chrome-plating (after its appearance) is undoubtedly its property of keeping clean. Not only does it resist tarnish indefinitely, but it seems to have an uncanny habit of actually repelling dirt, so that a chrome-plated switch cover, for example, shines up resplendent in even a neglected and dusty room.

Electric fires, irons, toasters, kettles and other domestic appliances are now commercially produced in this finish, and, as many architects are now embodying the finish as standard for the modern home, manufacturers of electrical appliances and fittings will need to prepare themselves to meet this demand.

The technical applications of chrome-plating are many and important, but it is outside the scope of this article to mention more than a few. One of the most striking is its use in the machinery and apparatus of the modern power station. Switchboards are particularly striking when plated with a metal that eliminates practically all cleaning. Whenever scientific instruments are exposed to dirt or bad weather conditions they may with advantage be protected by the chrome process.

There are a few misconceptions about chrome-plating still lingering in some manufacturers' minds. The process is not costly, and, apart from the initial outlay on the plant, does not compare unfavourably with other plating processes.

The process is not difficult, and if the equipment is purchased from a first-class house, it includes a short course of training in the correct technique to be employed.

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The modern plant has totally eliminated any obnoxious gases and fumes, and the whole process can now be operated as surely and as safely as any other plating process.

The only way in which the chrome plant differs from the more orthodox plating plants is in the exhaust apparatus which carries away the fumes. This apparatus is claimed to be so efficient that no trace of any gases can be detected immediately over the vat, or, indeed, within a few inches of the top of the solution.

ELECTRO-DEPOSITED CHROMIUM.

Effect of Current Density on Hardness.

AN investigation of the effect of current density upon the hardness of electro-deposited chromium was described to the fifty-sixth general meeting of the American Electro Chemical Society at Pittsburgh, by Mr. Robt. J. Piersol. The author found that using various current densities, from 1 to 7 A/sq. in. (16 to 109 A/sq. dm.), chromium has a maximum hardness when plated at about 4 A/sq. in. (62 A/sq. dm.). The value of this is approximately forty-three times as great as that obtained at a normal plating current density of 1 A/sq. in. (16 A/sq. dm.) as shown by abrasion tests.

MELTING POINT OF CHROMIUM.

Attempts to Secure More Accurate Determinations.

IN a recent communication to "Nature," Messrs. C. J. Smithells and S. V. Williams, of Wembley research laboratories of the G.E.C., state that no accurate determination of the melting point of chromium has been published recently, so far as they are aware, and the accepted value of 1 550 deg. C. usually quoted appears to be based on measurements made in 1907–8.

Various properties of metallic chromium appeared to the writers to be inconsistent with such a low value, particularly the very slow rate of diffusion of chromium into iron and nickel. They found ("J. Inst. Metals., 40, 273; 1928) that even in pressed bars of nickel and chromium powders heated to just below the melting point of nickel (1 450 deg. C.) very little diffusion takes place, whereas under the same conditions nickel and iron rapidly form solid solutions.

An attempt was made to melt electrolytic chromium in an atmosphere of hydrogen in an electric furnace, but at the maximum temperature of 1 700 deg. C. there was no sign of fusion. Rods of both electrolytic and thermit chromium were therefore prepared and heated by passing a current through them *in vacuo*.

A small hole drilled in the side of the rod enabled the true (black body) temperature of the axis of the rod, as well as the brightness temperature of the surface, to be determined (cf. Pirani and Alterthum, "Z. Elektrochem," 29, 5; 1923) by means of a disappearing filament pyrometer calibrated at the melting points of tungsten, molybdenum, platinum, and iron. The difference between these two temperatures at 1 600 deg. and 1 700 deg. C. was found to be 160 deg. C. A number of determinations of surface brightness at fusion gave a value of 1 760 deg. C., giving a value of 1 920 deg. C. for the melting point of chromium. The experimental errors all tended to make this a low value. More accurate determinations will be made when larger rods of chromium are available.

METAL "SPOTTING."

Research Indicates Methods for Minimising its Effects in Plated Finishes.

AN investigation recently carried out by the American Electroplaters' Society has established the fact that the "spotting" of plated finishes on domestic and other appliances may be of two quite distinct kinds, i.e., crystal and stain spotting.

The crystal spots consist of dendritic crystals which appear only on metals having an oxidised surface; that is, one coloured with copper sulphide or other sulphides, and subsequently lacquered. The stain spots appear especially on cast metals, either plain or lacquered, in the form of discoloured areas of irregular shape, usually with a small dark spot near the centre.

The crystal spots have been found by X-ray examination to consist of cuprous sulphide (Cu_2S or chalcocite) growing usually between the layer of cuprous sulphide on the metal and the lacquer film. Their formation is caused or accelerated by sulphur in even minute amounts, such as may be derived from sulphur or hydrogen sulphide in the atmosphere, or from rubber bands or wrapping paper or cardboard cartons. It was impossible to determine whether these traces of sulphur cause the slow formation of new cuprous sulphide in coarse crystals or the recrystallisation of the very fine-grained cuprous sulphide already present.

The only promising remedies are (*a*) exclusion of sulphur from the surroundings, (*b*) the use of lacquers found to retard spotting, (*c*) the application of a thin film of a grease, such as petrolatum, to the lacquered surface, and (*d*) the use of wax paper for wrapping.

The stain spots are caused by the absorption in pores in the metal of acid or alkaline compounds during the plating process. Upon subsequent exposure to a high humidity such substances absorb moisture and exude upon and stain the surface. It was found that alkaline substances are especially difficult to remove from capillary pores. It is not practicable, however, to eliminate alkaline substances from the cleaning and plating solutions.

In some cases the porosity of the metal may be reduced by a change in pattern or in casting conditions. No method of rinsing or neutralising was entirely effective in removing the compounds. Baking at high temperatures before lacquering is sometimes helpful.

The two most effective remedies are: (*a*) permitting the chemicals to exude or spot out by exposing the articles to a high humidity before the final finishing, and (*b*) the application of a lacquer which has been found to retard this type of spotting.

In general, phenol-condensation lacquers, which are less permeable to moisture than nitro-cellulose lacquers, are also more effective in retarding stain spotting.

Permeability to moisture is, however, not the only factor. Tests on many commercial lacquers of both types show that it is possible to develop lacquers which are much more effective for this purpose than the average nitro-cellulose lacquers previously employed.

"PANALUMIN."

Anti-Corrosion Process for Aluminium and Aluminium Alloys.

THE Panalumin process (known on the Continent as the "Jirotka" process), for the protection of aluminium and aluminium alloys against corrosion, is extensively used in many industries where aluminium and aluminium alloys are utilised, especially by motor-car manufacturers, aeroplane builders, constructional and machinery engineers, optical instrument makers, etc.

The chief aim of the process is the protection of light metals against corrosion, but there are other advantages to be obtained, namely, that paint and lacquer will permanently adhere to metal which has been treated. It is also possible to nickel-plate and to produce various colours on the metal, as well as to render it non-corrosive.

The treatment is very inexpensive and is obtained by immersing the articles in chemical baths prepared in accordance with the chemical and metallurgical characteristics of the particular aluminous metal, the only plant necessary consisting of enamel vats large enough to hold the articles undergoing treatment, no electrical energy or highly technical knowledge being needed. In certain cases it is possible to treat metal *in situ*.

H.T. INDICATOR.

Portable Apparatus for Cable Testing up to 15 000 V.

A CONVENIENT and reliable means of testing h.t. cables and apparatus up to 15 000 V, is provided by the Philips portable h.t. indicator, type 4 048.

The instrument consists of a Neon tube enclosed in an insulated cover of convenient dimensions. This is provided with a case of similar insulating material, which serves as a handle when the instrument is in use, fitting over the end in the manner of a fountain-pen cap. When in use, an earth connection is made to the terminal provided, and the hook at the end of the instrument is brought into contact with the wire or apparatus to be tested. Should the circuit be alive, the Neon tube will glow, the light being seen through a slot in the insulated cover. Absolute safety in using the instrument is assured, there is no danger of a short circuit, and the Neon tube will not fail to give a correct indication.

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SPRAY FINISHING FUNDAMENTALS.

Treating the Surface—Rust Removal—Cleaning Solutions and Methods Outlined—The Application of Coating Materials.

THE various types of spray finishing apparatus have already been described in these pages, and the following hints taken from an article by Mr. Paul W. Collins in " Electrical Manufacturing " should prove useful to the growing number of manufacturers using spray finishing processes.

Many a poor finish is unfairly attributed to the manufacturer of the coating material. While this is sometimes true, the real cause is usually found in : (1) lack of proper foundation (unclean surface) ; (2) improper method of application (improper drying time, insufficient sanding, etc.) ; (3) inadequate or improper equipment.

Removing Surface Impurities.

Proper cleaning is necessary before a permanent coating can be assured. Finishing an unclean article is like building a house on the shifting sands. By " clean " is meant the removal of dirt, rust, grease, oil, paint, acid, alkali and any of the other undesirable elements that may endanger the life of the coating to be applied. Even in the case of dip finishes with cheap materials and low priced products, the failure to remove the impurities from the surface to be coated frequently destroys the coating material for further use after a few submersions of unclean articles have been made.

Cast iron, steel, brass, aluminium, zinc, die castings, forgings, screw machine products : all should receive cleaning treatment according to the nature of the metal, the type of cutting aid used in machining, whether the surface is rusted, scaled or deeply pitted, the type of finishing materials to be applied, and many of the similar elements that enter into the manufacturing processes.

Castings sometimes need only a brisk scrubbing and dusting with a stiff brittle duster. This old method is fast giving way to the sand-blast machine which leaves a clean and highly desirable surface for coating.

Small castings are frequently " tumbled " in a rotating barrel or cylinder partly filled with steel polishing balls. This process saves a great deal of labour and handling, if there are no machined threads or particular planes or corners that might become damaged in the tumbling process.

Grease and dirt are sometimes " baked out " by subjecting the metal to a heat treatment of from 400 to 700 deg. F. for about one hour. By this method the dirt and grease is forced out of the pores of the metal and crystallised on the surface. The surface is then gone over with emery cloth, steel wool or sand paper, and afterwards brushed off with a stiff bristle brush or an air duster.

Die castings that are to be japanned must be given a preliminary heat treatment to drive out internal gases. The heat treatment should not run higher nor lower than when the coatings are baked on. Heat treatment will cause the surface to blister with small round balls. These are to be sanded off. Zinc becomes brittle at above 170 deg. F. and aluminium becomes injured internally at above 350 deg. F. Grease and dirt should be removed from die castings by brushing with a chemical solution and dried immediately.

A patented solution is obtainable for the removal of rust. It not only eliminates this undesirable feature from the surface but at the same time impregnates the metal against further action of the same sort for some little time. It is a combination of phosphoric acid and alcohol. The solution is simple to apply, and is becoming more and more popular as a rust inhibitive coating for steel and sand-blasted surfaces. Rust is undesirable beneath a finish because it soon causes the finish to crack and chip.

Cleaning solutions are divided into solvent cleaners (benzine, petrol, etc.) and chemicals (alkalis, acids, etc.). All are used separately and in varying percentage combinations to clean surfaces for the finishing coat depending on the metal and the substance to be removed.

Because benzine is cheap many think it is a very excellent cleaner to use in removing grease. It is primarily inexpensive, but soon loses its strength through dilution and quick evaporation. Many factories are giving it up in preference to chemical compounds because of the high flash point of benzine and petrol and their consequent fire hazard.

There are a number of reliable cleaner and remover compounds marketed by reputable chemical firms who employ large staffs of chemists and men capable of diagnosing the cleaning compound best suited to the individual needs.

Methods of cleaning are changing too. Not long ago articles were put into wire baskets and plunged up and down or whirled in the boiling cleaning solution. Modern plants of to-day are equipped with hooded tanks through which passes an endless conveyor belt or chain. The articles when placed on the chain pass under a steady spray of cleaning solution directed at the proper angle to clean them thoroughly. From there (if necessary) they pass under a shower of clean water or neutraliser and thence through a heated enclosure for drying, and on directly to the spray room or dipping tank.

Chemical solutions are usually kept at a temperature slightly under boiling. This prevents an excess of steam and helps to keep the solution at its full strength as long as possible. To get the best results, the solution must be kept at uniform strength. As an accurate test cannot be made in the boiling solution, frequent samplings should be taken out, cooled and tested with an hydrometer. The reading should be close to 8 deg. Baumé, indicating an average solution of one pound of cleaner to the gallon of water.

In selecting coating materials, one should consider the surface to be covered, the kind of use and abuse it will receive after having been sold, whether it is intended for use inside or out of doors, and who is going to buy the article. Then there are different quality finishes for the sliding price range of the " full line." The manufacturers of paints, varnishes and lacquers can best assist one in this respect, as they can match up their materials to the particular requirements. The general basic observations for finishing any piece are, however, the primer, the surfacer, and the finish coating.

The primer is applied for the main purpose of causing the finishing coats that follow to adhere to the surface. It is the " tooth " of the coating and is one of the most important steps in painting. The primer should be applied in one thin coat and must be perfectly dry before any other material is applied over it. The drying time ranges from 4 to 12 hours for oil base primers (depending on whether it is oven dried or air dried) and from 20 to 30 minutes for lacquer base primers. There are some surfaces that do not lend themselves well to a lacquer base primer and it is believed that this fact occasioned the early feeling that lacquer base primers were not much good.

Putty and glazing mixtures are next applied to a surface containing pits or depressions that should be levelled up to uniform surface. These materials are applied with a broad flexible putty knife, the action of which is to force the putty into the depressions and scrape off all surplus material. Deeply pitted castings and large depressions frequently need more than one application of surfacing with putty. Too heavy a layer cannot be applied at one time as it will take too long for the material to dry and the putty of glaze (which is a stiff putty) might crack open. Drying time for each application of putty should be approximately 12 hours. Lacquer base putties are rather faster.

Levelling-out Depressions.

Some finishers prefer to reserve the putty or glazing application until after one or two coats of surfacer have been put on. While it seems to be more common usage to follow the sequence offered here, there can be no possible harm in knifing in the putty after a coat or two of surfacer has been sprayed on and sanded to smoothness. It is contended that sometimes slight depressions will level out with the application of the surfacer coat, and this is frequently the case if the operator knows how to handle his spray gun.

The surfacer coats may be applied in one or several coats, allowing proper drying time between each coat. One heavy coat is not as good as three or four light coats.

The spray gun is practically universal in the application of surfacer coats as the saving of sanding labour alone would make its use indispensable. The spray gun leaves a highly atomised surface free from brush marks and streaks, all of which would be present and have to be removed if a hand brush were used in applying the surfaces. The usual method is to apply a coat of surfacer, dry it (often hastening this process by the use of ovens), and then sand this coat down to smoothness. The subsequent coats are applied in like manner. Care must be taken that all moisture is out of the surface before the succeeding coat is applied.

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BRIGHT-ANNEALING.*

Some Details of the Grünewald Method—How Oxidation is Prevented—Economic Advantages Claimed—Use of Thin-Walled Annealing Pots.

DURING the present century big improvements have been made in every branch of the metal industry. Only the intermediate and final stages in the two processes of rolling and drawing, viz., annealing, have not kept pace with the general development. More than 90% of all the products in the metal industry are still annealed by the clumsy and inaccurate methods that were in general use over fifty years ago.

The advent of the electric furnace opened the way to new possibilities, particularly as regards the maintenance of a more uniform temperature, but the problem of preventing the oxidation of the goods to be annealed still proved insoluble.

With the old methods of bright-annealing, such as filling the annealing pot with cast-iron chips, the cost of electrical heating proved prohibitive; and filling the muffle or furnace with inert, though, nevertheless, generally explosive gas, introduced so much inconvenience and additional cost that a wider use of this latter method was out of the question.

Protection Against Oxidation.

Comparatively early on it was found by experience that in order to obtain a bright surface of the annealed goods it is actually only necessary to provide protection against oxidation while the charge is cooling down. The Vitry method, for instance, depends on this fact, but since it involves the use of an inert gas, it has not been adopted very extensively.

The Grünewald method of bright-annealing also depends on this fact. Instead, however, of using inert gas to prevent air from reaching the goods, the annealing pot is rendered air-tight when the maximum temperature is reached, the principle being similar to that in preserving foodstuffs.

Constructionally, the Grünewald pot differs from all previously used types in that it does not stand on the bottom of the furnace but is suspended inside it from the rim at the top. Also, the charge is not laid directly in the pot but on a special tray suspended from the cover by means of rods, the cover also serving to close the furnace.

The economic advantages are obvious. Instead of making the pots 20 to 30 mm. thick out of cast steel or special plates, for temperatures up to 750 deg. C., the casings can be made of 6 to 8-mm. boiler plate. The reduction in the dead weight to be heated, alone enables a saving in the current consumption of 15 to 20% to be effected. The thin walls also offer much less resistance to the passage of heat; so that the productive capacity of the furnace is very appreciably increased. In general, the annealing pots used in electric furnaces have a longer average life than those used in other types of furnaces; the life of the Grünewald pot is still further increased, due to the fact that it can be used until it becomes so thin as to be no longer air-tight (three to four millimetres). Even then it is only necessary to replace that part of the casing which is exposed to the heat of the furnace (and therefore subject to oxidation), while the cover lasts indefinitely, so that the cost of repairing a Grünewald pot is barely one quarter of the cost of repairing a cast-steel pot which is placed wholly inside the heating chamber.

As already mentioned, Grünewald annealing pots with very thin walls can be used. This enables the part of the pot exposed to the heat to be made of special heat-resisting alloy steel, without rendering the cost too high. The thin walls, low weight, and the fact that the surfaces of the annealing pot are always free from oxide, allow the charge to be heated up and also cooled down in a much shorter time. Thus the number of annealing pots required for a given production is much smaller. Fewer furnaces are also required, so that, neglecting the saving in floor space, the total cost of the furnace plant, complete with annealing pots, is less than that of any other annealing plant for the same production, even if the walls of the former are made of the more expensive non-oxidisable metal.

The annealing pots themselves are sealed similarly to preserving glasses for fruit, by means of a rubber ring placed between the rim of the pot and the cover. The rubber ring is cooled by water circulated in a groove, and is thus prevented from becoming too hot.

The process of bright-annealing wire is as follows:—

The goods are first laid on the supporting tray. The cover with suspension rods is brought over the supporting tray by the crane, and the rods are attached to the tray. The cover is now lifted, together with the charged tray, carried to the pot, and lowered into it. Before bringing the pot together with the cover to the furnace, the cover is tightly clamped

A charge of wire coils on the supporting tray. The operator is seen fixing the suspension rods.

to the pot. By this means a uniform pressure is exerted on the whole of the rubber ring, and an air-tight joint made between pot and cover. The cooling-water groove is filled up with water before bringing the pot to the furnace. The pot can now be lowered into the furnace and heated up.

A large part of the air is expelled through the valve, due to the expansion caused by the rise in temperature and also due to the vaporisation of oil and grease which has adhered to the charge. The oxygen in the remaining air is used up in burning part of the oil vapour, so that the annealing pot is entirely free from oxygen long before the oxidation temperature of the charge is reached. The pressure in the pot drops towards the end of the process and the valve then closes automatically.

The Cooling Process.

When the desired annealing temperature has been reached, the pot is lifted out of the furnace by the crane and hung in a cooling pit, where it cools in 12 to 20 hours. The good fit of the cover and of the valve prevents any air from entering during the cooling process, so that a vacuum up to 400 mm. of mercury can be attained inside the pot. The valve is opened at the end of the cooling process, *i.e.*, when the temperature has dropped to the value required for bright, blue or black dull annealing, whichever is desired, and the charge, suspended from the cover, is lifted out of the annealing pot. The supporting tray is now placed on the floor and the suspension rods are removed and immediately fitted to another tray, ready loaded with a fresh charge.

* From an article in the "Brown Boveri Review."

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ALUMINIUM.

Some Methods of Affording Protection Against Corrosion.

DEALING, in his Autumn lecture to the Institute of Metals, with methods of protection against corrosion in aluminium, Dr. A. G. C. Gwyer said he considered that a very marked advance had been made by the recognition of the important part played by surface films, both in promoting and in retarding corrosive action. "Passification" of metals had been recognised for some time, although there was still some difference of opinion as to whether it was brought about by the formation of gaseous or solid films at the metal surface. Evans had recently succeeded in proving the presence of solid films, and had been able to give methods for their isolation and examination, and Callendar had shown that the local corrosion of metals in normal waters was governed very largely by the presence of boundary films of either a solid, liquid, or gaseous character on the metal surface.

Present Methods Unsatisfactory.

In the case of aluminium, what was still wanted was a satisfactory method or methods for measuring the extent of corrosion, as such comparatively simple methods as the "loss in weight," or "loss in tensile strength" methods had been of little real service, as they failed to distinguish between general and local corrosion or "pitting."

Two tests, both due to Mylius, must, however, be mentioned. The first consisted in immersing the specimen in hydrochloric acid contained in a flask under standard conditions, and in measuring the rise in temperature of the acid, it being assumed, that the reaction velocity in such circumstances may be taken as a measure of the corrodibility. In the second test, a sample of standard area was immersed in a solution of sodium chloride of given concentration, to which a definite amount of hydrogen peroxide had been added. After twenty-four hours the aluminium hydroxide which had been precipitated was filtered off, ignited and weighed, but it was questionable how far this test gave a measure of the total action, since it appeared to take account solely of the non-adherent deposit or scale.

It was much to be hoped that the valuable researches of Bengough upon zinc would be extended to aluminium, as they were of a highly fundamental character. Bengough and his colleagues had devised an ingenious and special form of apparatus in which the corrosion was allowed to proceed under accurately controlled conditions, so that the quantity of oxygen absorbed could be determined quantitatively.

With regard to methods of protection, very remarkable progress had been made. There were now a variety of paints, collodion lacquers, varnishes and cellulose mixtures which gave highly satisfactory results, always provided that care was taken to produce a thin and closely adherent coating free from pinholes. It was interesting to note that aluminium paint, which had long been in use for painting iron objects, such as lamp posts, tramway standards, etc., afforded excellent protection when sprayed on aluminium castings. It had also been found that the practice of dipping either in water-glass (sodium silicate solution) or lanoline, formed a useful precursor to painting proper. When the former process, which was developed in America by Zimmerman and Daniels, was followed, the castings or other objects must subsequently be baked for a couple of hours at 150 deg.

"Anodic Oxidation."

One of the most successful and important methods of protection was based upon the principle of causing the metal to build up its own protective film, as, for example, in the case the so-called "anodic oxidation process," devised and patented by Bengough and his colleagues. The process consisted in making the finished article the anode in a bath of chromic acid, the voltage being raised slowly to 50 V, whereby an extremely thin and tenacious coating of oxide was produced, which was extraordinarily resistant to the action of sea water. Another and rather similar process had been patented by Jiortka; here a protective film was formed by simple immersion in a heated solution of carbonates and other salts, no electromotive force being applied, but the films so produced were much thinner and rather less resistant under severe conditions.

In America the most recent development made use of the fact that very high purity aluminium was practically non-corrodible. A composite metal was produced, the outer layer consisting of very high purity aluminium, and one of the principal advantages claimed for this procedure was that the protective action of the coating extended over any portion of the metal base, which might have become exposed by abrasion or cutting.

The possibility of alloying with some element in order to raise the resistance to corrosion had been and was being also actively investigated. For example, in Germany the addition of antimony in comparatively small amount had been found to give rise to a highly protective film, which was rapidly reformed after abrasion, etc. The modern high-silicon alloys were also good from the standpoint of corrosion.

"TEMPORARY EXPEDIENTS."

Some Noteworthy Examples in Electrical Manufacturing.

AT an informal meeting of the Institution of Electrical Engineers on November 11th, with Mr. W. E. Lang in the chair, Mr. W. E. Highfield opened a discussion on "Temporary Expedients in Engineering." He said he felt that the modern trend towards specialisation in one branch of electrical engineering, at an early age, necessarily limited the range of practical experience. "Temporary expedients" might be simple or elaborate, they might be thought of in a moment or they might have been very carefully considered and elaborated. There was equal merit in all of them, and he hoped that the audience would not shrink from giving their experiences of ingenious expedients used by them merely on account of apparent simplicity. He next described some remarkable repairs in a variety of situations. Many of the extemporisations had that merit of simplicity which made one wonder that they had not been thought of before, but some of his instances of repairs to vessels at sea were epics of resource and resolution.

Among the electrical instances was a scene on the Bulgarian front during the war. The artillery required a military telephone board to link together their signalling system. There was no possibility of getting the board except by making it. The panel was easily made from a packing case lid. The plug receptacles were empty cartridge cases sawn in two vertically and screwed to the board. The plugs were "full" cartridges. It was simple and effective and for all practical purposes as good as the actual article.

The commutators of d.c. machines broke down sometimes, and if such a fault occurred to an essential machine something had to be done. The most frequent failure that occurred was a puncture of one of the mica cones, which entailed unsweating all the armature connections and removing the commutator. To remove the commutator intact a commutator jig was required. This was, of course, never available, but as a temporary expedient the commutator could be held together by binding it firmly round with a layer of wire. The failure in the mica cone was usually a small puncture, and this should be cleaned out and, if necessary, enlarged and filled with a hard-setting insulating cement. If no known cement was available quite a good one could be made by mixing water glass with precipitated chalk or even tooth powder. Another way of making a good insulating glue was to mix the frosting used on Christmas trees with Durofix, and this would set as hard as cement. When dry it was hard enough to file, and such a repair would enable a vital machine to be run again within a few hours of its breakdown.

Messrs. G. C. Allingham, G. F. Bedford, T. H. Dennis, W. A. Erlebach, L. J. Gooch, A. F. Harmer, S. B. Jackson, A. J. N. Kennett, A. N. D. Kerr, W. E. Lang, A. Morgan, W. J. Minton, N. Prentice, E. S. Ritter, J. F. Shipley, D. J. Watkin, and M. Whitgift also spoke.

BOOKS RECEIVED.

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"The Kinematical Design of Couplings in Instrument Mechanisms." By A. F. C. Pollard. (London: Adam Hilger.) Pp. 64. 4s. 6d. net.

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TREATMENT OF SULPHUR FUMES.

Points from Two Interim Reports in Connection with the Working of the Proposed Battersea Power Station.

INTERIM reports prepared by the advisers to the London Power Co., and by the special committee appointed by the Government Chemist, on the question of the treatment of sulphur fumes in connection with the working of the London Power Co.'s proposed new power station at Battersea, have just been issued [in Cmd. 3442: H.M. Stationery Office 6d. net].

Messrs. E. Ardern and R. V. Wheeler, the London Power Co.'s advisers, refer to experiments at the Grove Road power station between April and August this year, and state that the theoretical considerations on which the proposed treatment of the flue gases for the removal of sulphur gases were based were as follows:—

From the data available, it appeared that when the Battersea power station was in commission each boiler would yield a maximum of about 170 000 cu. ft. of flue gases per minute, the combustion control being such that the gases would contain 10% of carbon dioxide. The proposed lay-out of the plant arranged for three boilers to deliver to one chimney, so that about 510 000 cu. ft. of flue gases would pass up each chimney per minute. This quantity of gases would be derived from 1 ton of coal per minute (burnt at the three boilers working together).

To provide a working basis, it was assumed that the flue gases from a coal containing 1·5% of sulphur would contain about 0·03% SO_2 and 0·05% SO_3 by volume, such figures having been obtained in several analyses. It was recognised that these figures might be subject to considerable variation (dependent on several factors) but they sufficed for the purposes of calculation.

In small scale experiments on the washing of flue gases with water at St. Pancras power station, 0·328 gram of SO_3 had been removed per litre of water, or 0·328 oz.

Calculations set out in detail in the report gave an indication of the character of the problem, approached as one of "gas-scrubbing," the main practical consideration being: could the chimneys (and perhaps the flues) of the proposed plant provide sufficient scrubber capacity?

Two facts were evident, having regard to the obvious desirability of reducing to a minimum the amount of water to be used: (1) The time of contact between the flue gases and the water was all-important and required to be determined experimentally; and (2) The proportions of SO_2 and SO_3 in the flue gases required to be accurately known, for SO_3 can be more easily removed than SO_2. It was conceivable that, either by treatment of the coal on the grate or by treatment of the gases in the flues, the formation of SO_3 could be encouraged.

With these two main points in mind, experiments on a reasonable working scale were put in hand at Grove Road power station. The plant used is shown diagrammatically in the drawing reproduced below. It consisted essentially of a cylindrical absorption tower, 27 ft. high and 40 in. in diameter, with attachments for the delivery of flue gases and water in contra-flow.

The flue gases could be drawn by a fan from one of the chimney stacks (No. 2) of the Grove Road power station through a 12 in. pipe delivering at the base of the absorption tower, the rate of flow being controlled by a butterfly valve at the point of entry and measured by a Pitot tube. A short

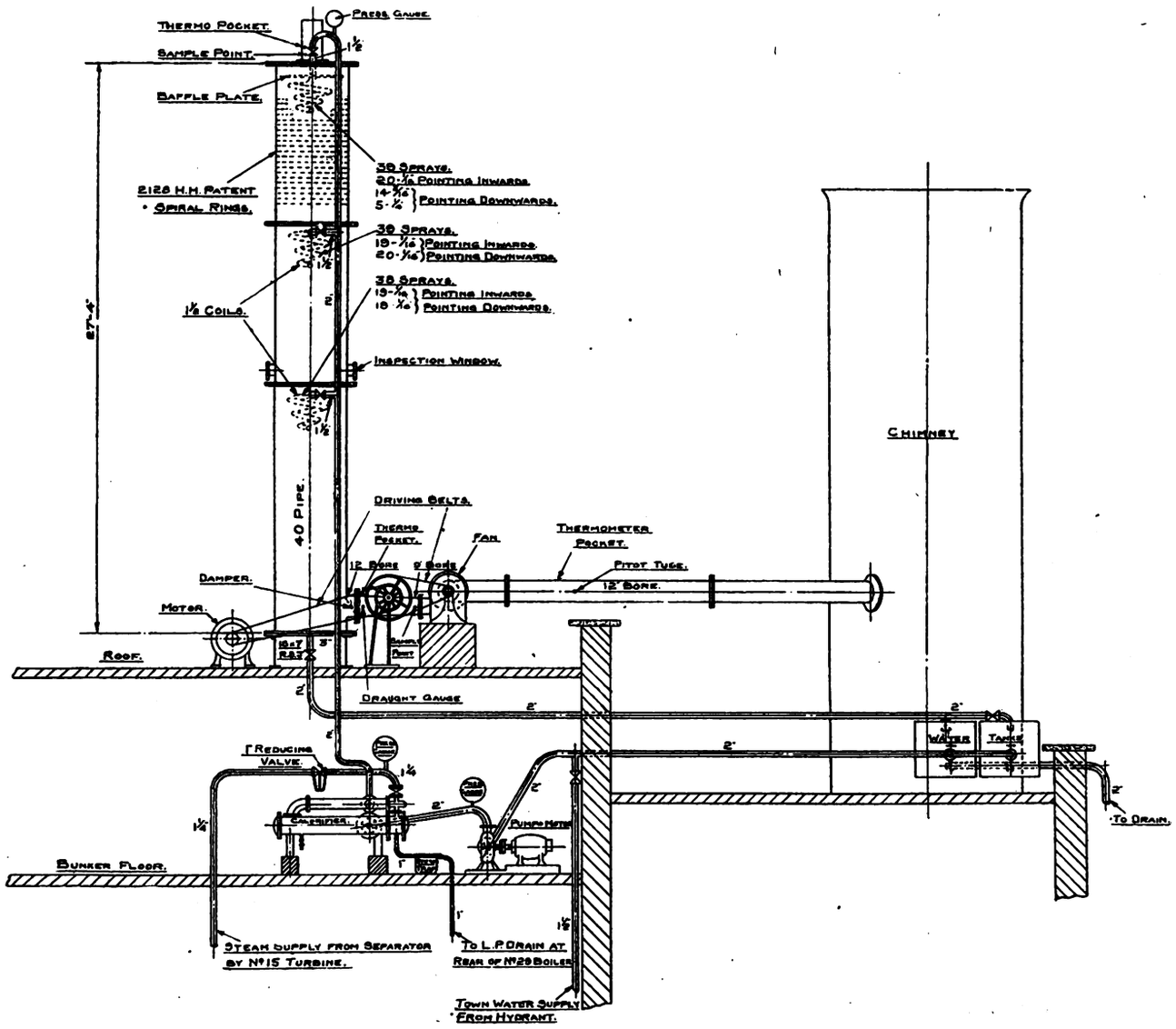

Diagram of the arrangement of the experimental gas washing plant on the roof of the west boiler house at the Grove Road power station.

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exit pipe, 12 in. in diameter, on the top of the tower carried the treated gases to the atmosphere. At both the inlet and the outlet pipes, draught and temperature measurements could be made and samples of the gases could be taken.

Water from the town main was used for scrubbing the gases, delivered through a centrifugal pump to spraying devices. After passing through the tower, the water could be collected in either of two 300-gallon galvanised iron tanks which in turn communicated with a drain. If desired, the wash-water could be re-circulated through the tower.

For the more important series of experiments, the water was delivered to three spirals, each carrying about 40 nozzle sprays, at heights within the tower of about 10, 17 and 24 ft. respectively. In the principal series of experiments described in this report, the portion of the tower lying between the two upper spray-spirals was packed with spiral absorption rings. Other experiments have tested the efficiency of water sprays alone, without packing.

From experiments, using cold water, it can be concluded that, when the time of contact of the flue gases with the wash-water is over 12 secs., there is complete removal of the sulphur gases, even when their original concentration is high, if sufficient water is used. As the velocity of the flue gases increases, the efficiency of removal of the sulphur gases decreases, but it is still high (90%) with times of contact as low as 7 seconds.

Comparative experiments (details of which are not recorded in the report) with the absorption tower (1) empty save for the spray-spirals and (2) packed, as to its upper portion, with absorption rings, showed that the efficiency of removal of the sulphur gases was as good with the unpacked as with the packed tower, provided that sufficient water was used. Rather more water was required with the unpacked tower.

A striking feature of the tests with hot water was the absence of any smell of SO_2 in the wash-water. When using cold water this smell was always noticeable and analysis showed the wash-water to contain sulphites. On analysing the hot wash-water, it was found that sulphites and thio-sulphates were entirely absent. All but about 2 or 3% of the total sulphur they contained could be accounted for as sulphate.

It thus appears that, by the use of hot water, the desired transformation of the SO_2 of the flue gases into SO_3 has been effected. The efficiency of removal of the sulphur gases by comparatively small quantities of hot water is thus explained.

It having been found that the amount of water required effectively to remove the sulphur gases from flue gases, even when their concentration is high, is not excessive, a scheme for the treatment of the gases at the Battersea power station was drawn up.

Requirements Amply Met.

This is shown diagrammatically in the report. It more than fulfils the requirements (as regards, for example, the time of contact of the flue gases with the wash-water) indicated by the Grove Road experiments, and allows for an additional treatment, a final washing with a slightly alkaline solution, which the advisers do not consider will be necessary. Provision has been made for the insertion of packing material (rough-sawn boards on edge) both in the downtakes from the main flue and in the uptakes to the chimney-stacks. The Grove Road experiments indicate that but little packing material will be required, the sprays in the main flue alone, with perhaps some packing in the downtakes, being sufficiently effective.

To guard against the emission from the chimney-stacks of gases saturated with water-vapour, with consequent condensation in cold weather, arrangements are provided for delivering hot and dry air to the stacks either just above the "eliminator plates" (which will entrap entrained moisture) or at any point higher up the stacks.

As regards the neutralisation of the wash-water, this will be effected by mingling with the "condenser" water, the volume of which will be about 40 times that of the wash-water.

The only alteration in the character of the river water would be a slight diminution in the carbonate content and a corresponding increase in the amount of sulphate present. Should the necessity arise for further treatment—for example, to remove suspended matter or to oxidise any sulphites that may occasionally be present—provision is made for settling tanks of adequate capacity.

The interim report of the committee presided over by the Government Chemist states that generally they consider the experimental work so far reported indicates that by the use of water sprays in the experimental apparatus it is possible to eliminate from the gases of combustion nearly the whole of the sulphur gases present.

In addition to seeing the interim report of the advisers to the Power Co., they had the opportunity of inspecting the experimental arrangements while in operation at Grove Road on July 8th, 1929, when neither acid taste nor objectionable odour could be detected by breathing the undiluted treated gases coming from the exit flue.

The analytical results as regards acidity of ingoing and outgoing gases during an experimental run at Grove Road were checked by a representative of the Government Laboratory and the absorption of about 95% of the sulphur acids in the flue gases was confirmed.

"Promising Results."

From what they have seen of the process in its small experimental stage, while they consider that it has afforded results that are promising, they consider that there are features in the experimental apparatus and process which are still obscure, so that, while they think there is no inherent reason why similar results should not be obtained from the larger experimental plant now being erected on the lines of a projected installation at Battersea, they prefer to await the results afforded by this larger experiment. They think it necessary that a more definite explanation of the mechanism of the oxidation of sulphurous to sulphuric acid in the experimental process should be forthcoming before they can report on the practicability of the process.

The committee points out that: "In connection with this power station very large quantities of condenser water are to be used, as much as 500 tons, we were informed, for every ton of coal burned. A portion only of this quantity should be required for washing the gases. We have ascertained that the alkalinity of Thames tidal water near Battersea is about 20 parts per 100 000. Five hundred tons of such water would have twice as much alkalinity as is necessary to neutralise the sulphur acids derived from one ton of coal containing 1·5% of total sulphur, even assuming that no sulphur remains in the clinker. Under these conditions there is no chance of an acid effluent going into the river if all the condenser water is systematically utilised for neutralisation, and this condenser water before being withdrawn maintains the required alkalinity, but there is a chance of some calcium sulphite remaining in solution. This, although a neutral salt, might be objected to, on account of its property of further depleting the river of oxygen. From the ready oxidisability of sulphurous acid and sulphites, their total conversion into sulphuric acid and sulphates should be easy, in which case the effluent water at Battersea would still retain a certain alkalinity, and would be altered only in the sense of having in solution a small quantity of innocuous calcium sulphate.

"We understand that mechanical separators are to be used for eliminating the bulk of the dust; the washing process which the gases undergo for removal of sulphur acids should prevent the escape of most of the residual dust particles, but we have no experimental data on this aspect of the question."

OVERHEAD OR UNDERGROUND.

The Ministry of Transport inspector, Mr. Gordon Tucker, held an inquiry at Poynton, on November 20th, into the application of the Electricity Co. of Macclesfield for permission to erect overhead lines for the supply of electricity in Poynton. Mr. Arthur Garner, land agent, Stockport, stated that building development in Poynton was being delayed by the absence of a supply of electricity. Mr. Pittfield, owner of land at Butley, said the advantages of electricity would outweigh the loss of amenities through the pylons. Mr. W. Lionel Howard, chief engineer to the company, said the cost of overhead line was less than one-third of the cost of underground cables, and the latter would not be justified in view of the small class of property in the district. There was opposition by the County Council and the Parish Council, but the inspector said the Ministry would have to be satisfied that the overhead cables interfered with the amenities of the district or were a public danger before being justified in refusing the application.

MIDLAND ELECTRICAL ENGINEERS' BALL.

The Midland Electrical Engineers' Annual Ball took place at the Grand Hotel, Birmingham, on November 15th. About 450 persons sat down to supper and spent a most enjoyable time. During the evening a presentation was made by Mr. W. H. Heaton, Chairman of the Engineers' Ball Committee, to Mr. and Mrs. R. A. Chattock to show appreciation of the former's valuable services as President of the Engineers' Ball Committee from its inception. The gift took the form of an antique silver cream jug and sugar basin, together with an old oak linen chest.

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THE ELECTRICAL INDUSTRY OF GREAT BRITAIN.

Important Survey Issued by the British Electrical and Allied Manufacturers' Association—Production Data—Greater Activity but Smaller Profits.

"THE Electrical Industry of Great Britain," published yesterday (Thursday) by the British Electrical and Allied Manufacturers' Association (pp. 233, £2 2s. net), is a notable production which should be studied carefully by every member of the electrical industry. It is a survey of the organisation, productive efficiency and world competitive position of the British electrical industry, and it attempts to give at once a retrospective view and a forecast. It explains in relation to the general industrial conditions of the country the way in which co-operation and marketing enterprise have saved the industry from trade depression. It also deals with the expansion of electrical exports in the leading markets of the world, the growth of electrical power consumption at home and overseas, and discusses the importance of the power industries in the public economic organisation of Great Britain.

Its length and the nature of its contents—including many facts and statistics which we have not seen elsewhere—preclude the usual form of review in the limited space available, so we must confine this notice to a selection of extracts which may serve as a sample of the remainder.

Emphasising the slow rate of capital depreciation in electricity supply, the survey points out that this means that renewals and replacements do not constitute an important factor as such in the market for power equipment, so that the electrical manufacturing industry is dependent on extensions and on new installations, and, above all, on its capacity to produce new types of plant sufficiently economical in operation to justify the retiral of existing plant before it is normally due.

The capital increase in the industry is very much less than that recorded in electricity supply, and is sufficient indication of the fact that the profit-earning capacity of this branch of the industry has not been such as to attract capital continuously in a volume relatively the same as that of electricity supply.

The capital expenditure on power equipment in this country since the conclusion of the war is, measured on a kilowatt basis, almost the lowest in the world, and it is interesting to find that more than 90 % of such expenditure has been met by home production.

The balance of the manufacturing industry is changing. Only a few years ago the weight of production lay undoubtedly in heavy generating plant, large industrial motors, main transmission cables, and overhead lines, but now production is becoming much more important in small transformers and switchgear and in consumers' apparatus generally. This means a new alignment of forces within the industry, which is not calculated to render difficult the work of co-operation on a horizontal basis.

Peculiar Market Reaction.

The industry is peculiar through the fact that it has the greatest potential market in front of it of any in the world, and this market reacts at once to a reduction in the selling-price of electricity. A reduction in price, as experience has shown, almost invariably means such a growth in demand that the net revenue accruing to the supply undertaking within the limits imposed by essential capital expenditure is increased. There is an optimum return on capital expenditure beyond which it is difficult for a supply undertaking to go, and the very existence of such an optimum return should be an incentive to such undertakings to bring their prices down to an economic minimum. There is a point where demand can be stimulated so greatly as a result of proper price adjustment that an optimum return is reached almost at once and the undertaking can expand its capital expenditure almost indefinitely, with the sure knowledge that a satisfactory return will be made on it. There is room for a very close examination of the electricity supply industry from this aspect.

Development expenditure has not been adequate in electricity supply, owing to the prevalence of the conception that a high price per unit is justified merely on the basis of return on capital expenditure. If supply undertakings adhered instead to the conception that their system should have a definite revenue-earning capacity, and if they set out to increase to the very maximum their distribution system and their demand complex, the position of Britain electrically would be enormously improved. Load-building can justify a very heavy capital expenditure, even in agricultural areas, and the growth of electricity in the future must depend on a policy of load-building with carefully reasoned and accurately detailed schemes. This whole subject merits the most minute investigation, since the issues involved are important, and there is need for some form of theory which will not only guide policy, but serve to concentrate effort along broad lines.

Chapter II deals with electrical manufacture, examines production, and points out that since 1907 output in Great Britain has increased by 404%, and in the United States by 540% ; but it is significant that generators, transformers, and other power plant equipment should only have increased by 300% in Great Britain and 283% in the United States—a fairly clear indication that the change in balance of production in the industry had begun before 1924.

Leeway Made Good.

Statistics are given which show that the industry has moved upwards very rapidly in fifteen years, but, during the last three years especially, owing to circumstances which together have retarded progress, the curve of increase has shown a tendency to straighten out, and the industry has not, as a consequence, fulfilled the expectations of those who assumed at the conclusion of the war that the rapidity of electrification would be so marked that the power industries would be fully occupied for a considerable number of years. During 1929, however, much of this leeway has been made good as a result of developments in connection with the national electrification scheme.

The statement has been made recently that the industry is now so fully employed that it cannot add easily to its existing industrial capacity. According to the survey, the industry is now in a position to increase its production by at least 40%. In one section, devoted to electric motors, there is undoubtedly excess productive capacity, owing entirely to the state of depression which has ruled in the industry since 1921. The natural expansion of this branch has been seriously checked, with the result that there is a high percentage of reserve plant not yet brought into full use. On the whole, the productive capacity of the industry in excess of its present output is placed at rather more than 40%, so that it can undertake any work of widespread industrial or national railway electrification which economic conditions may cause.

It is quite clear that the industry has gone through two cycles of prosperity and depression since the conclusion of the war. The year of greatest prosperity was 1921, following the trade boom of 1920. The engineering lockout and trade depression generally caused a very heavy slump in 1922. This slump affected more directly electrical than mechanical plant, while meters and instruments survived it with much less difficulty than any other section, due possibly to the fact that they are less affected by trade and more by the general growth of electricity.

Recovery was very rapid from this period of slump, with a point of maximum output in 1926. Since 1926 a period of fairly steady output has intervened, accompanied by falling prices and a definite increase in volume, as measured in horse-power. This increase in volume has had its effect in the absorption of more labour, on the one hand, and in a serious reduction of profits on the other.

A further observation may be made to the effect that general trade conditions, either of depression or prosperity, are reflected in electrical manufacture with the lag of one year. Thus the collapse of 1921 resulting from the coal strike affected electrical manufacture in 1922. Similarly, the crisis of 1926, which was less severe owing to the fact that it was not accompanied by deflation in prices, interrupted the expansion of the industry in 1927, and still had a certain effect in 1928.

The one section which had moved upwards practically in a straight line since 1922 has been control and switchgear, and it is rapidly becoming one of the most important sections of the engineering branch of the industry. The development of the national scheme must serve to make it still more important, with the result that one would expect the productive capacity of the industry to increase much more rapidly there than in any other branch, with the possible exception of transformers.

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THE ELECTRICAL INDUSTRY AND COMPETITION.

The Annual Dinner of the B.E.A.M.A.—Export Orders in 1929 Higher than Any Year Except 1927—Minister of Transport on Development in Rural Areas.

OVER 700 persons attended the annual dinner of the B.E.A.M.A. at the Connaught Rooms, London, on November 20th, presided over by Lord Derby, the president of the Association, and among those present were Sir Andrew Duncan, Sir Philip A. M. Nash, Mr. W. L. Hitchens, Lt.-Col. R. K. Morcom, Sir T. F. Purves, Sir John Brooke, Dr. S. Z. de Ferranti, Mr. A. Page, Col. R. E. Crompton, and Sir Duncan Watson.

Mr. J. H. THOMAS, proposing the toast of "Electricity in Industry and Transport," said that the prosperity of the electrical industry was a good answer to those who doubted whether we could compete against the world. The volume of exports of electrical goods and apparatus had risen since 1924 by 15%. The index of production showed that export orders in 1929 were the highest of any year except the abnormal year of 1927, following the hold-up caused by the coal dispute.

Demand for Heavy Electrical Plant.

In the past seven months orders for heavy electrical plant to the value of £7 000 000 had been obtained from abroad, in the face of foreign competition. During the same period orders for £12 500 000 of heavy plant for home use had been placed. The first necessity for selling abroad was that we should make the right article at the right price. It was the buyer who decided what he wanted, and we should make up our minds to give it to him. In price, we were up against it. We were trying to maintain our standard of living against the formidable competition of other countries with a lower standard. Our standard could be maintained only by fully using our heritage of industrial skill, both of employers and workpeople, by a vigorous cutting of unnecessary on-costs and by the highest technical efficiency.

We were told that this was an age of big business. Big business cannot be done by small isolated units, however efficient. For big business, research and experiment were needed, and it was a truism of all research that it could only be successful in the long run if effort and results were pooled. For big business, big financial resources were required, and these would readily be forthcoming for any well-organised plans of concerted action in any industry, whether for export trade or for internal equipment and home development. There were certain matters in which it was thought the Government could help, and ought to help, but for industrial difficulties as a whole it was true to-day that self-help should come before Government help. The electrical industry was one which, in the main, had helped itself. That was one reason why it was properous, and it was also a reason why it would always command sympathetic attention from the Lord Privy Seal.

Sir FELIX POLE, replying, said that as a newcomer to the electrical industry he was astonished at the fierce competition and alarming price-cutting which took place. The popular notion was that, through combination and co-operative action, electrical manufacturers had been able to secure high prices for their products and were in a position to obtain a satisfactory margin of profit over production costs. That was not the fact. Not only was there strong domestic competition, but there was a form of foreign competition which was not apparent on the surface. He referred to the tendency in some quarters to invite tenders from foreign firms, and then to bargain with British companies to force them to reduce their considered quotations as an alternative to placing orders out of this country. In the long run, that procedure was not calculated to obtain the best results, either in equipment or service.

Protection of Home Markets.

As to foreign competition, he looked hopefully to the present Government. As he understood it, they were helping—indeed forcing—the coal industry to bring into effect a comprehensive scheme of protection of home markets. In the electrical industry they were in need of similar protection. They lived in the most highly taxed country in the world—hours and wages were more onerous here than in many competing countries, and the cost of social services was increasing. They were prepared to exert themselves to the utmost to get business at home and abroad. They were prepared to cut prices to get export business, but he asked them not to force down prices to the level of those quoted by foreign competitors. The English market was the foreigner's excursion traffic, and electrical manufacturers could no more live on the basis of foreign prices than could English railways live by carrying all their passengers at excursion rates. He asked railway companies, municipal corporations, statutory supply undertakings, etc., to patronise home industries at fair prices, having regard to conditions at home, and he wished the Government would seriously bear this in mind when considering the question of safeguarding of essential industries. He would also ask Mr. Thomas to help them to increase their trade by reviving and extending the Trade Facilities Act, which would help the electrical industries by affording facilities for the financing of large contracts at home and abroad.

Mr. HERBERT MORRISON, M.P., Minister of Transport, congratulated British manufacturers on their achievements in the supply of electrical equipment overseas, but progress in the home market was not as good as it should be. The industry ought to pursue a really aggressive policy in achieving the almost universal use of electrical power. There were a large number of areas where electricity was not yet available, in some cases even in towns. That was an indefensible state of affairs, and he urged everybody to go ahead with the ideal of having electricity available throughout Great Britain. There were hundreds of thousands of private houses equipped with electricity for lighting only. The electricity undertaking that was content with such a state of affairs in the houses it supplied was not doing its job.

The sales of electricity to consumers had already advanced from 3 645 million kWh in 1922 to 7 603 million in 1928, showing an increase of 108%. No less than 500 applications for consent to overhead lines had come before the Commissioners and the Ministry in the last seven months, consent having been given in the majority of cases. Since April the Electricity Commissioners had issued loan sanctions to local authorities to the extent of £10 000 000 for electrical purposes, and he, the Electricity Commissioners, and the Central Electricity Board were giving special attention to the supply of current in rural areas, in the light of the valuable reports drawn up by the Conference on Electricity Supply in Rural Areas.

Work of the Central Board.

The work of the Central Board was proceeding. Six regional schemes had been transmitted to the Board by the Commissioners covering nearly half of Great Britain, and including about 80% of the population. These schemes provided for the establishment of 1 870 miles of 132 000 V line, it being estimated that during the next 10 years over 4¼ million kW of plant would be required. The work of building the "grid" was proceeding satisfactorily. He, as Minister of Transport, had consented to the erection of 144 miles of overhead lines, forming part of the system, and the Electricity Commissioners had consented to a number of important underground main transmission lines in the London area. About two-thirds of the lines of the Central Scotland area had already been erected. The "grid" lines were alive between Bonnybridge and Dalmarnock; Dalmarnock and Yoker; Stockport and Macclesfield; Bedford and Little Barford. In the near future the Board would be giving supplies to Greenock, Kettering, Luton, Aylesbury, Epsom and Worthing.

It was a misfortune that the electricity supply industry had not been developed as a co-ordinated national enterprise. Only since the war was some reasonable degree of national control being secured. Even so the industry was afflicted by a mix-up of authorities, sometimes getting in each others' way, but the Commissioners and the Board, together with the Ministry of Transport, were trying to evolve order out of chaos. He hoped that at some time he would be able to take a hand in the further national development of electrical generation and distribution. If he did, the manufacturers would be able to look forward to a big expansion of demand in the home market.

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E.T.B.I. DINNER.

Gratifying Response to President's Appeal for Funds.

MR. HOWARD MARRYAT presided over a gathering of some 260 members of the electrical industry assembled at the Savoy Hotel, London, on Tuesday evening for the annual festival dinner and dance of the Electrical Trades Benevolent Institution.

Proposing the toast of the E.T.B.I., Mr. Marryat said he had never undertaken a task which had given him such real pleasure as the presidency of the E.T.B.I. His task had been greatly simplified by the generosity of the contributors, and he was glad to announce that he had received no fewer than eight gifts of not less than £500, and a number of other large sums. He was personally delighted at the wonderful support he had received from his colleagues amongst the electrical installation contractors.

Mr. Marryat said he had noticed that electrical people generally had developed the distressing habit of telling each other that business was bad, although official figures conclusively proved that the bright spot in the industrial firmament was the progressive and prosperous electrical industry. This habit had led us to think of the E.T.B.I. on too low a scale; in pence when it should be pounds, and in pounds when it should be tens. The income needed to meet the cases of distress inseparable from any great industry, could only be provided by a very substantial increase in the capital fund of the E.T.B.I., which, at the start of this year, amounted only to £37 000, a sum less than the yearly disbursements to beneficiaries in some other industries.

Only the committee which dealt with the claims on the E.T.B.I. knew the appalling destitution of some of the industry's pioneers, who were too proud to air their distress in public. It was unthinkable that we should allow these old people to end their days under conditions of dire necessity. They had ploughed the rough ground which was now yielding ample reward, and but for some accident depriving them of their health, would now be enjoying their share of the harvest which was coming to those now in the industry.

Tactful Administration.

From personal knowledge he could say that great care was taken in investigating the *bona fides* of claimants for help, and that the fund was administered with remarkable sympathy, tact and patience. Help was given in a way which could not offend the self-respect of any individual, and it was gratifying to note that many of those who had thus been helped through times of difficulty, had been able to take their places again in positions of responsibility.

It was the proud claim of the E.T.B.I. that it had never yet failed to aid anyone who had a proper claim to assistance. The time had now come when the normal income was inadequate to meet the needs of cases of incurable disease which should be pensioned.

Great efforts were being made to place the finance of the Institution on a basis of small contributions from those likely to benefit from them. It would be a long time before the additional income from this source could satisfy requirements, and it was essential to raise the fund to at least £50 000, in order to start the New Year with any degree of security. There were still two vacancies for vice-presidencies, positions for which anyone might qualify by making a donation of £500. Others willing to give £100 could become life governors, and to those who could not afford this, he recommended a life membership at £10.

Mr. Justus Eck then made a presentation on behalf of all the committees of the E.T.B.I. to Mr. F. B. O. Hawes, who, after 19 years, was now retiring from the position of honorary secretary, to which he had devoted so much of his leisure. The presentation took the form of a seven-valve all-mains wireless receiving set bearing an inscribed tablet, a piece of silverware for Mrs. Hawes, and a leather envelope containing a series of letters commenting on the value of Mr. Hawes's services to the Institution.

A Record Collection.

Mr. Hawes, after acknowledging the gifts, said he desired to emphasise the necessity for keeping the finance of the Institution on a voluntary basis. The danger of the fixed contribution plan was that the Institution might come to be regarded as a friendly society.

The health of The President was proposed by Mr. L. B. Atkinson, seconded by Mr. W. R. Rawlings, and briefly acknowledged by Mr. Marryat, who announced that the totals of the collectors' lists amounted to £8 009 10s., which, with the collection during the dinner of £925, brought the total to £8 934. This sum was later raised up to £9 000, the difference being partly accounted for by 25 guineas received for a framed water colour painting presented by Mr. Marryat, auctioned by Mr. Justus Eck, and "knocked down" to Mr. C. L. Arnold. This collection makes history by exceeding the previous record collection of £6 912 by a very considerable amount.

A novel feature of this year's Festival was the dance, which was held after the dinner, and continued until 2 a.m., at which hour quite a number of couples still held the floor.

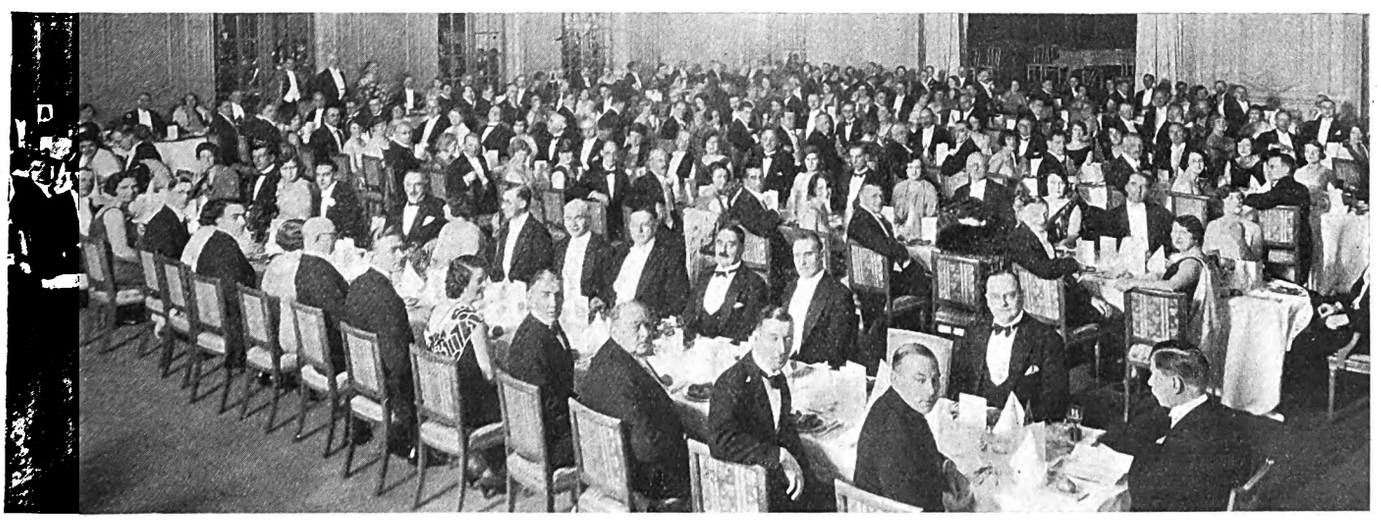
The totals of the collectors' lists are as follows:—

President's List:—Personal, £5 286 2s., per Mr. L. C. Penwill, £72 1s. 11d.; per E.C.A., £624 10s. 3d., total, £5 982 14s. 2d.

"Distribution" £79 9s. 6d.; Messrs. A. G. Beaver, £16 16s.; C. H. Cox, £81 15s.; J. Y. Fletcher, £546 2s. 9d.; H. Howitt, £280 15s. 6d.; W. R. Rawlings, £158 2s. 6d.; Major W. Roberts, £17 13s. 4d.; E. E. Sharp, £11 0s. 6d.; J. M. Sim, £40 14s.; J. N. Stephens, £218 16s. 9d.; L. Thurner, £128 16s. 6d.; C. Wilson, £184 19s. 6d.; E. Wilson, £243 8s. 6d.; Miss C. Haslett, £18 5s. 6d. Total, £8 009 10s.

Some of the large individual donations made to the Institution during the year are specially noteworthy. They include the following:—

Mr. Dane Sinclair, £602; Mr. N. Frankenburg, £500; Messrs. Merz and McLellan, £500; Sir George Sutton, £500; Sir Hugo Hirst, £500; Mr. J. A. Crabtree, £500; Sir Tom Callender, £500; Sir Harry Renwick, £250; Electrical Contractors' Association, £200; the Electric Lamp Manufacturers' Association, £105; Whitehall Securities, £100; Mr. H. Alabaster, £100; the Mullard Wireless Service Co., £100; Holophane, Ltd, £100; Mr. W. R. Rawlings, £75; and Mr. R. S. Whipple, £50.



Some of the company assembled for the annual festival dinner and dance of the Electrical Trades Benevolent Institution at the Savoy Hotel, London, on Tuesday. Mr. H. Marryat, the president, who is seen standing, announced a record collection of £9 000 for the capital fund of the Institution.

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CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

"Our House in Order."

[To the Editor.]

Sir,—I notice under the above heading a communication from Mr. A. Montgomery, for the N.R.E.I.C., stating that that institution has not at any time expressed any opinion against compulsory wiring rules.

I do not think that the extract from the Executive's report that I quoted could be construed to mean exactly that, as I gave the context stating that the Executive could not recommend the adoption of compulsory wiring rules, the time not being ripe. This indicates rather, I think, that at the moment the idea is not practicable.

In any case, this need not really be gone into at length, as the whole object of my article now seems to have been achieved, the E.C.A Council, at their last meeting on October 29th, having agreed to the appointment of a sub-committee to formulate a definite policy with regard to compulsory wiring rules, compulsory registration, and like matters. The findings of this committee will doubtless be reported to the Council, and may eventually become the E.C.A. policy.

This news will delight the hearts of all sincere E.C.A. members, and I think the thanks of the whole industry are due to the editor of this journal for the valuable opportunity afforded for the ventilation and discussion of these most important questions.

The names of the individuals appointed to this important committee will be awaited with great interest, but I think that it will be possible to promise beforehand that, whatever the finally decided policy of the E.C.A. may be with regard to these vitally important matters, all members will support it with all the influence at their command. Personal opinions will fade into the background; in fact they would never have flourished for so long but for the often-deplored absence of a clear-cut lead, now, happily, a thing of the past.

May one obscure E.C.A. member wish this committee every success in its labours, and express the hope that from them will emerge a policy that will represent the greatest step forward that the Association has ever achieved?—I am, etc.,

T. C. Gilbert.

Folkestone,
November 25th.

Standardisation of Page Sizes.

[To the Editor.]

Sir,—The variety of page sizes in British trade and technical journals is the cause of much waste of money by advertising through the multiplication of designs and blocks. An advertiser using the same advertisement in three journals having page sizes of, say (1) 8 in. by 5 in., (2) 9 in. by 6¼ in., and (3) 11 in. by 7½ in., must necessarily have three sets of blocks, and in the case of journal No. (3) whose page differs in proportions from those of Nos. (1) and (2), he must also have a new layout. It might be thought that the unnecessary expenditure under this heading is small, but in actual fact it is a serious item for all advertisers, and in the case of one engineering firm in the North of England is estimated to represent no less than 15% of the money spent on designs and blocks.

As in the design and production of commodities, so also in the design and production of advertisements it is essential to eliminate waste and make for greater efficiency and economy by the adoption of standards. The Engineering Section of the Incorporated Society of British Advertisers, Ltd., has therefore initiated a movement towards standardisation of page size in British trade and technical journals, and this letter sets forth the proposals, so that the opinions of advertisers other than those who are members of the Society may be obtained.

Since any money which is wasted by the advertiser on unnecessary designs and blocks cannot be spent on the purchase of advertising space, such money is lost to the publisher, and it is quite as much to his interest as to that of the advertiser to assist in preventing this waste. The Incorporated Society of British Advertisers, Ltd., has therefore invited the co-operation of the publishers in considering the problem and the practical steps to be taken in adopting standards. The Society desires to thank a large number of publishers for their practical assistance in the formation of a joint committee representing the Incorporated Society of British Advertisers, Ltd., the Periodical, Trade Press and Weekly Newspaper Proprietors' Association, Ltd., and independent publishers. This Committee now propose the following:—

"That a standard type space size of 10 in. by 7 in. be adopted for advertisement pages by trade and technical journals in Great Britain, and that if a larger or smaller page be considered to be absolutely necessary this should be in the same ratio—and either 11½ in. by 8 in. or 9 in. by 6¼ in."

Note.—The proposals affect only the area occupied by the advertisement, and do not affect the gross page size.

The standards have been proposed for the following reasons:—

(1) 10 in. by 7 in. is already the printed page size of a large number of British trade and technical journals, and has been adopted as standard in Canada and the United States. It further approximates so closely to the page size of many other British trade and technical journals that the change to the standard can be made without undue inconvenience on the part of the publisher.

(2) While it is desirable to have one standard only, this is not practicable at present, and it is therefore proposed that two other sizes should be considered. These, however, are in the same proportion as that 10 in. by 7 in. page, so that the same drawings and designs may be used without alteration.

Although publisher and advertiser will both share the ultimate benefit of standardisation, we realise that the change from over 135 page sizes to three for British trade and technical journals will involve a certain amount of expense for the publishers of those journals whose pages do not at present correspond with the standards proposed. It is only reasonable, therefore, that we as advertisers should recognise this fact and should be prepared to meet the convenience of publishers in making the change. We propose, therefore, that any change of size should be made at a time convenient to the publisher of any journal concerned, preferably at the end of a volume, and we also propose that where a page size of a journal is slightly reduced, no demand is to be made for a reduction in rate, although the advertiser will lose a small percentage of space.

Many publishers are keenly interested in the proposed standardisation, and are anxious to put our proposals into effect. Before they take such an important step, however, they wish to ascertain the views of their advertisers as a whole. This is a reasonable standpoint to adopt and we invite you, therefore, to write, giving your opinions on the proposals regarding standardisation made by the Joint Committee, to the Secretary, Incorporated Society of British Advertisers, Ltd., Aldwych House, Aldwych, W.C.2, with a copy of the letter to the editor of this journal.—We are, etc.,

Thomas Bell,
Chairman, I.S.B.A.
J. Taffs,
Chairman, Engineering Section, I.S.B.A.
A. W. Swan,
Hon. Secretary, Engineering Section, I.S.B.A.
Alfred H. Angus,
General Secretary, I.S.B.A.

Aldwych House,
Aldwych, W.C.2.
November 22, 1929.

"Overhead Lines or Underground Cables?"

[To the Editor.]

Sir,—In answer to Mr. Fennell's remarks in your issue of November 15th, and to those made by "J.A.S." in your issue of November 22nd, we would point out the following:—

(1) Mr. Fennell states that we have under-estimated the cost of laying 33 kV cables.

The cable-laying costs which we gave were taken from a *definite quotation*, from a responsible Continental firm, for the laying down of cables in a large area in England, and include the cost for the use of machinery, etc. We clearly indicated in our article that these costs refer to work carried out in districts where the soil is suitable.

(2) Mr. Fennell states that wayleaves for underground cables would be greater than those for overhead lines. It may be possible that the initial cost of compensation to the farmer, for the damage done to his land at the time of laying the

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cable, would be greater than that for the building of an overhead line. We contend, however, that the farmer will suffer so much less interference in his farming operations from the uninterrupted surface which the underground cables form, and that he will appreciate the fact that his land will not be traversed by those responsible for the upkeep and supervision of the overhead line, that the total capitalised cost of wayleaves will be considerably lower in the case of underground cables than in that of overhead lines.

This is also an answer to the question asked by "J.A.S."

(3) Mr. Fennell remarks that there is no reason why we can calculate on a shorter route for underground cables than for overhead lines. On account of Mr. Fennell's considerable experience in this direction, we are very grateful to him for the information, which we shall duly take into consideration in future calculations, although this item is not important.

(4) "J.A.S." remarks that 33 kV overhead lines could be built for a price of £500 per mile. We calculated on a price of £1 000, which appears to comply with the figure given in the Electricity Commission's preliminary estimate of these feeders. If, however, we take "J.A.S.'s" figure, by means of which the cost of an underground cable line would be almost two-and-a-half times that of an overhead line, the actual cost per unit calculated on a supply of 8 600 kVA for 2 000 hours per annum, for a supply by underground cable, would exceed the cost of a supply by overhead line construction by about 0·015d. per unit. We leave it to your readers to say whether this difference would be justified by the more efficient service given by the underground cable.

(5) We leave "J.A.S.'s" statement that the maintenance of underground cables would probably be greater than that of overhead lines to the judgment of your readers. We have experience of underground lines laid 30 years ago which have cost nothing for maintenance, and which are in as good condition now as when first laid down.

(6) "J.A.S." says that the grid supply should be available *at any point in the land*, and that the use of cables would completely nullify this condition, etc. We think that this is a misunderstanding on "J.A.S.'s" part. The 33 kV lines which we have under consideration are to radiate from selected stations to certain points in a district and are not to be tapped, but the distribution is to take place from these points.

(7) "J.A.S." thinks it very unlikely that the Central Board would use Continental cables. This is quite possible, but the English cable industry has developed so greatly that we are convinced that it can manufacture cables of as good a quality as those now obtainable from the cable makers on the Continent, and at the same price.

Finally, in our article on 33 kV underground cables we calculated on losses greater than we believe will be incurred in general practice, but we intend to correct this in an article on 11 kV lines, which we hope will shortly appear.—We are, etc.,

R. E. CROMPTON.
ALFRED EKSTRÖM.

London, W.8.
November 25th.

"Where *is* that Battery?"

[TO THE EDITOR.]

SIR,—Mr. Raymond Mitchell's suggestion for a big prize as an inducement to the invention of an epoch-making storage battery will not, I fear, bear the test of analysis.

Let us look at it for a moment. What individual or what organisation can or will offer a minimum of £50 000 as a reward for the invention of a light, cheap, durable, compact storage battery? A famous daily paper made both a name and capital for itself by not only offering but paying large money prizes encouraging the development of practical aeroplanes. No newspaper to-day would think of offending its huge advertising clientele representing the petrol, oil, tyre, car, vehicle and accessories industries by offering a large prize for a traction battery, the invention of which would rob it of hundreds of thousands of pounds in annual revenue.

This fact prompts us to turn elsewhere. Will some cigarette, soap, pill, pork or powder king come to the rescue with one eye on publicity and the other on profit? I think not.

I think that the electrical industry has the money for a big prize, but with 25 years' work "on its plate" at the present time, in co-ordinating electricity supply and in catching up with the domestic demand, it is much too busy to worry itself about a traction battery.

I have already pointed out that the battery makers to-day are finding good enough profits in existing types, and therefore do not need to concern themselves with a "posterity battery" which is very hypothetical in any case.

Having now run the gamut of plutocratic prize possibles, we are left with the prospect of State intervention; need we bother to examine this in view of the pioneer work now being carried out by the Irish Free State? The prize idea is a good one, but will Mr. Mitchell tell who shall offer the prize?—I am, etc.,

"BATTERY ELECTRIC."

London,
November 26th.

THERMAL STORAGE.

Some Advantages of the Constant Pressure System —Dr. Kiesselbach's Method Described.

DURING the last few years attention has been consistently directed to methods of steam-heat accumulation, in which the surplus steam generated during periods of normal operation on light load is condensed to water in order to conserve the heat. In this system, when the demand for steam is greater than the normal steaming rate of the plant, the pressure is allowed to fall and the water evaporates and is used as steam at lower pressure to augment the steam generated by the boilers.

Since, however, the water in which the heat is thus accumulated cannot be evaporated except by reducing the pressure imposed upon it, the system is only readily adapted to works requiring two or more processes. It will be appreciated that in this method the accumulator shells must necessarily be large, as they must hold sufficient water to condense all the surplus incoming steam.

Distinct from this system of falling or variable-pressure accumulation is the constant-pressure system, which appears to possess distinct advantages in many industries where single pressures as well as more than one pressure are used. Under this heading comes the system devised by Dr. Kiesselbach, which consists primarily of a storage tank in which water is accumulated and maintained at both boiler temperature and pressure.

Water Level and Circulation.

The accumulator is in direct contact with water in the boiler by means of an overflow pipe from the boiler which maintains constant water level, and the water is circulated from the boiler to the accumulator and from this storage-vessel back to the boiler, by means of a circulating pump. The normal feed-water pump is controlled by a pressure-operated regulator connecting the feed-pump and the live steam delivery line, and the feed-pump then operates in accordance with the rise in boiler pressure. A pressure equilibrium pipe admits steam from the boiler on to the top of the water in the accumulator, and ensures that the accumulated water is maintained at boiler pressure and temperature.

Under conditions of normal operation of the boiler the circulating pump runs normally, the feed-pump passing the same quantity of water as is being evaporated. In the event of a decreased demand on the steam line, the pressure tends to rise and the automatic regulator between the live steam line and the feed-pump supplying the boiler opens, admitting more steam to the feed-pump and increasing its speed and the quantity delivered. The consequent rise of water level in the boiler causes an overflow of water to the accumulator, and the low-temperature water admitted to the boiler tends to lower the pressure. As the demand for steam increases, the pressure tends to fall, with the result that the boiler feed-pump is slowed down, while evaporation in the boiler continues. At the same time, water which is at full boiler temperature and pressure is circulated from the accumulator, flowing to the boiler and back to the accumulator.

In this way the water level in the accumulator continues to fall at the exact rate at which it is being evaporated, but during this period of excessive evaporation the boiler is fed with water at boiler temperature and pressure, and consequently only the latent heat to convert this water to steam at the same temperature has to be added. When the period of excessive steam demand is passed, evaporation again becomes normal, the pressure regulator admitting water from the feed-pump, restoring the water level in both the boiler and accumulator.

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NEWS IN BRIEF.

School Lighting—Progress of Burnley Hiring Department—Appointments Vacant—Electricity in Manchester Baths—Electrical Development in France.

BARROW Corporation's new showroom, offices, demonstration and lecture room, etc., in Duke Street, which have cost about £10 000, were opened on November 15th.

Seaham Harbour Electricity Committee has decided to equip Emily Street School with large cooking equipment for about 200 scholars, in addition to lighting the school by electricity.

It is understood that the Tribunal of the German Patent Office in Berlin has upheld the claim of the Western Electric Co. against the Klangfilm-Tobis Co. regarding a certain patent, and has declared it null and void.

Burnley Electricity Department in October fixed 859 prepayment meters, 589 meters on rateable value system, and 206 appliances, including radiators and cookers, on hire or hire purchase.

An experimental installation of five electrically operated fans at Blackwall Tunnel having improved the ventilation, the London County Council Highways Committee recommends the installation of further plant at a cost of £8 000.

Bexhill Electricity Committee has considered the provision of further lighting on the parade and the lighting of parade shelters, and a full report on the subject is to be presented. The basement at the showrooms is to be adapted as a model kitchen.

Applications are invited for the following appointments: Lecturer in electrical engineering at the Government Technical Institute, Insein, Burma; test-room supervisor and test-room assistant in the Hull electricity department; electrical showroom salesman and lady demonstrator of electric cooking and domestic apparatus at Barrow-in-Furness; assistant engineers in Sunderland electricity department.

Manchester Corporation Baths Committee reports that the use of electricity for driving purposes has proved far more economical and cleaner than by steam power, and, consequently, all the later establishments are being driven by electric power and all new schemes will be on similar lines. The machinery in two of the establishment laundries, a large number of pumps connected with filtration aeration, and a large proportion of the machinery in the washhouses have been converted to electric driving.

Mr. B. Waite, district manager, Post Office Telephones, addressed, last week, a meeting of the South Wales and Monmouthshire branch of the Chartered Institute of Secretaries on "The Telephone Service." Mr. Waite said at present the total capital account of the telephone system amounted to £109 766 608, and of this not less than £74 000 000 had been sanctioned since 1920. Expressed in terms of telephones per 100 of the population, London headed the list with 10·2, Bournemouth being second with 7·6, and Cardiff followed with 6·3.

Mr. F. W. Goodenough, president of the Incorporated Sales Managers' Association, said in a recent address, we had to learn that recognition of the vital importance of scientific salesmanship was essential to progress. That was why the Committee on Education for Salesmanship, whose interim report would soon be published, were so anxious to arouse the interest of manufacturers in the problem. We needed a better appreciation of the importance of salesmanship in the high places of the industrial world; and an appreciation of the importance of education and training.

The direct telephone communication which has been established between ships in the Tyne and the shore is found to be a complete success.

Hull Corporation Aerodrome Committee has authorised the Town Clerk to negotiate with National Flying Services, Ltd., terms for the installation of an oil engine and generator for the purposes of electricity supply at the aerodrome.

The Magistrates of Glasgow recommend that automatic signals be erected at the corner of Queen Street and George Square as a further experiment on similar lines to the signals already set up at the corner of Hope Street and Sauchiehall Street.

The French Prime Minister has laid on the table in both Houses of the French Parliament the portion of the National Equipment Bill asking for an immediate vote of £1 600 000 for developing the electrical power industry.

A fire which occurred recently in the tower of St. Andrew's Church, North Berwick, was apparently due to a leak in the by-pass of the gas lighting equipment for lighting the clock. At last week's meeting the T.C. decided to light the clock electrically in future.

Engineering employers last week declined to concede the demand of the trade unions for an increased wage or to make any offer, and the unions decided to report the deadlock to their executives, with a view to calling a meeting in January of next year. The employers supported their decision by facts showing that the financial commitments of the Government would impose greater additional burdens upon industry.

The Western Union Telegraph Co. announces that the effect of the recent earthquake upon its cable service between Great Britain and North America is considerably less than was at first anticipated. The service via Western Union between this country and the American Continent is now practically normal.

Swanscombe U.D.C. has received a report from the Surveyor that the Northfleet Gas Co.'s successors have offered to provide and instal service pipes in the Council houses now being or to be built, free of charge, so that the tenants or purchasers can have a supply of gas for use with cookers, coppers or fires. The houses are to be wired for electric lighting.

Mr. W. M. Rankin, principal of Burnley Municipal College states in his annual report that during the session engineering students, numbering over 400, were in excess of any previous year. Twenty students—a record—obtained national certificates in mechanical and electrical engineering, and 10 others were placed in merits lists of Union of Lancashire and Cheshire Institutes. For the first time an honours engineering degree of London University was obtained by part time study, by Mr. Gilbert H. Jackson, of Todmorden.

The exhibition and annual meeting of the British Institute of Radiology, incorporated with the Röntgen Society, will take place from December 4th to 6th, inclusive, at the Central Hall, Westminster. A number of interesting papers will be read, including two by Dr. A. Orliansky and Mr. W. R. Gray, on "Output of Transformers under different methods of High Tension Rectification" and "A Hot Cathode Tube with Rotating Anode," respectively, and the annual dinner will take place on December 6th at the Trocadero Restaurant, London. Tickets (15s. each) from Major D. B. McGrigor, 32, Welbeck Street, London, W.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated November 29th, 1879:—*

The P.S.N.C. successfully tried electric lighting in the new steamer "Mendoza."

The "Scotia" and "Kangaroo" were on their way to Aden to lay the last portion of the Cape cable.

As a result of damage by gas lighting to frescoes in the Paris Opera House, electric lighting was to be installed.

* * *

FIFTEEN years ago THE ELECTRICIAN *recorded that:—*

The Germans had installed electric street lighting in the badly-damaged town of Malines.

The Bank rate prevailing at that time was 5%.

* * *

TEN years ago it was stated in THE ELECTRICIAN *dated November 28th, 1919, that:—*

The Lyric Theatre, Hammersmith, London, had installed electric heating throughout.

Stepney (London) B.C. had decided to become a member of the E.D.A.

Sir John Snell, Rear-Admiral F. L. Field, Prof. J. E. Petavel, Dr. W. H. Eccles, and Messrs. F. J. Brown, James Swinburne and L. B. Turner were appointed members of an International Communications Committee, under the chairmanship of Sir Henry Norman.

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PERSONAL.

MR. P. W. Bancroft has been appointed, subject to confirmation, tramways manager to Derby Corporation

Sir Harry Hatt, deputy Mayor of Bath, has been elected Chairman of the Electricity Committee for the 28th time.

Mr. Bernard D. F. Dudley Docker and Sir Edmund Wyldbore-Smith have resigned from the Board of Associated Electrical Industries, Ltd.

Dr. Yasujiro Niwa, chief engineer of the Nippon Electric Co., Ltd., has been awarded the Asano Prize of the Institute of Electrical Engineers of Japan.

Louth Corporation has ratified the appointment of Mr. Edgar Marsden, of Huddersfield, as electrical engineer, at a salary of £300 per annum.

Mr. E. Morgan, general manager of the Sheffield Electricity Department, announces that his permanent address is now "Glensone," 23, Thornsett Road, Sharrow, Sheffield.

In connection with our reference last week to the late Mr. W. R. Sayers, we are given to understand that he joined the staff of Messrs. Cromptons in 1882, and not 1888 as stated.

The marriage of Mr. Eric R. Knight, of the Leicestershire and Warwickshire Electric Power Co.'s staff, and Miss Dorothy Edith Southorn was solemnised at Leamington Spa on November 12th.

Hammersmith (London) Establishment Committee recommends the payment of £168 15s. 4d. to Mr. R. H. Paterson, borough electrical engineer, in respect of his services as acting borough electrical engineer from February 13th to July 17th last.

Mr. T. R. Martin announces that, having resigned his position as joint managing director of J. H. Tucker and Co., Ltd., correspondence of a personal nature should be addressed to him at "Highland Lodge," Wellington Road, Edgbaston, Birmingham.

In the Sheffield Tramway offices on November 21st, Mr. Rowland C. Moore, who is shortly leaving to take up the position of traffic superintendent to the Stockton Corporation Motor Bus Department, was presented, on behalf of his colleagues, with a clock and barometer.

Dr. W. E. Sumpner, principal and head of the physics department of Birmingham Central Technical College, is retiring at the end of the present year. He has held the position of principal for 35 years. Dr. A. H. Railing, who distributed the prizes at the College last week, expressed the appreciation by the industrial community of Dr. Sumpner's work.

With reference to the resident engineer required for the Kirkstall power station, Leeds Electricity Committee, after interviewing Messrs. E. C. Harris (Barking), Frank H. Pooles (Hams Hall), J. F. Sarvent (Hammersmith), Ronald Dickinson (Ribble), John Mullin (Brimsdown), recommended Mr. J. F. Sarvent, power station superintendent at Hammersmith (London), for the appointment.

Barking Electricity Committee received a letter last week from the electrical engineer, Mr. W. Holmes, stating that the specialist whom he had consulted in connection with his illness had reported that he was not at present, and would not in future be, fit to take charge of his department. In the circumstances he placed his resignation in the hands of the Council. The committee received the news with regret and appointed Mr. W. E. Kidner, the present acting electrical engineer, as electrical engineer at a salary of £725 per annum.

Members of the staff of the Yorkshire Electric Power Co. assembled at the Leeds Liberal Club on Monday evening for the joint purpose of bidding farewell to Mr. R. H. Harral, and congratulating Mr. Oldroyd and Miss Crowther on the occasion of their marriage. Mr. R. H. Harral, who has been a mains engineer on the staff of the company for 11 years, is leaving to take up an appointment as mains superintendent in the Blackburn Electricity Department. He was the recipient of a handsome clock, a loud speaker, and an illuminated address. Mr. Oldroyd and Miss Crowther have served on the company's staff for 17 and 14 years respectively, and were presented with a pewter tea-service, a canteen of cutlery, a case of fish-eaters and an illuminated address.

Obituary.

Mr. JOHN W. LIEB, on November 1st, aged 69 years. He was a past-president of the American Institute of Electrical Engineers and senior vice-president of the New York Edison Company.

BUSINESS ITEMS.

MESSRS. MAXIMS, radio engineers, of Locksbrook Post Office, Lower Weston, and Brougham Hayes, have opened additional premises at 33, Broad Street, Bath.

We have received an inquiry for the name and address of the makers of the "Eclipse" electric kettle. Will any reader able to supply this information please communicate with the Editor.

A general view of the new showrooms of Metro-Vick Supplies which have been opened at Newcastle.

FERRANTI, LTD., Hollinwood, Lancs., announce that with the coils now being supplied in the company's h.f kit for the "Screened Grid 3," it is necessary to use 0·0005 μF. tuning condensers in place of the 0·00035 condensers originally specified. This alteration has become necessary owing to the changes in wavelength that have taken place since the receiver was first made available to the public.

Following the satisfactory operation of the "Alton" batteries installed at the Foochow, Changchow, Changeu and Nanking telephone exchanges, the ALTON BATTERY CO., LTD., of Alton, Hants, advises us that an order has been received covering three batteries which are required for the Shanghai automatic telephone network. This contract now brings the total number of Alton batteries shipped for the automatic telephone systems being installed in China and Manchuria to 23.

In connection with the new building recently opened as a furniture emporium by Messrs. Bradley's, at Fore Street, Edmonton, SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., advise us that the furniture window displays are floodlighted by means of Siemens' lamps and shop window reflectors. For the lighting of the various floors "Ultralite" fittings are used. The NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO., Sales Department, were responsible for the wiring and lighting schemes.

The BRITISH THOMSON-HOUSTON CO., LTD., is showing electric lighting equipments for motor cycles and motor-cycle combinations at the Motor Cycle Exhibition, at Olympia, London. Types P.B.17, P.B.K., P.A. and C.A. are exhibited. B.T.H. magnetos also occupy a position of prominence, all the well-known types for single, twin (V or flat) cylinder motor-cycle engines being shown, while attention should also be drawn to the B.T.H. impulse startor. Among the other exhibits reference may be made to Fabroil silent timing and pump gears, electric horns and "Mazda" motor-cycle electric lamp bulbs.

In our issue of July 26th, page 116, we reproduced a photograph of the new premises built for the Newcastle offices of METRO VICK SUPPLIES, and pointed out that at that time the showrooms were not completed. We are now advised that this section has been opened and the reproduction above gives some idea of the department's extent and scope. The picture, however, does not show the model rooms that have been equipped—drawing room, bedroom, bathroom, kitchen, etc., with a view to demonstrating the advantages of electrical domestic appliances both from the artistic, utility and economy points of view. It will be appreciated from the illustration that every endeavour has been made to avoid the unpleasant effect of a "jungle" of fittings, and owing to the imposing size of the room this can be done without in any way sacrificing the variety of the display. The general decorative scheme for the showroom is blue and silver.

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LEGAL INTELLIGENCE.

Dispute Concerning Re-wiring of Old Lighting Installation.

ALLEGATIONS of bad workmanship were made in the High Court, on November 18th, in an action brought against Messrs. George Thomas (Dover), Ltd., engineers, of Dover, in regard to a contract carried out by them for overhauling the electric lighting installation at Kearsney Court, near Dover. The plaintiffs, Messrs. A. H. and H. G. Stocker, who had acquired Kearsney Court as a convalescent home, alleged that in 1927 they employed the defendants to overhaul the electric lighting installation, for which they paid £156, but afterwards found that the work had been done so badly that they had to have it re-done. They accordingly claimed £151.

The defendants denied negligence, and pleaded that the work was done under the personal supervision of the plaintiffs' foreman of works and approved by him.

Mr. Carthew, for the plaintiffs, detailed some of the defects complained of and said that the joints in the cables were made simply by twisting the wires and re-insulating them but without soldering. The cables were cramped and tightly pressed together without sufficient insulation. The extensions were contrary to regulations, and wires had been passed down through ceilings without any protection. The defendants did not do the work themselves, but sub-contracted with a Mr. Mason, of Dover. It was after complaints had been made by the Borough Electrical Engineer of Dover that the plaintiffs employed an expert to examine the work and then found that it had been badly done.

Mr. James Douglas Allen, of Foundations, Ltd., said the work was exceptionally bad, and material used was unsuitable for the purpose.

Mr. Clery, of Messrs Drake and Gorham, Ltd., who reviewed the work executed by the defendants, said the re-wiring should have been done on the looping-in system. The work as done by his firm would have cost £345.

Mr. David Connors, foreman to Messrs. Drake and Gorham, said a good deal of the work was left in a dangerous condition, for the junctions were not soldered.

Mr. Clery recalled, said he had cut out and kept a number of the defendants' junctions to add to his museum.

Mr. Craig Henderson, for the defendants, said they quite agreed that the job ought to have been done on the looping-in system, but they were compelled to do it on exactly the same system as they found it, as time did not permit of adopting any other. They did exactly what they were employed to do, and were not allowed to adopt the looping-in system. As to the joints, they were done exactly as the old ones had been done. It was impossible in repairing an old system to work in accordance with modern regulations, and it was significant that nothing ever went wrong with the work.

Mr. E. W. Hansell, K.C., Official Referee, giving judgment, said that though it might have been better to adopt the looping-in system and to solder instead of adopting the tie joint, there was no obligation on the defendants under the contract to change the system they found existing, especially as no danger resulted. The plaintiffs had failed to prove that what the defendants did was not enough to make the work sufficient and safe, and therefore there would be judgment for defendants with costs.

Valve Holder Patents.

Judgment was given in the Chancery Division on November 19th in the action in which Benjamin Electric, Ltd., and the Igranic Electric Co., Ltd., sought an injunction to restrain Garnet, Whiteley and Co., Ltd., from infringing the plaintiffs' patents for improvements in thermionic valve holders.

Mr. Justice Clauson said the action concerned two patents belonging to the plaintiffs—the Benjamin and the Burndept. It was obvious that they had been infringed, and the questions for the court were whether prior publication and prior user amounted to anticipation, and whether the plaintiffs' inventions contained subject matter for a patent. In both cases the valve holders were carried on springs, the springs serving to carry the holder and to conduct the current to the valve.

Describing the various alleged anticipating inventions and prior user, his Lordship said there was some evidence that in December, 1923, the Sterling Telephone and Electric Co., Ltd., made and published a form of holder, but it was not a true anticipation.

It was said that the plaintiffs' device was merely a combination of several old features, but it appeared to him that the combination was not a mere juxtaposition of old features but a new and useful article. In his opinion the selection and co-ordination of old features in this instance involved a new invention. He held that both the patents were valid and had been infringed, and therefore there would be judgment for the plaintiffs.

A stay of execution was granted with a view to an appeal.

Pending Electricity Suit.

On the application of Mr. Tyldesley Jones, K.C., on behalf of the plaintiffs, Mr. Justice Bennett, in the Chancery Division, on November 22nd fixed December 11th, subject to anything part heard, for the hearing of the action, Oxford Corporation *v.* Oxford Electricity Co., Ltd.

He said the action related to the construction of an Act of Parliament under which the Corporation had served notice on the company requiring them to sell to the Corporation the electricity undertaking. Evidence would probably not be called on the claim, but there would be some on the counter-claim, chiefly by experts on the question of construction.

Imported Cable.

A summons under the Merchandise Marks Act, against Messrs. Walter James Edwards, Arthur Norman Edwards, and Thomas Daniel Edwards, trading as Edwards Brothers, 20, Blackfriars Road, London, S.E.1, was heard at Tower Bridge Police Court, before Mr. Oulton on Tuesday. Defendants were summoned for advertising cable for sale without indicating the country of its origin.

Mr. St. John Hutchinson supported the summons on behalf of the Cable Makers' Association; Mr. A. H. Osmond, solicitor, defended.

Mr. Hutchinson said he understood defendants would plead guilty. Under the Act of 1887 defendants were entitled to go for trial, the offence was actually under that Act although proceedings had been taken under the Act of 1926.

Mr. Osmond said defendants would ask the Court to deal with the case.

Mr. Hutchinson said the prosecution was under the Merchandise Marks Act of 1926, sec. 5, sub-sec. 2, which laid down that if any person offered for sale any imported goods of any class or description without indicating the place of origin they were guilty of an offence. By an Order in Council made in 1928 insulated cable was brought under the Act, and defendants should have shown in their advertisements either the place of manufacture or the word "foreign." They advertised as Edwards Bros., and one of the items advertised was "Grey Cable," as a cable passed by the Cable Makers' Association. These particular cables were advertised as "Siemens Schuckert (Great Britain)," and people reading that description would come to the conclusion that the cable was made by a British firm. The Cable Makers' Association had inserted advertisements in all the trade papers, pointing out that the place of origin of such goods must be mentioned under the Act. In pursuance of their objects the Cable Makers' Association bought a length of this cable, which bore a ticket showing that it was manufactured by Messrs. Siemens Schuckert, Ltd., Berlin, and it also bore the words "Made in Germany." If the cable had been purchased in smaller quantities there would have been nothing to show where it had been made.

Mr. Osmond said his clients acted in ignorance. The goods were labelled according to the Act, and also bore the words "German Manufacture." They had advertised only in trade papers.

Defendants were fined £2 each, and ordered to pay £5 each as costs.

THE INDUSTRIAL SOUTH.

The Ministry of Labour's annual survey of the distribution of the working population, industrially and geographically, shows that the shift of industry to the south is continuing. Over Great Britain and Northern Ireland, as a whole, the insured population has grown by 8% since 1923. In London the increase has been 13·6%, in the south-eastern division 22%, in the south-western 13%, and in the Midlands 9·7%. In the other divisions the increase has been less than 5·2%, while in Wales there has been a decline of 2·4%. Among the industries which show increases of a fifth or more since 1923 are: heating and ventilating apparatus 61·1%; electrical wiring and contracting 44·4%; electric cables, wires and lamps 33·1%; iron and steel tubes 20·1%.

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PLASTICS ASSOCIATION.

Formation of Trade Association—Election of Committee.

A REPRESENTATIVE meeting of firms engaged in the plastic trade was held in London, on October 16th, with a view to discussing the formation of an association. The meeting was presided over by Mr. James Macfarlane, who pointed out that the purpose of such an Association would be to protect the interests of the plastics industry and to promote its development.

Some discussion followed the Chairman's opening remarks, the chief point at issue being whether one or two associations should be formed, for manufacturers in the one case and for moulders in the other. A decision in favour of one association was finally made.

During the course of the discussion it was revealed that the moulding industry in Germany, although not any older than the moulding trade in this country, primarily started in the electrical industry. The Verband Deutscher Elektrotechniker formulated rules with regard to the supply of mouldings to the electrical and allied trades, and at the same time indicated the physical, chemical, electrical and allied properties of the materials required for mouldings. Every manufacturer engaged in the electrical and wireless moulding trades was given a monogram of the association, and each member was allotted a number, which, when used with the monogram, indicated the grade of material from which the moulding was made. The grading of materials and classification of mouldings were of some importance, particularly to those members of the plastics trade who supplied the electrical industry with mouldings and raw material.

The formation of an Association committee was discussed, and after considering all the views expressed, the following were proposed and seconded :—Messrs. C. C. Last (Bakelite, Ltd.), R. R. Todd (Birkbys, Ltd.), A. S. Welch (Jas. Ferguson and Sons, Ltd.), A. V. Keller (Kelacoma, Ltd.), A. Fraser (Rissik Fraser and Co., Ltd.), H. E. Ashdown (H. E. Ashdown, Birmingham), J. W. Barber (Brownie Wireless Co., Ltd.), B. Weaver (Ebenestos Insulators, Ltd.), W. C. Waghorn (Insulators, Ltd.), S. A. Goode (Streetly Manufacturing Co., Ltd.), C. T. O'Callaghan, C. S. Dingley and F. C. Higgins. The committee will select its own chairman.

The following firms were among those represented at the meeting: A.E.G. Electric Co., Ltd., H. E. Ashdown (Birmingham), Ltd., Bakelite, Ltd., Beatl Sales, Ltd., Bell Moulding Co., Birkbys, Ltd., British Celanese, Ltd., British General Mfg. Co., Ltd., Brownie Wireless Co., J. A. Crabtree and Co., Ltd., Thos. De La Rue and Co., Ltd., Ebonestos Insulators, Ltd., Erinoid, Ltd., Jas. Ferguson and Sons, Ltd., Graesser-Monsanto Chemical Works, Ltd., H. C. S. Hicks and Co. (Galalith), F. A. Hughes and Co., Ltd., Rockhard Resins, Ltd., Insulators, Ltd., Kelacoma, Ltd., Lorival Mfg. Co., Ltd., the M.L. Magneto Syndicate, McLeod and McLeod, Ltd., Mica Mfg. Co., Ltd., Plastic Moulding Co., Ltd., Ranton, Ltd., Rissik Fraser and Co., Ltd., St. Albans Moulding Co., Ltd., Solidite and Synthetic Mouldings, Ltd., J. M. Steel and Co., Ltd., Streetly Manufacturing Co., Ltd., Synthetic Resins, Ltd., United Ebonite Mfrs., Ltd., Messrs. H. Courtney Bryson, F. C. Higgins, Rex Jones, H. McL. Melville Smith, C. T. O'Callaghan, and A. Titmuss also attended.

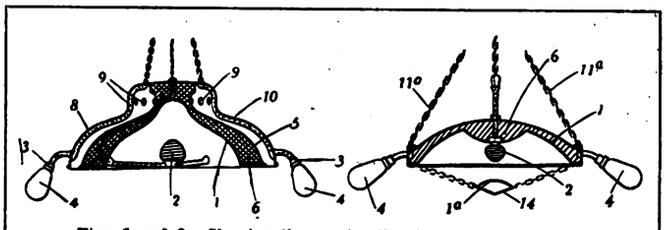
MODERN SHOP LIGHTING.

In the course of an address to members of the West of England Display Association at Exeter on Monday, Mr. T. Catten, of the Electric Lamp Manufacturers' Association, said the whole subject of display had been revolutionised, and the art of selling had become positive. In the early days of electric lighting, window displays were of little importance, and interior displays were entirely absent. For a long time the sole outlook on lighting was its ability to permit vision, but the modern store had a different outlook. The intensities of the light employed both in the windows and the interiors was well in excess of the limits which permitted clear vision. It was realised that a well-lighted window or interior possessed a sales force which was second to none in its appeal and effectiveness. The advertising value of such display or a cheerful and bright interior was of such importance that no progressive shop-keeper could afford to be without it. Mr. Catten demonstrated the difference between old and modern systems of window lighting, and referred to the "new art" system which was being adopted for facia lighting.

A NEW HEATING DEVICE.

WE have received from Mr. James Dorman, 24, Lower Leeson Street, Dublin, particulars of a new combined heating and lighting unit which he has patented. The number of the specification is 314 567 and a brief description of the arrangement is as follows :—

A heating and lighting unit adapted to be supported from a wall or ceiling comprises a heating device consisting of a



Figs. 1 and 2. Showing the constructional arrangement of the combination fitting.

resistance wire carried by an insulating former, a reflector, and one or more electric incandescent lamp sockets disposed outside the reflector. A part or the whole of the heating device constitutes a permanent fixed part of the unit. In Fig. 1 the heating device 2 is arranged in an inverted bowl reflector 1, separated by insulation 6 from an outer bowl 5. A surrounding shroud 10 carries lamp sockets 3. Air passes upwards between the shroud and bowl and through perforations 9 at the top of the former. In Fig. 2 the heating device is arranged centrally of a reflector carrying lamp sockets on its periphery. An auxiliary reflector 1*a* and a guard 14 are arranged below the heating device. The heating and lighting circuits are controlled by separate switches. Modifications referred to in the full specification comprise concentric heating and lighting devices and heating devices grouped about a central lighting device.

IN PARLIAMENT.

Electricity Special Orders Approved by the House of Commons.

THE House of Commons has approved Electricity Special Orders in respect of (1) the urban districts of Crewkerne and Ilminster, and parts of the rural districts of Chard and Yeovil; (2) the borough of Honiton, the urban district of Ottery St. Mary, and parts of the rural districts of Axminster, Honiton and St. Thomas.

Replies to Questions.

The following are points from answers to questions in the House of Commons :

The works on which the Postmaster-General has arranged to spend an additional £750 000 in telephone construction are in connection with the development of trunk telephone traffic. They comprise a number of duct and cable schemes which were originally contained in programmes not scheduled to be put in hand this year.

Proposals in regard to the future of the Indo-European Telegraph Department are under consideration which may necessitate reductions in various grades of personnel employed by the Department, in which case the question of compensation for the retrenched officers for the loss of employment will be carefully considered.

The financial position of the telephone service does not at present permit of a reduction in rental charges.

The latest available figures as to the British Broadcasting Corporation's income and expenditure are for the year 1928, and are shown in the Corporation's report for that year. Its total expenditure during 1928, including provision for depreciation, was £879 324 6s. 2d., and its total income was £1 002 505 10s. 3d., of which £871 763 16s. 9d. was in respect of wireless licences.

The Minister of Transport has recently been in communication with the London and North Eastern Railway Co. with respect to the possibility of electrifying the railway between Newcastle and South Shields, and has been informed by them that the question of the electrification of the section of line concerned has been considered, and that in their view there are a number of other schemes for improvements to their system which should be given precedence.

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WATER HEATING.

First of the E.D.A. Sales Conferences at Manchester.

"DOMESTIC Electric Water Heating" was the title of a paper given by Mr. R. J. Hebbert, of Ferranti, Ltd., at the first of the series of E.D.A. Sales Conferences to be held at Manchester during the present season.

Mr. Hebbert said that much thought had been given lately to the framing of tariffs to attract the load, and many supply authorities were now offering exceedingly low prices for this purpose. Because so much had been done to improve load factors by the development of water heating, however, it should not be concluded that all types of equipment were good from the load-building point of view. They used to feel that for the purpose of central heating of buildings electricity could not compete, on grounds of economy, with coke and other low grade fuels, but with current available at less than a farthing a unit this was no longer the case. Domestic water heating was of greater concern, however, and this involved the widest possible use of storage principles. In most modern houses hot water could be supplied from one heater, and it was preferable to place it in the scullery, as close as possible to the sink. In larger houses it was generally possible to divide hot water points into conveniently centred groups, and thus instal two or more large heaters, each feeding its own separate group of taps. It could not be too strongly emphasised that anything in the nature of a circulating pipe to give instant hot water at the taps was prohibitive.

He could assure those present that, at ½d. per kWh, the electric heating of water for an average small household did satisfactorily bear comparison with the cost of equal service obtainable by any other means. They had in Great Britain at the present time over 40 electricity undertakings whose domestic tariffs incorporated a kWh charge of ½d. or less, and the population which they served represented one fourth the total population of the country. In general, where the kWh rate incorporated in the ordinary domestic tariff was more than ½d. per kWh it would be wise to consider the possibility of offering a reduced rate for storage heaters, under some special control to restrict its loading to off-peak conditions of supply. He considered that at ½d. per kWh the service was one which paid the average consumer, and if the load could not be generally attracted at this rate, he suspected it was due to some other obstacle.

Interesting comment was made by several speakers in the discussion which followed, and the initial cost of the necessary installations was apparently one of the main difficulties which were put forward. Mr. Barrett, of the North Wales Power Co., said that he would like to see a greater understanding between the manufacturers of the appliances and the supply undertakings. He felt that reductions in both cost of apparatus and tariff rates would be possible if there was more working together. Mr. Burton, of the Liverpool Corporation, mentioned the success which had attended the adaptation of electrical heating units to existing cylinders.

SWISS RAILWAYS.

Over 1 600 Kilometres of Lines now operated by Electricity.

THE report of the Swiss Federal Railways for 1928 states that expenditure included 9 302 464 frs. for coal (decrease 3 356 783 frs.) and 17 198 223 frs. for electric power (increase 2 332 475 frs.). The distance covered by electric locomotives was 29 290 502 km., and by steam locomotives 17 103 419 km. The price of electric power worked out at 4·85 centimes per kWh, compared with 5·32 in 1927. Expenditure on constructional work was 87 826 391 frs., including 24 404 343 frs. on rolling stock. Expenditure on electrification was 27 449 902 frs., against 60 335 428 frs. in 1927, exclusive of the fourth and fifth instalments—10 million frs. in each case—of the Federal subsidy of 60 million frs. for railway electrification. The end of 1928 witnessed the completion of the first stage of the electrification of the Federal Railway system, of which 1 666 kilos. are now operated by electricity. The electrified lines, representing 56·6% of the Federal Railways system, carry approximately 85% of its total traffic. At the end of 1928 the railways had expended 650 441 255 frs. on the electrification of their system. In 1928 the railways acquired 22 electric express locomotives and 16 electric shunting locomotives, at a total cost of 13 758 168 frs., in addition to 16 motor coaches, at a cost of 4 747 327 frs. They also added 28 passenger coaches for fast trains and 97 goods vans to their rolling stock. At the end of the year they owned 345 electric locomotives for main-line traffic, 20 electric shunting locomotives, 45 motor coaches operating under 15 000 V, 10 motor coaches operating under 5 500 V, 17 tractors and other vehicles working with batteries.

THE SOCIAL SIDE.

The first G.E.C. dance of the season was held at Magnet House, on November 8th, when there was a good attendance. The arrangements being in the capable hands of Miss Harbour and Mr. Nash, a very successful evening was the outcome. On November 9th a social evening was held at Magnet House, when the "Wilson" and "Byng" tennis challenge cups were presented to the winning teams by Mrs. F. P. Driver, in the unavoidable absence of the donors, Mr. C. Wilson and Mr. E. G. Byng. These trophies, the former for gentlemen and the latter for ladies, were competed for by the whole of the London Establishments of the G.E.C., and won by the Osram Lamp Works gent's team and the Magnet House (London) ladies' team. Singing and dancing, interspersed with conjuring and ventriloquial entertainments by various G.E.C. "stars," contributed towards a very pleasant evening. The fortnightly debate provided some keen discussion, the motion "That the tendency of the cinema in England is to undermine English character" being lost by a large majority. Football, hockey, netball and Badminton sections of the G.E.C. Social Club have heavy programmes and are meeting with pronounced success, while the Choral Society is rehearsing ambitious numbers.

A CHRISTMAS lamp display at the trade counter of the General Electric Co., Ltd., at Magnet House, Kingsway, London, W.C.2. Christmas tree lighting sets and colour-sprayed lamps are interspersed among holly and other leaves.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

CLYDEBANK CORPORATION.—Electric lighting work in connection with erection of about 320 houses at Parkhall housing site, No. 2 development. Intending contractors apply to Mr. J. W. Johnston, town clerk; deposit £1 1s.

STROUD JOINT HOSPITAL BOARD, November 29th.—Electric light wiring of administrative block of Stroud Isolation Hospital. Particulars from the Clerk to the Guardians, John Street, Stroud.

BELFAST CORPORATION, December 2nd.—Manufacture, supply, and erection of (*a*) h.t. armour-clad switchgear (specification W. 99); (*b*) transformer kiosks (W. 100); three-phase star neutral earthing compensator (W. 101); and cable testing equipment (W. 102). Specifications, etc., from Mr. F. H. Whysall, city electrical engineer and manager, East Bridge Street, Belfast; deposit £2 2s.

EDINBURGH EDUCATION AUTHORITY, December 2nd.—Electric lighting and heating installations in the projected extension of Lochend Road School. Specifications, etc., from Mr. J. M. Johnston, 47, Charlotte Street, Leith.

STOCKPORT CORPORATION, December 2nd.—Supply and erection of 6 600 V switchgear, comprising metal-clad, compound-filled switch units. Specification (No. 3A) from Mr. R. Lee, borough electrical engineer, 23, Tiviot Dale, Stockport; deposit £1 1s.

ROCHDALE CORPORATION, December 3rd.—Electric lighting and power installations in 104 houses on Spotland estate. Particulars from the Borough Surveyor, Town Hall, Rochdale.

BIRMINGHAM GUARDIANS, December 4th.—Electrical work at Western House. Specification, etc., can be obtained from Mr. C. P. Beech, Union Offices, Edmund Street, Birmingham; deposit £2 2s.

NEWBURY CORPORATION, December 5th.—Electric motors, starting gear and centrifugal pumps, with ancillary works, at pumping station. Specification, etc., from Messrs. Howard Humphreys and Sons, 28, Victoria Street, Westminster, S.W.1, on and after November 18th; deposit £3 3s.

STEPNEY (LONDON) BOROUGH COUNCIL, December 5th.—Installation of wireless receiving equipment and apparatus at each of the Council's three hospitals, with l.t. charging machines, h.t. generators, motor to drive generators, accumulators, etc. At the three hospitals the requirements include 1 160 pairs of headphones and 24 loud speakers. Specifications, etc., from the clerk, Mr. S. McClelland, Bancroft Road, Mile End, E.1; deposit £1.

GLASGOW CORPORATION, December 7th.—Electrical work in connection with erection of observation ward at Belvidere Hospital. Specifications, etc., from the Office of Public Works, 64, Cochrane Street, Glasgow; deposit £3 3s.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, December 10th.—Extra high and medium pressure cable extensions (contract No. 48). Specification, etc., from Mr. R. W. Willis, electrical engineer and manager, 37, High Street, Cheadle, Cheshire; deposit £2 2s.

Transformers, Switchgear, etc., for Manchester.

MANCHESTER CORPORATION, December 10th. and December 17th.—(*a*) Delivery and placing into position, at Barton power station, of twelve single-phase feeder reactors (specification No. B. 71); (*b*) supply and erection, within Manchester area of supply, of one 6 600 V sheet steel type transformer kiosk and switchgear (specification No. 259); (*c*) supply and placing in position, within Manchester area of supply of 125–250–500–750–1 000 kVA, 6 400/400 V, three-phase, oil immersed, self-cooled transformers (specification No. 260). Specifications, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s. for each. Tenders for (*a*) and (*c*) by December 10th, and for (*b*) by December 17th.

MANCHESTER CORPORATION, December 13th.—Supply of electrically propelled tower ladder vehicles. Specification, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

HULL CORPORATION, December 19th.—Supply of electricity meters (contract No. 148). Forms of tender, etc., from Mr. J. N. Waite, city electrical engineer, Electricity Works, Sulcoates Lane, Hull; deposit £2.

MILLOM URBAN DISTRICT COUNCIL, December 20th.—Haverigg extension scheme, comprising e.h.t. and l.t. cables, pillar box, etc. (section A); and e.h.t. and l.t. switchgear, transformers, etc. (section B). Specification, etc., from Mr. A. Lawrence, solicitor, clerk to the Council.

CENTRAL ELECTRICITY BOARD, December 21st.—Supply and erection of 132 000 V transformers in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.-F.T.1) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

HALIFAX CORPORATION, December 21st.—Electrician's work in connection with erection of new Girls' High School at Craven Lodge. Names of intending contractors to be sent by December 21st to Mr. A. C. Tipple, borough engineer, Crossley Street, Halifax; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, January 6th.—Supply and erection of 132 kV overhead transmission lines (special crossings and high spans), in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.—P.L. 2) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note:—An asterisk denotes that local representation is, in practice, essential.*

WESTERN AUSTRALIA GOVERNMENT, November 29th.—Supply and erection at Perth of (*a*) boiler house equipment, and (*b*) 12 500 kW turbo-generator and condensing plant. Specifications (£1 1s. for each; not returnable) from the Agent-General for Western Australia, Savoy House, Strand, London, W.C.2.

EGYPTIAN MINISTRY OF THE INTERIOR, November 30th.—Diesel engine driven electric lighting installation at Abou-Tig. (Reference B.X. 5 791.)

BLOEMFONTEIN MUNICIPALITY, December 2nd.—Supply of two electrically-driven low lift pumping units and two electrically driven high lift pumping units, with cables, startors, valves, etc. (contract No. 18, 29/30).

BLOEMFONTEIN MUNICIPALITY, December 2nd.—Supply of copper conductors, poles, transformers, switchgear, etc., for electrification of Mazelspoort Waterworks (contract No. 19, 29/30). (Reference B.X. 5 825).

MADRAS GOVERNMENT, December 3rd.—Electrically-driven hoisting drums, in connection with Pykara hydro-electric scheme. Specification (C. 17—part of) can be obtained (on payment of 5s.), from Messrs. Balfour, Beatty and Co., 66, Queen Street, London, E.C.4 (acting on behalf of Power Securities Corporation, Ltd.).

INDIAN STORES DEPARTMENT, December 3rd.—Ceiling and table fans. (Reference B.X. 5 672.)

CAPE TOWN MUNICIPALITY, December 4th.—Supply of 200 c.i. pole bases (specification No. 481/1929). (Reference A.X. 8 771.)

CAPE TOWN MUNICIPALITY, December 4th.—Supply of 50 35 ft. tubular poles (specification No. 479/1929) and 1 500 30 ft. tubular poles (specification No. 480/1929). (Reference A.X. 8 773.)

VICTORIAN ELECTRICITY COMMISSION, December 9th.—Supply of 3 000 kVA transformers and spares (specification No. 29/119). (Reference B.X. 5 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Switchboard keys and parts (schedule No. C. 496). (Reference B.X. 5 776.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Supply of electric lamps, lamp caps and sockets for the Government telephone service (schedule C. 497). (Reference B.X. 5 783.)

ROUMANIAN POSTS, TELEGRAPHS AND TELEPHONES, December 10th.—Bronze wire, hard and soft copper wire and copper sleeves. (Reference A.X. 8 809.)

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GATOOMA (SOUTHERN RHODESIA) MUNICIPALITY, December 12th.—Two fire-tube boilers, steam engines, alternators and switchboard, etc. (Reference A.X. 8 749.)

CHRISTCHURCH DRAINAGE BOARD, December 13th.—Supply and installation of four electrically-driven automatically-controlled pumping plants, each consisting of two horizontal centrifugal pumps with direct-coupled electric motor (contract No. 29/420); and two horizontal type, 3 H.P. a.c. motors direct coupled with centrifugal sewage pumps (contract No. 29/421). (Reference A.X. 8 788.)

Electric Pumping Plant for N.S.W.

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, December 16th.—Supply and erection of electrically-driven pumping plant, with ironwork, crane and gantries, for Junee water supply. (Reference A.X. 8 740.)

VICTORIAN ELECTRICITY COMMISSION, December 16th.—Oscillograph equipment. (Reference B.X. 5 692.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Secondary batteries (schedule C. 505). (Reference B.X. 5 777.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Telephone fuses, heat coils and protectors (schedule C. 498). (Reference B.X. 5 784.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Loading coil pots (schedule C. 499). (Reference B.X. 5 785.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 27th.—Telegraph material, including g.i. tubular arms, insulators, upper tubes for poles, etc. (tender No. 175). (Reference A.X. 8 734.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, December 28th.—Supply and erection at site of Mankabad Barracks of three Diesel engine driven electric generators, and sinking of two wells. Specifications (£1 os. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 4th.—Supply and erection at site of Meadi Barracks, Cairo, of two Diesel engines to drive existing generators. Specifications (£1 os. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 6th.—Supply and erection of plant for supply of filtered and unfiltered water, including pumps, electric motors, etc. (Reference A.X. 8 746.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of testing instruments (schedule C. 504). (Reference B.X. 5 786.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of timing clocks (schedule No. C. 507). (Reference B.X. 5 762.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of contact pressure testers (schedule No. C. 516). (Reference B.X. 5 821.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of telephone hand sets (schedule C. 526). (Reference B.X. 5 823.)

BLOEMFONTEIN MUNICIPALITY, January 10th.—Supply of automatic electric traffic signals (contract No. 5). (Reference B.X. 5 887.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 13th.—Supply of four-point jacks (P. and T. 151/1897). (Reference B.X. 5 840.)

Australian Switchgear Contract.

VICTORIAN ELECTRICITY COMMISSION, January 13th.—Supply of 2 200 V switchgear and accessories (specification No. 30/2). (Reference B.X. 5 827.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of ringing motor-generator sets, for automatic telephone exchanges. (Reference B.X. 5 839.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of telephone indicators (schedule C. 518). (Reference B.X. 5 822.)

CAPE TOWN MUNICIPALITY, January 15th.—Supply of direct-coupled, electric motor driven, centrifugal pump for sewage works (specification No. 475/1 829). (Reference A.X. 8 836.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 15th.—Supply of automatic telephone exchange equipment for new station at Auckland. (Reference B.X. 5 841.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 16th.—Plug covers for telephone switchboard plugs. (Contract P. and T. 151/1 943.) (Reference B.X. 5 879.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 28th.—Supply of 50 kV oil-immersed circuit breakers, with current transformers and relays (section 299). (Reference B.X. 5 878.)

POSTMASTER-GENERAL'S DEPARTMENT, January 28th.—Supply of telephone cycle signalling equipment. (Reference B.X. 5 906.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 28th.—Supply of induction coils and regulator plates (schedule No. C. 533). (Reference B.X. 5 899.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

Tenders Accepted.

HEMEL HEMPSTEAD GUARDIANS.—Gibbons, electric light installation in laundry and kitchen, £24 3s.

CARLISLE EDUCATION COMMITTEE.—R. M. Hill and Sons, electric light installation at Newtown School.

CANTERBURY CORPORATION.—Electricars, Ltd., supply of electric vehicle for refuse collection, £470. (Recommended.)

BOMBAY CORPORATION.—Chloride Electrical Storage Co., Ltd., supply of battery for lighting set at Tansa, Rs. 2 495.

TENTERDEN RURAL DISTRICT COUNCIL.—C. Milsted and Sons, electric light installation at Gate Field Cottages, Rolvenden, £7 18s. 6d.

GLASGOW CORPORATION.—John Thompson (Water Tube Boilers), Ltd., six boilers, for Pinkston tramways power station, £90 327. (Recommended.)

UPTON-ON-SEVERN RURAL DISTRICT COUNCIL.—Addyman, of Worcester, electric light installation in Council houses, parlour type, £6 3s. each; non-parlour type, £4 12s. each.

CROYDON CORPORATION.—Works auxiliary switchboard: Ferguson, Pailin, Ltd., ironclad £3 051, cubicle, £1 728 (recommended). Also tendered: Metropolitan-Vickers Electrical Co., Ltd., £3 306 and £1 870; English Electric Co., Ltd., £3 342 and £1 889; British Thomson-Houston Co., Ltd., £3 394 and £1 950; Switchgear and Cowans, Ltd., cubicle, £1 871; A. Reyrolle and Co., Ltd., ironclad, £3 388.

CROYDON CORPORATION.—Equipment for connecting up new switchhouse to existing switchrooms, English Electric Co., switchroom A—modification to existing No. 4 10 000 kW generator switchgear cell and control panel, £280; modification to existing No. 5 10 000 kW generator switchgear cell and control panel, £117; new split conductor feeder switchgear cell and control panel 300 A, £711. Metropolitan-Vickers Electrical Co., Ltd., switchroom B—2 400 A group feeder equipment, £1 763; modifications to auxiliary transformer cubicle, £480; busbars, troughing, etc., £346; tank raising and lowering devices, £120; two split conductor feeder equipments, £902; erection, etc., £1 500; potential transformers, £500; current transformers, £150. Metropolitan-Vickers Electrical Co., Ltd., switchroom C—2 400 A group feeder equipment, £2 521; 1 000 kVA auxiliary transformer unit and control panel, £1 243; split conductor feeder equipment, £1 212; split conductor feeder equipment, for Addiscombe No. 3 unit, £1 360; 1 800 A interconnector unit, £1 254; two split conductor feeders, £2 721; busbar cross-overs, £1 940; contingencies, cabling, etc., £1 000 (All recommended.)

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WORK IN PROSPECT.

BIRMINGHAM.—286 houses. Particulars, Mr. A. F. Underhill, Housing Director, Council House, Coventry.

BOLTON.—Erection of baths and wash-houses. Particulars, Borough Engineer, Town Hall.

BOURNEMOUTH.—Motor-bus and coach station. Particulars, Messrs. Jackson and Greenen, architects, Bournemouth.

BOSTON.—Three new blocks at the Fever Hospital. Particulars, Borough Engineer.

BRADFORD.—Rebuilding of Central Area as a shopping centre. Particulars, Mr. E. Cowles-Voysey, architect, Gray's Inn Square, London, W.C.

BRIGG.—Alterations and additions to Brigg Grammar School. Particulars, Mr. H. G. Gamble, architect, Lincoln.

BROUGHTON.—New club house and billiard room. Particulars, Messrs. Gotch and Saunders, architects, London.

BURY.—New Music Pavilion. Particulars, Borough Engineer.

COVENTRY.—New branch of Lloyds Bank. Particulars, Messrs. H. T. Buckland and W. Haywood, architects.

EDINBURGH.—New school. Particulars, Mr. J. M. Johnston, 47, Charlotte Street, Leith.

GREAT YARMOUTH.—Additions to Girls' High School. Particulars, Messrs. Olley and Howard, architects, Great Yarmouth.

HENDON.—Welfare centre and school clinic. Particulars, Mr. A. O. Knight, engineer, Town Hall, Hendon, N.W.4.

KETTLESING.—New Wesleyan chapel. Particulars, Mr. J. Ward Knowles, architect, Accrington.

KIRKCALDY.—Slaughter house, to cost £20 000 to £25 000. Particulars, Borough Surveyor.

LEEDS.—Extension at Rawdon Baptist College, to cost £5 000. Particulars, Mr. Herbert Illingworth.

LLANDOVERY.—New casual wards. Particulars, Mr. J. Owen Parry, Ammanford, S. Wales.

LONDON.—New cinema to accommodate 3 500. Particulars, Mr. George Coles, architect, Craven Street, Strand.

LINTHWAITE.—Extensions to Cotton Waste Mills, for W. E. Cotton and Sons, Ltd. Particulars from John Kirk and Sons, architects, Huddersfield.

MANSFIELD.—Two picture palaces, one near post office and one at High Stree , Edwinstowe, to cost £13 000 and £8 000 respectively. Particulars from Mr. Beyan Dean, architect.

MANCHESTER.—Reconstruction of the "Three Arrows," Barry Road, Ainsworth. Particulars from Messrs. Graves and Ellerton, architects, Manchester.

MARYLEBONE (LONDON).—Large block of flats in Seymour Place. Particulars, Messrs. Joseph, architects, 2, Paul's Bakehouse Court, E.C.4.

NORFOLK.—New offices for C.C. Particulars from Boardman and Sons, architects, Norwich.

PADDINGTON.—New buildings for St. Mary's Hospital, to cost £500 000. Particulars, Sir Edwin Cooper.

PLYMOUTH.—New school to accommodate 800, and clinic. Particulars, Mr. J. Wibberley, city engineer.

ROTHWELL.—New Conservative club. Particulars, Mr. J. Brown, Chartered architect, Northampton.

ROTHERHAM.—340 houses on the Herringthorpe Estate. Particulars, Borough Engineer.

SCARBOROUGH.—Enlargement and reconstruction of "Red Lion," Longwestgate. Particulars, Mr. F. Baker.

SOUTHWELL.—New church school and reconstruction of existing buildings. Particulars, Mr. Cyril E. W. Haseldine.

SUNDERLAND.—300 houses, at Bainbridge Holme. Particulars, S. T. Brown and Son, architects, 51 Fawcett Street.

TWICKENHAM.—51 houses between Fifth and Sixth Cross Roads. Particulars, Messrs. White and Moyes. — 28 houses on north side of Nelson Road. Particulars, P. Chase Gardener and Co., Ltd., architects, Hounslow.—29 houses Hampton Road. Particulars, Mr. G. T. Crouch.

WESTMINSTER (LONDON).—Adaptation of Nos. 8, 9 and 10, Great George Street. Particulars, County Architect, 89-91, Tufton Street, S.W.1.

WEYBRIDGE.—Erection of a new ward at Hospital. Particulars, Mr. E. C. Hughes, contractor, Wokingham.

WHITBURN (DURHAM).—New Council school. Particulars, Mr. F. Willey, architect, 34, Old Elvet, Durham.

WINDLESHAM.—New fire station, for U.D.C. Particulars, Council's Surveyor.

WORTHING.—Office and oil depot, at the West Worthing ods yard. Particulars, British Petroleum Co.

TRADE PUBLICATIONS.

THE DRAYTON REGULATOR AND INSTRUMENT CO., LTD., West Drayton, Middlesex, has issued list No. 128, relative to the "Dial Set" temperature regulator.

The "Reliability Wireless Guide" No. 296, with electrical supplement, has been published by J. H. TAYLOR AND CO., Macaulay Street, Huddersfield.

MAVOR AND COULSON, LTD., 47, Broad Street, Glasgow, S.E., have issued a new leaflet dealing with the latest "M and C" troughed belt gate-end loader.

Publications recently received from B.E.N. PATENTS, LTD., 92, Tottenham Court Road, London, W.C., include leaflets dealing with the company's mechanical polisher and air units.

FALK STADELMANN AND CO., LTD., 83/93, Farringdon Road, London, E.C., has published booklet P1363, concerning electric fires, and a special catalogue dealing with the same subject.

A new showcard just issued by Siemens Electric Lamps and Supplies, Ltd.

The latest publication of SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38/39, Upper Thames Street, London, E.C.4, is catalogue No. 405, devoted to "Xcel" domestic electrical appliances.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C., has published leaflet No. 6612, dealing with dual wave coils, and No. 6626, describing the "Megastat" volume control.

List No. 11029, containing a full description and several illustrations of mercury switch tubes has been sent to us by the SAXONIA ELECTRICAL WIRE CO., LTD., Roan Works, Greenwich, London, S.E.10.

We have received from the REDFERN RUBBER WORKS, LTD., of Hyde, near Manchester, a copy of a new brochure entitled "Rubber: The Story of a Famous Manufacturing Firm." The issue is extensively illustrated.

"You are Losing Money" is the striking title given to a new publication by OWENS BOILER CIRCULATOR, LTD., 22, Surrey Street, Strand, London, W.C.2. The subject dealt with is the economic generation of steam.

The London agents for "Gee Gee" electric water heating apparatus, E. R. MORTON, LTD., 22, Bartlett's Buildings, Holborn Circus, London, E.C.4, have sent us a copy of a new catalogue dealing with the apparatus offered.

The HENDON LAMP AND ACCESSORIES CO., LTD., 104, Southampton Row, London, W.C.1, has published special lists for overprinting, concerning the "Hendon" British-made lamps and the "Popular" continental lamps.

"Nonpareil Sheet Cork for Land Type Cold Stores" is the title given to a new folder by NEWALLS INSULATION CO., LTD., Washington, co. Durham. The same firm has published a booklet dealing with insulating bricks and other forms of insulation.

A well-produced brochure describing and illustrating the various types of "Sisson" engines, has been sent to us by W. SISSON AND CO., LTD., Elmridge Road, Gloucester. The publication is well illustrated, and includes details of the employees' social and welfare activities.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs, have replaced folder P.243 with P.F.60, the subject being single-phase meters. H.96 has also been replaced with P.F.61, ebonite sheathed cables being the subject matter. The "Mistake-Proof" switch cut-out is dealt with in a new publication, P.183.

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ELECTRICITY SUPPLY.

Hay Electricity Undertaking and the Builth Wells Electricity Supply Co. Acquired by the S.W.S. Electric Power Co.—Shannon Scheme News—Supply for Abertillery—Electrical Development in New Zealand.

DOVER T.C. has applied for a loan of £2 000 for electric mains.

Croydon Electricity Committee is to lay a distributor in the Wellesley Road district, at a cost of £500.

Batley T.C. is to seek sanction to borrow £2 800 for e.h.t extensions and £5 000 for mains and services.

Wandsworth (London) Highways Committee is to improve street lighting in Clapham, at a cost of £1 143.

The County of London Electric Supply Co.'s sub-station at Broadwater Road, Tooting, is to be extended.

St. Helens T.C. has applied for a Special Order to cover the parish of Bold, and a portion of the township of Burtonwood.

Winchester Council has received sanction to a loan of £8 567, part of the cost of supplying electricity to the parishes of Twyford and Compton.

The Wessex Electricity Supply Co. is to supply current to the village of Chieveley by overhead lines. Energy will be available early next month.

St. Pancras (London) Electricity Committee proposes that the standing charge under the "one-meter" system should be reduced from £16 to £12 per kW.

Eston Electricity Committee seeks sanction to borrow £1 000 for hired wiring; £1 000 for services; £1 500 for meters and £250 for domestic apparatus.

The undertaking of the Builth Wells Electricity Supply Co., Ltd., has been acquired by the Shropshire, Worcestershire and Staffordshire Electric Power Co.

A supply of current provided by the West Wilts Electric Light and Power Co. has been inaugurated in the village of Box. For street lighting there are twenty-nine lamps.

The Clyde Valley Electrical Power Co. has offered to provide a cable to supply electricity to Biggar and district provided a sufficient number of guarantors can be obtained.

The Central Electricity Board has informed the Featherstone Urban Council that wires in the Council's area cannot be placed underground owing to the cost. The Council is approaching the Minister of Transport on the question.

A 7 000 kW turbo-alternator installed by the Metropolitan-Vickers Electrical Co., as sub-contractors to Vickers-Armstrong, was formally started by the Mayoress at the Barrow electricity works on November 15th. The new plant cost £60 000.

The Shropshire, Worcestershire, and Staffordshire Electric Power Co. has acquired from Mr. W. Lilwall the Hay electricity undertaking, which has served Hay since 1911.

West Lancashire Council is making application to the Commissioners for sanction to a loan of £22 625 in connection with development in the parishes of Aughton, Maghull and Lydiate.

Birtley P.C. has received sanction to a loan of £2 600 for converting the public lighting from gas to electricity. Energy will be supplied by the County of Durham Electrical Power Distribution Co., Ltd.

Porthcawl U.D.C. is to hold a special meeting to consider a proposal to apply to the Electricity Commissioners for authority to transfer the Council's electricity undertaking to the General Electric Co., Ltd.

Ashford Electricity Committee has reported on the offer of the Kent Power Co. for a bulk supply, but the U.D.C. has agreed to proceed with the necessary negotiations with the Electricity Commissioners for plant extensions.

Ballyboy (Co. Managhan) T.C. has passed a resolution calling on the Electricity Supply Board to hasten with the supply from the Shannon scheme, as the Electric Light Co. has increased its charges from 1s. to 1s. 2d. per kWh.

Burnley Electricity Committee has received approval of an electricity scheme for the relief of unemployment. It provides for the extension of a h.t. feeder from Brunshaw to Plumbe Street; the laying of an e.h.t. feeder from Every Street, to Rosehill; and the renewal of various mains.

It is proposed that with the coming of the Shannon scheme the Dundalk power station, which has been under municipal control for 18 years, should be scrapped. The U.D.C. asks the Electricity Board to inquire whether expediency does not outweigh considerations of strict economy in this particular case.

In view of the circumstances disclosed by the negotiations carried on with the several bodies concerned, Islington (London) Electricity Committee recommends that the Council approve generally of the scheme of the London and Home Counties Joint Electricity Authority regarding a bulk supply for the borough.

At a public meeting in Carrick-on-Suir Town Hall last week, it was agreed to sign a petition and send it to the Electricity Supply Board protesting against the increased charges. It was stated that charges that had been fixed at 1s. 6d. a week were raised to 2s. 3d. and 2s. 6d., and charges of 3s. 6d. per week had been raised to 5s. At least 200 houses in the town have been wired.

Portland Electricity Committee has arranged that two-rate meters be installed for shop lighting, provided a maximum of 120 W be connected on the shop lighting circuit. The Committee has arranged to supply current to the premises of the National Omnibus and Transport Co., Ltd., at Victoria Square. The U.D.C. has decided that underground cables be used in the whole of the compulsory area.

Mr. Frank Hodges switched on the current on November 22nd at the new sub-station from which a supply of electricity is given in Abertillery, and Mr. J. Hillier, chairman of the Electricity Committee of the U.D.C., switched on the l.t. gear. A supply is taken in bulk from the Ebbw Vale Co. and the equipment of the sub-station was provided by the Electric Construction Co., Ltd., and A. Reyrolle and Co., Ltd.

An l.t. cable to distribute current to Islip's Manor and the Northolt Housing Estate is to be laid by the Uxbridge and District Electricity Supply Co. The cost of the house services, to be paid by the Ealing T.C., is £3 3s. 10d. per house. Tenders are to be invited for the house wiring.—The Council has agreed to offer no objection to the placing by the Metropolitan Electric Supply Co. of overhead lines to the Sewage Works.

At a meeting of Hull Electricity Council last week Mr. J. N. Waite, city electrical engineer, reported on the scheme for supplying electricity to Willerby and Kirkella, and stated that the Rural and Parish Councils had sanctioned the overhead lines, but objection had been taken by the residents in Victoria Avenue. The Council decided to support the Engineer, and authorised him to apply for compulsory powers, if necessary.

In reply to a request for lower charges for current supplied by the T.C., Hastings R.D.C. has been informed by the Electricity Commissioners that from figures supplied by the Borough Accountant there was a deficiency in the extended area of £1 241 for the year ending March 31st last, and that it was estimated that there would also be a deficiency for the current financial year. A reduction in the charges would depend entirely on the income.

Carnarvon T.C. has decided to terminate its agreement with the National Electric Construction Co., and to carry on the electricity undertaking as a municipal concern. The company offered to provide a supply at a maximum charge of 6d. per kWh for lighting, 2d. for heating and cooking, and 2½d. for small power; and to pay to the Corporation 25% of the net profit made in any year, but the Council decided not to renew the agreement.

The Calcutta Electric Supply Corporation has issued to the share and debenture holders a statement relating to the project to tunnel under the river Hooghli, to enable all necessary cables to be carried across to the right bank. A contract has been let for the construction of the tunnel and the contractors are John Cochrane and Sons, Ltd., of London. It is estimated that the work should be completed by mid-summer, 1931, if no unforeseen complications are encountered.

The official opening of the first generating station under the Waikaremoana hydro-electric power plant, the last of the three major power schemes of the North Island of New Zealand, took place last week. There are to be three generating stations which will derive their power from the Waikaremoana Lake, and the part of the equipment of the first station which has now been put into operation will supply power to the Gisborne, Napier, and Wellington districts. It will eventually be linked up with the Arapuni scheme, near Auckland, and with Wellington's station, Mangahao, to form the complete scheme for North Island. The new installation provides 40 000 H.P., and the potential capacity is 190 000 H.P. That from the Arapuni plant is 96 000 H.P., and of Mangahao 24 000 H.P.

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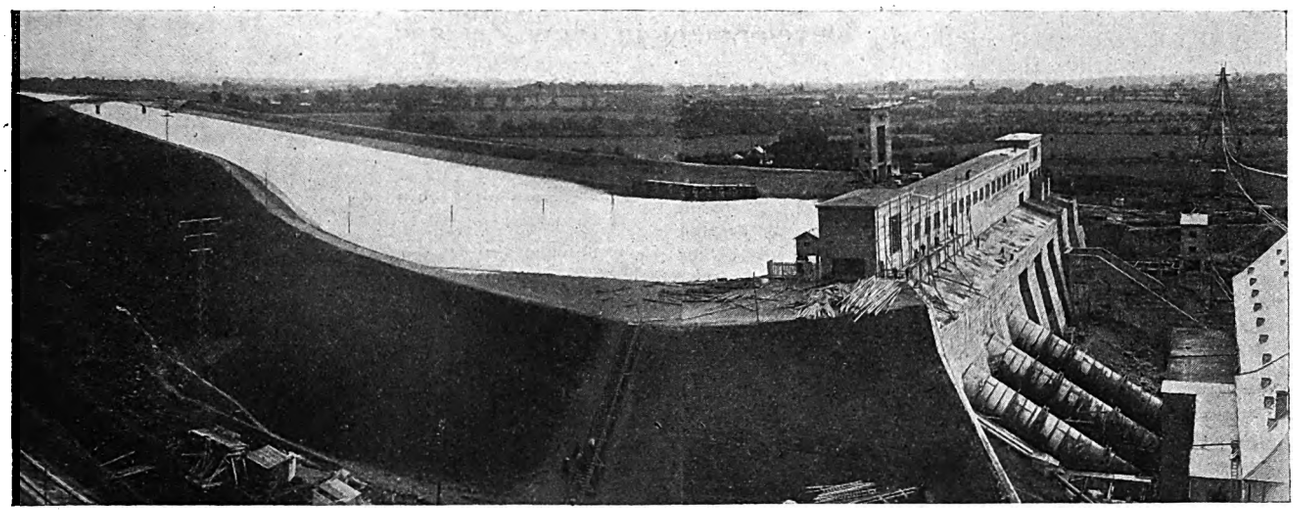
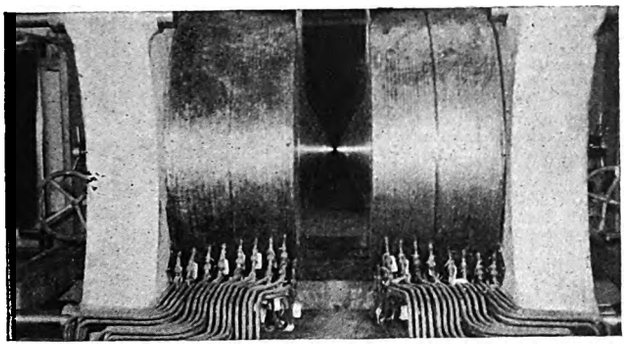
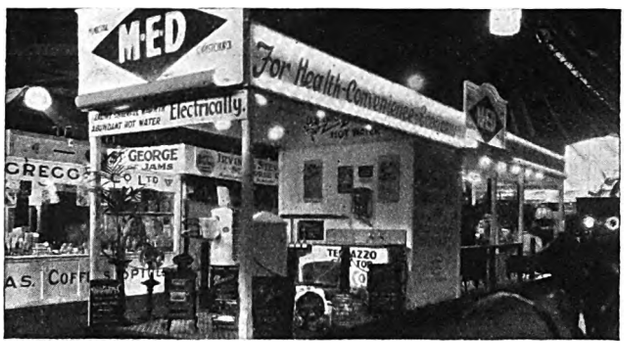
ELECTRICAL NEWS OF THE WEEK IN PICTURES.



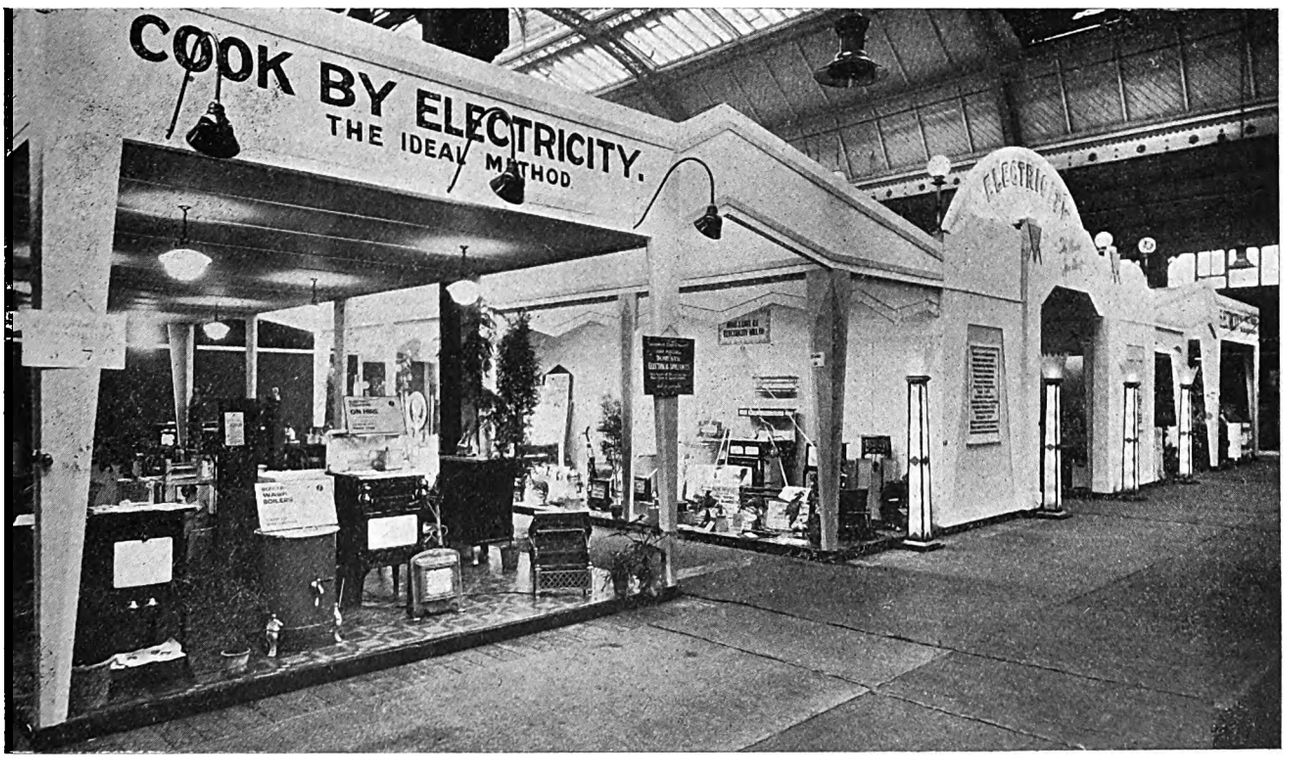
One end of the head race for the Shannon Electricity Scheme. This view shows a part of the 7½-mile cutting on the left, with the 100-foot fall to the Ardnacrusha power station on the right. Current is already being transmitted over a network south of Dublin to Limerick.



This electro-magnet, claimed to be one of the largest in the world, is part of the equipment at the Academy of Science of Paris. This picture and that of the Faraday electro-magnet published last week make an interesting comparison.



The stand of the Christchurch (N.Z.) Electricity Department at the local Winter Show. The exhibit was visited by 80 000 persons, excluding schoolchildren, and many inquiries were converted into sales.



The combined electrical stand at the Smoke Abatement Exhibition recently held in Manchester. The stand was a combined display by a number of supply undertakings in the neighbourhood, together with the E.C.A. and the E.D.A. The equipment was loaned by a number of manufacturers. In the centre of the stand was a series of seven rooms representing a house wired in accordance with the E.D.A. specification, whilst in other parts of the stand were sectionalised shows of domestic electrical equipment. Demonstrations of electric cooking for domestic purposes and also bread and confectionery baking were held daily. A section of the stand, seen in the centre, was designed to indicate what a unit of electricity will do. Another part of the exhibit was the showing of E.D.A. films.

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COMPANY NEWS.

Improved Prices of Electrical Securities—Ferranti's Increased Net Profit—Telephone Manufacturing Co.'s New Policy—Reports and Dividends.

RECOVERY has occurred during the past week in the prices of electrical securities, the most noteworthy movements being in the shares of two leading cable manufacturing companies. W. T. Henley's ordinary shares, in spite of the deduction of the dividend from the price, register a rise of 5s., from £5 12s. 6d. to £5 17s. 6d., and Enfield Cable Works ordinary shares at £4 17s. 6d. have regained last week's fall of half-a-crown. Callender's are unchanged at £3 12s. 6d. Johnson and Phillips at 36s. 3d. are 1s. 3d. to the good, notwithstanding that their dividend is no longer included. The same applies to Ever Readies, which have risen from 18s. 3d. to 19s. General Electrics have moved up from 45s. to 46s. 3d., and Associated Electrical Industries have risen nearly 2s.

Hydro Electrics are up to 39, after having been higher, and International Holdings also finish below the best at 6¼. Radio Corporations are slightly better at 36, and Marconi Internationals have recovered from 41s. 3d. to 45s. Cables and Wireless issues have also hardened; the "A" stock at 81½ has regained the two points dropped last week, and the "B" stock at 44 has also recovered two points. International Telephone and Telegraph stock is up to 75 dollars again, recovering the five dollars lost last week, and American Telegraph and Telephone capital stock has advanced from 225 to 230.

Transportation shares have shown irregularity. District and Metropolitan railway ordinary stocks have risen 1 and ½ respectively; but British Electric Traction issues have fallen, the ordinary stock 3 points to below 120.

In the electricity supply section, Bournemouth and Poole shares have recovered to the extent of half-a-crown, and Clyde Valley to the extent of 1s. 3d. The latter's preference shares are 1s. down at 27s. 6d. Yorkshire Electric Power ordinary shares have risen from under 32s. to 33s. 6d., regaining last week's fall; and Midland Counties and Scottish Power ordinary shares at 27s. 6d. and 29s. are each sixpence to the good. County of London ordinary shares are a shade better, but South Londons have shed a shilling to 25s. 6d., and Westminsters 6d. to 25s.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	20/6	22/6	19/9
6½	" " " C. Cum. Pref. ..	20/6	20/6	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	58/9	56/3	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	26/-	26/-	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	51/10½	51/10½	56/-	32/6
5	" " " 5% Cum. Pref.	21/3	21/3	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	93½*	94½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	36/3	35/-	41/6	26/6
8	" " " " 8% Pref.	27/6	28/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	48/9	48/1½	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	48/1½	48/1½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	45/-	26/9
4	Fife Tram. Lt. & P Ord.	12/6	12/6	23/6	10/-
6	" " " " 6% C.P.	15/-	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	£17/6
4½	" " 4½% 1st Mt. Deb. Stk.	89	89	92	80½
—	Hydro Electric Securities ..	35	38	87	20
—	International Holdings	5⅞	6¼	35½	6¼
(e)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref...	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	28/-	28/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/-	27/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	97	97	104	95
10	Melbourne Electric Ord. Stk. ..	170	170	180	150
1/9½	Metro. Elec. Sup. Ord.	36/3	36/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	27/6	27/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(c)	St. James & P.M. Ord. (£1) ..	26/-	26/-	28/6	23/6
8	Scottish Power Ord.	29/-	28/6	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	25/6	26/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	20/-	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	93½	92½	98½	86½
7	Urban E.S. Ord.	35/-	35/-	46/6	18/-
5	Victoria Falls Power Ord. ..	58/9	56/3	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	81½	81½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	87½	87½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	119½*	122½	152	117
7·67	" " " 6% Pf. Stk.	123½*	124½	133	103½
6	Calcutta Trams Ord.	14/4½	15/7½	24/-	14/6
5	" " " 5% Cum. Pf.	13/9	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb. ..	77	77	83	77½
5	City & S. London, Cons. Ord. ...	67	67	64	52
4	" " 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	74	74	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	61	60½	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	72½	71½	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	82½	83½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	22/-	22/-	28/2	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	83½	83½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	30/-	28/1½	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " " 4% Mt. Deb.	75½	75½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	75/-	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " " 7% C.P. ..	20/-	21/3	22/9	21/-
4	" " " 1st Mt. Deb. ..	66½	66½	75	68
20	Enfield Cable Works Ord. ..	97/6	95/-	82/-	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	6/3	6/3	15/9	5/-
—	" " 6% C.P.	8/9	8/9	18/9	7/-
5½	" " 1st Mt. Deb. ..	88	88	103½	86
6	" " Conv. Deb. ..	71½	71½	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/-*	18/3	92/3	18/1
10	" " 7% Partic. Pref. ..	29/-*	29/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	46/3	45/-	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P.	25/-	25/-	27/9	22/9
7	" " 1st Mt. Deb. ..	103½	103½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	117/6*	112/6	120/-	69/3
10	International Auto. Telephone Ord	35/-	35/-	50/6	35/-
10	Johnson & Phillips Ord.	36/3*	35/-	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord. ..	26/3*	27/6	36/6	24/9
10	" " " Cum. Pref.	32/6	32/6	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/3	21/3	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	230	225	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Tele. Ord. Stk. ..	60½	60½	63½	56½
6	" " " 6% Prefd. Stk...	99½	99½	105½	91
1½	" " " Deferred Stk...	24⅜	24⅜	25½	22
8	Anglo Portuguese Telc. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	81½	79½	—	—
—	"B" Ord. Stk.	44½	42½	—	—
—	5½ Cum. Pref. Stk. ..	96	95½	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	75	75	81½	74
4	Eastern Extension 4% Deb. Stk.	75	76	80	74½
22	Great Northern Telegraph (£10)	29	29	43½	26
10	Indo-European (£25)	52½	52½	48½	30
—	International Teleph. & Teleg. ..	$75	$70	161½	48½
15	Marconi Int. Mar.	45/-	41/3	90/-	16/6
4½	New York Tele. 4½ % Mt. Bds. ..	96½	96½	101	96
12	Oriental Telephone Ord.	38/9	38/9	65/-	41/-
—	Radio Corporation of America ..	35½	36	115½	18½
4½	United R. Plate Tele. 4½ % Deb.	85	87½	89½	82
4	Western Tel. 4% Deb. Stk. ..	76	76	82	76

(a) 1s. 9·5d. per share. (b) 1s. 9·3d. per share. (c) 1s. 8·940d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. *Ex dividend.
(g) 2s 2½d per share.

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Directors' Reports, etc.

PARA ELECTRIC RAILWAYS AND LIGHTING CO., LTD.—Div. on 6% cum. pref. shs. at rate of 3%, less tax, on acct. of year ending Nov. 30 will be payable on that date. Transfer books are closed until Nov. 30, inclusive.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—A drawing of 5½% 2nd mtge. debs. fallg. due for redemptn. on Jan. 1, 1930, will be made on Dec. 6 at the office of the company, 2, London Wall Bldgs., London, E.C.2, at 11 a.m.

PHILIPS' GLOWLAMPWORKS, LTD.—A proposal to increase cap. by £1 250 000 to £2 100 000 has been approved. A fusion between the company and the Splendor Factory has not yet been concluded, but negotiations are proceeding.

FEDERAL NEON SYSTEM.—This company has been formed in the United States to acquire by purchase the electrical advertising and neon tube business of the Federal Electric Co., and by exchange of shs. controllg. interests in Rainbow Luminous Products, Inc., and the National Neon Agency. An issue of £2 000 000 of the company's common stk. is to be offered for subscription.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—Company's progress statement shows that rev. for 1928 was £955 129, agst. £930 291 for 1927, div. was 12% plus bonus 4d. p. sh. (the same for both years), electy. sold was 147 957 366 kWh, agst. 129 090 227, and houses connected at end of 1928 were 27 626, agst. 24 985. Electy. sold in 9 months ended Sept. 30, 1929, 127 290 079 kWh, increase 17 729 902 kWh.

INDO-EUROPEAN TELEGRAPH CO., LTD.—The directors have issued a notice informing the shhldrs. that an offer has been made by Imperial and International Communications, Ltd., for the purchase of shs. of the company at £55 p. sh. upon certain conditns. set out in the offer. Full particulars of such offer, which the directors recommend shhldrs. to accept, and of the steps to be taken by shhldrs. deciding to accept such offer can be obtained at the reg. office of the company, 18, Old Broad Street, London, E.C.2, and at Barclays Bank, Ltd., 54, Lombard Street, London, E.C.3.

CAPE ELECTRIC TRAMWAYS, LTD.—Pft. for year ended June, 1929, £32 755, agst. £38 348. After providg. for deb. int. and redemptn., blce. is £13 314, plus £28 625 brt. in. To res. £5 000, agst. £10 000, leavg. £36 939. Rpt. states positn. with rgeard to motor 'bus competitn. still continues to cause great anxiety, number of opositn. 'buses on the road hvg. doubled during period. Directors regret no div. can be considered until some amelioratn. takes place in present workg. conditns. Combined tramway and motor 'bus services show increase of 758 005 passengers and in receipts of £6 114, but this is much more than counterbalanced by increased expenditure.

NIGERIAN POWER AND TIN FIELDS CO.—First rpt., for period ended March 31, 1929, states Kurra Falls concession, with all works and plant thereon, has been sold to Nigerian Electricity Supply Corporation. Mining areas consist of mining leases over 8 175 acres and exclusive prospecting licenses over four square miles. Apart from a small amount of tin won during work carried out to fulfil Government's labour requirements, no mining operatns. have yet been commenced on these areas, Government having granted a suspensn. of labour obligatns. until such time as electric power is available. Proposals will be submitted for amalgamatn. with Nigerian Base Metals Corporation and Anglo-Nigerian Tin Mines. Directors recommend acceptance of scheme.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Half yearly int. on 5½% 1st mtge. bonds, due Dec. 1, 1929, will be paid by Messrs. Arnus-Gari, 9, Pasco de Gracia, Barcelona, agst. productn. of coupon 36 in the new form. Bondhldrs. have optn. of collectg. the int., in sterling at Bank of Scotland, 30, Bishopsgate, London, E.C., where listing forms can be obtained.—The final instalmt. of $9.30 in respect of the additional ord. shs. of no par value included in certificates of subscription held in respect of the Jan., 1929, issue must be paid on Dec. 2 at the Bank of Scotland, as above, Canadian Bank of Commerce, 2, Lombard Street, E.C.3, or Lloyds Bank, Ltd., 20, King William Street, E.C.4, London.

AMERICAN GAS AND ELECTRIC CO.—A circular, signed by the president and issued to the shhldrs., is to the followg. effect: Do not be alarmed as to the real value of your hldgs: in our company due to the unprecedented panic and hysteria which have been prevailg. upon the Stock Exchanges during the past few weeks. There is nothing in the situatn., as far as your company is concerned, which may occasn. any alarm. Our earngs. are increasg. We have contracts for large amts. of new business coming on to the system. Our public relatns. with our customers are of the very best. The company's assets are stated to be in excess of $400 000 000, and to include cash and call loans in excess of $15 000 000; high grade bonds and pfd. stk. in the treasury having a readily saleable value $60 000 000; physical property, largely now in operatn., paid for out of cash on hand and agst. which bonds and pfd. stks. can be issued and sold, amtg. to more than $40 000 000. Available surplus at Sept. 30, 1929, was $39 308 634.

Company Meetings.

FERRANTI, LTD.—Dr. S. Z. de Ferranti, presiding at the meeting on November 21st, said the net profit for the year was £66 976, against £54 615 for the previous year, an increase of £12 360. The directors had made the usual allocation of £15 000 to depreciation reserve account, and the total now standing to the credit of that account was £151 912, equal to more than one-third of the total value of the fixed assets represented by land, buildings, plant, machinery, etc. During the year £40 000 of the general reserve account was capitalised and transferred to ordinary share capital account. It was now proposed to transfer a similar sum out of profits to general reserve account, and this transfer would make the balance on this account £270 000, the same as last year. The balance-sheet showed that they had spent £44 867 on additional buildings, plant, machinery, fixtures and office furniture. The bank overdraft was £96 805, an increase of £64 831 over last year. This position arose partly from the fact that the balance of the first mortgage debenture stock was paid off in 1928 (£48 000 approximately), and partly from the expansion of trading which had taken place. It was anticipated that this expansion would continue, and this would necessitate raising further capital. The board were considering the method by which this further capital should be raised, and they would, of course, adopt the method which was most economical and desirable, after taking the best advice, and it might be that their suggestions would have to be submitted to the shareholders for approval. A dividend on the ordinary shares of 12%, tax free, was approved, and a balance of £39 572 is carried forward, an increase of £5 456.

TELEPHONE MANUFACTURING CO., LTD.—An extraordinary general meeting was held on Monday to consider the scheme for the separation of the manufacturing side of the company's business from the rental installation side. Mr. Fred. T. Jackson (chairman and managing director) stated that the adoption of this scheme would enable shareholders to participate in the progressive prosperity which had been attained for many years past by the installation side of the business. The profits earned for the past ten years, after charging depreciation and all expenses, but before charging certain non-recurring expenditure and interest, were as follows: 1919, £49 039; 1920, £53 366; 1921, £40 005; 1922, £41 172; 1923, £30 902; 1924, £43 364; 1925, £46 624; 1926, £46 658; 1927, £53 820; and 1928, £54 929. The Australian subsidiary was progressing satisfactorily, the profits for 1927 being £8 869, and for 1928, £12 982, and for the half-year ended June 30th, 1929, further expansion was shown. The average profits of the British installation companies over the past five years were over £49 000 per annum, and the combined profits of the British and Australian companies over the past two years were over £65 000 per annum. It was proposed that a new company be registered to take over the installation side, having a capital of £600 000 divided into 2 400 000 shares of 5s. each, and that the company to be registered to take over the manufacturing side should have a capital of £250 000, divided into a million shares of 5s. each, which would be equivalent to a shareholding of 7s. 6d. for each 10s. share held in the present company, being made up of one share of 5s. in Telephone Rentals, Ltd., for each 10s. share held in the Telephone Manufacturing Co., Ltd., and one share of 5s. in the new Telephone Manufacturing Co. (1929), Ltd., in place of every two shares held in the present company. The joint capital of the two new undertakings would be £750 000, compared with £1 000 000. It was proposed to utilise the difference in writing out of the balance-sheet fixtures, fittings, dies, expenses on share issue, etc. The approval of this scheme would mean that the new company, Telephone Rentals, Ltd., would, immediately the necessary formalities had been completed, declare an interim dividend of 2½%, and a final dividend in the early months of next year, and the Manufacturing Company on the new basis would have every opportunity of becoming a profit-earning concern. The resolution was carried by the requisite majority.

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METALS COATING CO. LTD.

(*Incorporated under the Companies Acts, 1908 to 1917.*)

SHARE CAPITAL, £150,000, DIVIDED INTO 600,000 SHARES OF 5s. EACH.

ISSUED OR TO BE ISSUED: 500,000 SHARES OF 5s. EACH.

The purchase consideration for the Shares in Metallisation (Sales), Limited, has been wholly satisfied by the issue of 80,000 Shares of the Company credited as fully paid. The balance of the capital will be offered in the first instance *pro rata* to the Company's shareholders if and when it is decided to issue the same.

A copy of this Prospectus has been delivered to the Registrar of Companies for registration.

The Committee of the Stock Exchange, London, has granted permission to deal in the shares of the Company.

DIRECTORS:

Frank B. Goodchild, A.M.I.Mech.E., "Shortmead," Hadleigh Road, Leigh-on-Sea (Director, Metallisation (Sales), Limited), *Chairman.*

Ernest Beck, 21, Fitzgeorge Avenue, West Kensington, London, W.14 (Director, Amalgamated Cotton Mills Trust, Ltd.).

William John Thompson, J.P., Harborough Hall, Blakedown, Kidderminster (Joint Governing Director, John Thompson (Dudley), Ltd.).

Harry James Williams, 7, Iverna Gardens, Kensington, London, W. (Director, Metallisation (Sales), Ltd.).

BANKERS: National Provincial Bank, Ltd., 15, Bishopsgate, London, E.C.2.

BROKERS: Bremner and Tripp, 25, Austin Friars, London, E.C.2, and Stock Exchange; Rengald Stokoe, Wellington Chambers, 95, Pilgrim Street, Newcastle-upon-Tyne, and Stock Exchange.

SOLICITORS: Cosmo Cran and Co., 5, Devonshire Square, London, E.C.2; Simpson and Marwick, W.S., 18, Heriot Row, Edinburgh.

AUDITORS AND ACCOUNTANTS: Oscar Berry, Froude and Co., Chartered Accountants, 1, Queen Victoria Street, London, E.C.4, and Berlin, W. 8, Behrenstrasse 24.

TECHNICAL CONSULTANT: Dr. Albert L. Mond, D.Sc. (Geneva), 19, Southampton Buildings, London, W.C.2.

SECRETARY AND REGISTERED OFFICE: Percy Bryant, 22, Birchin Lane, London, E.C.3.

TRANSFER OFFICE: Sewell, Hutchinson and Co., Finsbury Pavement House, London, E.C.2.

ABRIDGED PROSPECTUS.

The Company was incorporated on the 12th September, 1929, and intends to acquire (*a*) a freehold factory at Dudley, Worcester, and the plant, machinery, stock and equipment thereof, and the numerous patents and patent rights relating to the metals coating process; and (*b*) the whole of the Issued Share Capital of Metallisation (Sales), Ltd., of London, thereby giving this Company the benefit for Great Britain, Northern Ireland, the Irish Free State, and the Empire of India of all existing letters patent covering a process whereby any metallic or non-metallic surface (such as glass, rubber, paper, wood, textiles, etc.) can be covered with a coating from 1/20 m.m. up to any desired thickness of any metal that can be drawn into wire or obtained in powder form. The Company will be working in association with the Metals Coating Company of America Inc., Metallisator A/G, Berlin, and Metallisator A/G, Altona Works, Hamburg. Apart from the assets to be acquired as already referred to, the Company has through exceptional circumstances secured an option for six months to acquire 91 per cent. of the issued Ordinary Share Capital of Metals Coating Company of America Inc., which company holds the majority of the issued capital of Metallisator A/G of Berlin, which in turn holds the majority of the issued capital of Metallisator A/G of Hamburg, the exercising of which option would secure the world rights of all letters patent, together with the plant, factory premises, stock and goodwill of existing factories in Germany and America for a sum of £136 500, and would bring under the control of this Company world rights, establishing an effective world monopoly in the field of metal spraying.

The metals coating process is in continuous use in all the great industrial countries of the world. For example, in Germany important users include Siemens-Schuckert, A.E.G., Krupp, Thyssen and Co., Nord-Deutsche Lloyd; in America: General Electric Co., Westinghouse Electric and Manufacturing Co., Bethlehem Steel Co., Standard Oil Co., and Ford Motor Co.; in England: Guest, Keen and Nettlefolds, Ltd., Courtaulds, Ltd., English Electric Co., Ltd., Mond Nickel Co., Ltd., and Swan, Hunter and Wigham-Richardson, Ltd.

Report and Opinion of Dr. Albert L. Mond, D.Sc. (Geneva): In a report to the Directors of Metals Coating Co., Ltd., dated October 14th, 1929, Dr. Mond says: In the course of years of experience with this process numerous improvements have been made which are protected by Patents, which in my opinion sufficiently and adequately protect the subject of metal coating by the pistol, even when the extended term of the British Patent No. 25132/1913 (wire pistol) and the equivalent Patents in foreign countries have expired.

Powder-fed spraying pistols have been protected by British Patents Nos. 296 546, 298 858, 277 071, and in foreign countries.

Moreover, processes for metal coating by electrical means have been protected by British Patents Nos. 210 423 and 210 750 and by Patents in sixteen foreign countries. Also British Patent No. 196 695 is referred to. The value of the process, as far as convenience is concerned, is obvious and is recognised by most engineers and chemists.

The use of aluminium for coating, in the alumetising process is well known. It is possible by means of this wire-fed pistol to provide iron, steel and copper articles with a coating of aluminium or an aluminium alloy, which renders them immune from scaling at temperatures up to 1 000° C. There are several Patents for this alumetising process. I am of the opinion that the Patents and Patent applications under which you operate, contain valid subject matter and give you an effective monopoly of substantial duration for carrying out the metal spraying process by means of the wire-fed metal spraying pistol.

Report on Assets and Profits.—To the Directors, Metals Coating Co., Ltd.

GENTLEMEN, We have examined the accounts of Metallisation (Sales), Ltd., for the period from the incorporation of the Company on the 6th May, 1929, to the 31st October, 1929. The trading has resulted in a profit of £7 017 for the period of approximately five months, excluding Depreciation and Directors' Fees. The Assets and Liabilities of Metallisation (Sales), Ltd., on the 31st October, 1929, were: Plant, machinery, etc., £6 076; stock and work in progress, £2 648; capitalised exhibition expenditure, £1 560; debtors, £10 216; cash, £884. Total, £21 384, less Liabilities (Sundry Creditors), £4 367; Net Assets, £17 017. The further assets which you are acquiring, namely, the freehold factory at Dudley, and the Plant, Machinery, Stock, etc., thereof, are valued in excess of £30 000.

To comply with Paragraph 1 of Part II. of the Fourth Schedule of the Companies Act, 1929, we formally report that no dividends have been paid on any class of shares since the date of the incorporation of Metals Coating Co., Ltd., on the 12th September, 1929, and that no accounts have been made up.—Yours faithfully, Oscar Berry, Froude and Co., Chartered Accountants.

The issued and paid up capital of Metallisation (Sales), Ltd., is £10 000.

Estimate of Profit.—Assuming the sale of only 250 apparatus for the coming year and including the amounts earned by the various contracting plant, the net profits of the Company available for distribution should amount to about £35 000 per annum. In this connection it should be noted that in the past six weeks over 3 000 enquiries and negotiations for the sale of apparatus and contract work are on hand.

Working Capital.—The Directors estimate that after payment of the purchase price and the cost and expenses of the formation of the Company and this issue, the proceeds of the issue will provide approximately a sum of £60 000 for working capital and for the general purposes of the Company.

[ADVT.]

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MUNICIPAL FINANCE.

Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1928–9 of the 205 undertakings included in the following table and in the tables which appeared in our issues of August 9th, September 13th and November 1st, was £27 682 273. The gross profit on the year's working of the undertakings was £13 256 470, and the aggregate sales of electricity amounted to 4 740 713 058 kWh, while 79 undertakings out of the total number have contributed out of the year's profits or from reserve an aggregate of £456 914 to the relief of rates. In many cases the costs include items of a capital nature, and net profits have been reduced as the result of reduction of charges for current. As it is desired to make these tables as complete as possible, the Editor will be pleased to receive similar particulars of other municipal electricity undertakings.

Authority.	Total Revenue. £	Gross Profit. £	Net Profit (+) or deficit. (−) £	(a) Working Costs per kWh sold.	Total Cost per kWh (inc. capital charges).	Electricity sold (kWh).	Increase (+) or Decrease (−) in kWh sold.	Maximum Simultaneous Load in kW.	Load Factor.	Radiators and Cookers Connected (total) in kW except where otherwise stated.	Other Domestic Appliances connected (total) kW.	Contributed in Aid of Rates.
Adwick-le-Street U.D.C.	14 157	6 291	+ 1 432	2·068d.	3·346d.	912 635	+ 89 797	350	29·76	6	8	—
Aldershot T.C.	22 864	9 350	+ 4 076	2·660d.	3·710d.	1 216 100	+ 183 054	950	15·90	100	50	—
Ayrshire Electricity Board (Ayr)	234 678	127 945	+ 3 289	0·664d.	1·240d.	38 569 499	+ 1 256 965	20 400	27·10	See footnote (c)	See footnote (c)	—
Barking U.D.C.	38 330	9 997	+ 3 857	1·083d.	1·773d.	4 013 439	+ 572 750	1 944	23·56	See footnote (c)	See footnote (c)	894
Barnsley T.C.	70,548	37,057	+ 11 718	0·810d.	1·490d.	9 976 860	+ 78 161	3 853	29·60	See footnote (c)	—	—
Basingstoke T.C.	25 523	13 110	+ 4 101	1·320d.	2·320d.	2 246 982	+ 69 701	1 185	21·60	See footnote (c)	See footnote (c)	1 158
Bethnal Green (London) B.C.	70 860	32 636	+ 15 149	1·137d.	1·657d.	8 069 302	+ 868 817	4 393	20·97	(b) 939	See footnote (b)	—
Bridgend U.D.C.	16 901	5 725	+ 1 684	2·100d.	3·020d.	1 113 412	+ 90 770	680	18·97	—	—	—
Brierfield U.D.C.	3 947	829	+ 58	0·700d.	1·300d.	289 647	+ 23 959	450	7·35	—	—	58
Burnley T.C.	101 790	37 234	+ 15 717	1·163d.	1·648d.	12 537 398	+ 372 463	5 440	26·30	(b) 8 248	See footnote (b)	—
Buxton T.C.	20 727	11 232	+ 4 529	1·589d.	2·719d.	1 434 060	+ 228 475	992	16·50	(b) 1 897	See footnote (b)	600
Calne T.C.	982	449	+ 103	1·050d.	8·130d.	25 840	+ 2 233	30	9·79	—	—	20
Cannock U.D.C.	29 292	8 874	+ 223	1·099d.	1·624d.	3 995 175	− 109 597 7	1 627	28·03	1 371	881	—
Colchester T.C.	42 514	17 125	+ 2 486	1·200d.	1·567d.	4 154 895	+ 1 109 311	2 501	17·32	3 900	1 500	—
Dewsbury T.C.	39 866	11 901	+ 3 768	1·410d.	1·940d.	4 458 345	+ 286 294	2 357	21·59	See footnotes (c) (d)	See footnote (b)	1 080
Douglas T.C.	33 696	17 526	+ 1 067	1·840d.	4·035d.	1 799 355	+ 182 491	1 067	19·30	(e) 250	—	—
Ealing T.C.	93 879	29 397	+ 2 368	2·607d.	3·700d.	5 937 191	+ 1 122 546	4 092	18·90	See footnote (c)	See footnote (c)	—
Elland U.D.C.	14 242	5 348	+ 902	1·500d.	0·700d.	1 415 461	+ 149 954	847	23·50	371	—	—
Erith U.D.C.	69 999	25 645	+ 16 189	0·792d.	0·964d.	13 718 658	+ 1 045 150	4 750	42·58	(b) 813	See footnote (b)	1 144
Fareham U.D.C.	7 061	1 541	+ 115	2·640d.	3·170d.	532 156	+ 27 921	284	24·70	287	—	—
Finchley U.D.C.	74 451	32 704	+ 8 312	0·732d.	2·190d.	6 566 089	+ 883 795	4 400	17·00	—	—	2 400
Gloucester C.C.	59 937	22 424	(n) + 7 939	1·160d	1·930d.	6 471 333	+ 324 036	3 590	24·71	See footnote (c)	See footnote (c)	1 000
Hastings T.C.	124 977	69 141	+ 24 092	0·500d.	1·660d.	13 828 042	+ 3 253 242	8 550	21·86	10 947	958	7 925
Hazel Grove & Bramhall U.D.C.	12 704	5 452	+ 1 126	0·721d.	2·024d.	797 071	+ 206 600	730	14·20	—	—	—
Hebden Bridge U.D.C.	11 036	3 638	+ 1 605	1·600d.	2·000d.	1 130 713	+ 30 000	695	24·00	(e) 46	See footnote (c)	188
Heywood T.C.	22 777	6 747	+ 1 332	1·094d.	1·450d.	3 515 036	− 175 385	1 701	23·60	—	—	1 168
Ilford T.C.	157 466	41 770	+ 9 553	1·250d.	1·800d.	17 444 592	+ 3 155 630	9 673	20·59	16 893	5 066	—
(g) Inverness T.C.	24 201	12 620	+ 5 061	1·760d.	3·900d.	1 422 210	+ 157 939	1 016	17·50	(b) 548	See footnote (b)	—
King's Lynn T.C.	26 102	12 462	+ 4 296	1·030d.	1·940d.	2 695 419	+ 115 022	1 690	18·20	—	—	—
Kingston-on-Thames T.C.	64 476	37 197	+ 5 209	1·535d.	2·938d.	41 841 248	+ 866 563	2 880	27·45	See footnote (c)	—	—
Lanark County Council	13 769	5 563	+ 506	2·120d.	3·847d.	702 773	+ 42 162	502	15·98	—	—	—
Leigh (Lancs) T.C.	54 275	18 547	+ 2 481	0·747d.	(f) 1·140d.	9 559 720	+ 1 104 809	4 770	25·70	See footnote (c)	See footnote (c)	—
Leyton T.C.	99 480	23 916	+ 3 992	1·570d.	1·910d.	11 996 476	+ 1 514 239	5 175	31·54	—	—	2 192
Littleborough U.D.C.	12 032	3 779	+ 888	1·040d.	1·300d.	2 102 277	− 528 642	969	29·59	(b) 50	See footnote (b)	—
Londonderry C.C.	44 356	31 055	+ 7 752	1·010d.	2·773d.	3 142 721	+ 47 273	2 100	22·06	See footnote (c)	See footnote (c)	6 052
(g) Lossiemouth T.C.	3 612	1 711	+ 205	4·142d.	7·426d.	110 102	+ 8 851	85	18·36	See footnote (c)	See footnote (c)	—
Malvern U.D.C.	14 647	4 313	+ 790	1·305d.	3·570d.	691 046	+ 65 832	508	15·53	—	—	—
Marlborough T.C.	3 489	659	+ 95	See footnote (h)	See footnote (h)	133 000	—	101	15·03	20	—	—
Morley T.C.	11 596	2 932	+ 1 995	2·000d.	2·247d.	909 049	+ 156 063	530	19·58	—	—	—
North Berwick T.C.	3 972	1 424	− 408	4·780d.	8·210d.	127 900	+ 19 320	93	19·27	See footnote (c)	See footnote (c)	—
Norwich C.C.	212 725	100 491	+ 25 905	0·895d.	1·495d.	29 888 666	+ 3 742 673	14 960	22·80	19 588	1 088	—
Pontypridd U.D.C.	31 741	6 365	(i) + 1 002	1·728d.	2·187d.	2 786 795	+ 52 341	2 141	19·44	919	137	—
Preston T.C.	249 042	124 112	+ 18 035	0·416d.	0·858d.	62 421 057	+ 24 144 843	21 000	33·93	15 000	8 000	—
Prestatyn U.D.C.	5 559	2 297	+ 703	1·420d.	2·030d.	271 920	+ 99 698	195	19·10	170	—	400
Sale U.D.C.	16 703	7 509	+ 4 614	1·070d.	1·480d.	1·689 550	+ 377 943	1 035	20·80	(m) 1 548	See footnote (m)	287
Saffron Walden T.C.	2 456	1 384	− 51	2·760d.	6·470d.	92 862	+ 26 224	87	12·10	20	5	—
Scarborough T.C.	58 020	19 368	− 305	2·350d.	3·530d.	3 938 426	+ 809 207	2 395	18·72	(b) 6 885	See footnote (b)	—
Skelton and Brotton U.D.C.	5 421	1 617	+ 624	2·670d.	4·440d.	304 557	+ 3 632	855	16·79	196	273	—
Stepney (London) B.C.	355 848	189 994	+ 47 593	0·528d.	0·987d.	71 312 995	+ 15 891 822	34 750	25·21	(b) 5 842	See footnote (b)	—
Stretford District Elect. Board	201 271	72 474	+ 9 660	0·527d.	0·769d.	57 146 921	+ 2 805 129	19 244	33·90	See footnote (c)	See footnote (c)	—
Sutton Coldfield T.C.	44 101	17 293	+ 5 961	0·679d.	2·419d.	2 552 196	+ 429 905	1 971	14·84	2 992	—	—
Swinton and Pendlebury U.D.C.	19 233	5 330	+ 1 318	1·782d.	2·295d.	1 871 768	+ 226 520	997	26·10	1 125	786	500
Tanfield U.D.C.	5 590	3 091	+ 255	2·300d.	5·002d.	251 933	+ 50 719	130	27·50	50	75	—
Thornton Cleveleys U.D.C.	7 400	3 892	+ 395	1·540d.	3·070d.	548 650	+ 181 302	259	27·31	(b) 875	See footnote (b)	—
Tynemouth T.C.	64 170	24 981	+ 12 506	1·130d.	1·480d.	8 400 077	+ 536 606	See footnote (k)	See footnote (k)	—	—	—
Wakefield T.C.	79 783	38 098	+ 11 747	0·910d.	1·550d.	11 062 878	+ 931 936	5 595	29·17	—	—	—
Wimbledon T.C.	173 809	88 710	+ 27 063	0·880d.	1·546d.	22 467 621	+ 4 055 922	13 050	21·00	See footnote (l)	See footnote (l)	—
Wolverhampton T.C.	282 054	92 501	+ 11 139	0·631d.	0·741d.	71 041 457	+ 2 957 628	24 515	33·00	(b) 13 660	See footnote (b)	—
York C.C.	119 340	59 229	+ 28 928	0·530d.	0·870d.	24 543 618	+ 1 359 960	9 813	33·40	(d) 6 395	See footnote (c)	3 450

(a) Usually includes management, repairs and maintenance, rates and taxes and special charges. (b) Includes other domestic electrical appliances. (c) Not available. (d) Cookers 130 kW; radiators not known. (e) Cookers only. (f) Includes £1 590 capital expenditure out of revenue. (g) Year ended May, 1929. (h) Supply purchased in bulk. (i) After deducting income tax. (k) Bulk supply obtained at numerous points. Simultaneous maximum demand unknown. (l) About 24 000 kW of radiators, cookers and other domestic electric appliances hired from Corporation. Other figures not available. (m) Includes other domestic electrical appliances. Hired apparatus only. (n) Out of this amount, £3 639 has been transferred to capital account.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BONAS, L. M., 116, Park Street, Marble Arch, W., wireless manufacturer. £21 4s. 6d. October 10th.

BRITISH ELECTRICAL MANUFACTURING CO., Alexandra Works, Brent View Road, West Hendon, electrical engineers. £13 18s. 9d. October 23rd.

EGERTON AND CO. (a firm), 26, Pear Tree Road, Derby, electricians. £14 3s. 7d. October 14th.

JOHNSON (WM.) AND CO. (SHEFFIELD), LTD., 49, Leopold Street, Sheffield, electrical engineers. £23 2s. 6d. October 22nd.

SERVICE BATTERY STATION, 3, St. Edward Road, Southsea, dealers. £18 11s. 9d. May 1st.

SUMMERS, L., 30, London Road, Romford (trading as SOUTH ESSEX ELECTRIC CO.), electrical engineer. £22 2s. 5d. October 18th.

Receiverships.

ELECTRODRIVES, LTD. D. E. Evans, of 29–30, King Street, Cheapside, E.C., 2, was appointed receiver and manager on November 11th, under powers contained in debenture dated October 5th, 1929.

PINNACLE INVESTMENT TRUST, LTD. E. L. Donald, C.A., of Atlantic House, 46, Holborn Viaduct, E.C.1, was appointed receiver and manager on November 13th, under powers contained in debenture dated August 1st, 1929.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BETTA TRADING CO., LTD., London, W., gramophone and wireless dealers, etc.—Registered November 14, £6 000 and £8 000 debentures, to C. W. Chambers, 44, Dunstan Road, N.W.11, and Chambers and Bright (1929), Ltd., 204, Great Portland Street, W.; general charge.

CRAVEN HYDRO-ELECTRIC SUPPLY CO., LTD., near Skipton.—Registered November 14th, £5 000 debenture, to Linton Mills Estate Co., Ltd.; general charge.

ELECTRICAL AGENCIES (LONDON), LTD.—Registered November 18th, £800 debentures; general charge. *Nil. August 9th, 1928.

ELECTRO DYNAMIC CONSTRUCTION CO., LTD., London, S.E.—Registered November 15th, debenture, to Lloyds Bank, Ltd., securing all moneys due or to become due to the Bank; charged on lease of Dynamo Works, Devonshire Grove, S.E.15, also general charge. *£1 000. May 14th, 1929.

G. AND L. ELECTRICAL SUPPLY CO., LTD., London, W.C.—Registered November 18th, £2 000 debentures; general charge. *——. January 27th, 1928.

RAVEN (PETER) AND CO., LTD., Birmingham, dealers in electrical accessories, etc.—Registered November 15th, series of £1 000 debentures, present issue £400; general charge. *Nil. May 24th, 1929.

WOLF AND MORGAN, LTD., London, E.C., manufacturers of electrical apparatus.—Registered November 12th, £1 000 debentures, balance of £2 000; general charge. *——. September 28th, 1928.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

HASLAM (G.) AND CO., LTD., electrical engineers, The Broadway, Leigh-on-Sea. The statutory meeting of the creditors of the above was held recently, when Mr. H. J. B. Feist, the liquidator, reported that the liabilities were £801, of which £501 was due to the trade, and £300 to the bank. The assets comprised stock £355, estimated to realise £250; fixtures and fittings, £10; book debts, £240, expected to produce £200; cash at bank, £55; work in progress, £30; and motor car, £8; making a total of £553, or a deficiency of £248, so far as the creditors were concerned. The liquidator said that the liabilities might be slightly increased, whilst the book debts might not produce the figure at which they were set down.

It was reported that the business was established in 1918, and was carried on successfully as a private concern until September, 1922. The company was then formed with a nominal capital of £2 000, of which £1 712 had been issued and was fully paid. During the first year or two of its existence, the company was successful. A lock-up shop was acquired at London Road, Leigh, and the trade there had not been good, losses aggregating some £700 to £800 having been incurred. The shop at London Road had been closed down, and the stock removed to the Broadway premises. The latter were held on a lease which had three years unexpired at a rental of £85 per annum.

The creditors decided to confirm the voluntary liquidation of the company with Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C. as joint liquidator.

London Gazette, etc.

Company Winding-up.

STANDARD PLATINUM CONTACTS, LTD. Winding-up order, November 18th.

Winding-up Petition.

FELLOWS MANUFACTURING CO., LTD.—A creditors' petition for winding-up has been presented, and is to be heard at The Royal Courts of Justice, Strand, London, on December 9th.

Bankruptcy Information.

GASCOIGNE, Harry, 40, Cricklade Street, Cirencester, Glos. wireless dealer. Receiving order, November 19th, debtor's petition.

PEACE, ERNEST EVERITT, rear of 230, High Street, Erdington, Birmingham, trading as PEACE AND CO., manufacturing electrical engineer. First meeting, December 4th, 11 a.m., Official Receiver's Office, 191, Corporation Street, Birmingham. Public examination, January 8th, 2.30 p.m., Court House, Corporation Street, Birmingham.

Notice of Dividend.

PAGE, Edgar George Matthews, Bohemia Road, St. Leonards-on-Sea, dealer in wireless sets and accessories. First and final dividend, 20s. per £, payable, November 26th, [Official Receiver's Office, 12A, Marlborough Place, Brighton.

Notice of Intended Dividend.

GARNETT, William Terrell, trading as W. T. GARNETT'S CABLE CO., Barkerend Mills, Bradford, electric cable and wire manufacturer. Last day for receiving proofs, December 10th. Trustee, J. O. Morris, 12, Duke Street, Bradford, Official Receiver.

Order Made on Application for Discharge.

STRATHDEE, Andrew Knox Ewart, 923, Romford Road, Manor Park, trading as EMSCO RADIO, electrical engineer. Discharge suspended for three months until January 29th, 1930.

METAL AND CHEMICAL PRICES.

		TUESDAY, November 26th. Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£77 0 0	£2 0 0	—
Electro Wirebars	,,	£84 0 0	10s. 0d.	—
H.C. Wires, basis	per lb.	11⅛d.	⅛d.	—
Sheet	,,	11⅜d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis ..	per lb.	1s. 2⅛d.	⅛d.	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,, ...	,,	10⅛d.	—	—
Wire ,, ...	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£22 15 0	—	10s. 0d.
Foreign or Colonial	,,	£21 10 0	—	7s. 6d.
Tin—				
Ingot	per ton	£190 5 0	£9 15 0	—
Wire, basis	per lb.	2s. 6⅛d.	1⅛d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£20 7 6	—	£1 10 0
Mercury	per bottle	£23 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10 0
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £20 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2⅛d.
Sodium Bichromate—Per lb., 3⅛d.
Rubber—Para fine, 8 11/16d.; plantation, 1st latex, 8¼d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.

THE LEAD MARKET.

Prices in the lead market last week collapsed on Wednesday and Thursday, November lead, according to James Forster and Co., being sold at £20 15s., and February £20 17s. 6d. A recovery of about 12s. 6d. per ton was made later.

Closing prices on November 22nd were £21 8s. 9d. for November, £21 10s. for December, January and February, 11s. 3d. to 8s. 9d. per ton lower on the week.

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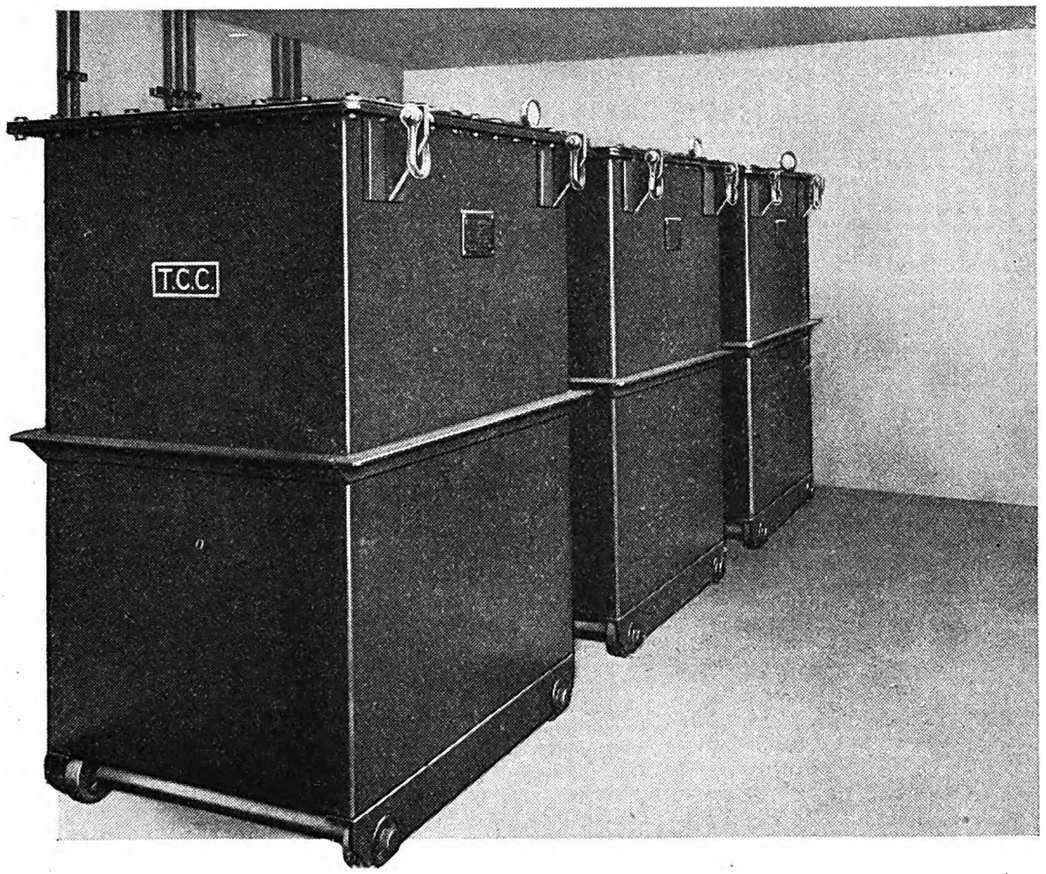

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

318 647 C. J. Beaver and W. T. Glover and Co., Ltd. Impregnating paper for insulation of electric cables and apparatus therefor.
318 559 J. A. Crabtree. Electric switches. (4/4/28.)
318 502 C. Croom-Johnson. Electric accumulators. (2/5/28.)
318 557 J. J. V. Armstrong (Telefunken Ges. fur Drahtlose Telegraphie). High frequency telephone systems. (3/3/28.)
318 654 L. Mellersh-Jackson (Siemens and Halske Akt.-Ges.). Electro-optical cells for use in electrical picture transmission and television systems. (9/5/28.)
318 475 Igranic Electric Co., Ltd., J. Lucas, Ltd., A. H. Mackley and J. W. Burleigh. Electrically operated and controlled vehicles. (25/5/28.)
318 477 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Telephone systems. (31/5/28.)
291 385 British Thomson-Houston Co., Ltd. Electric remote-control systems. (31/5/27.)
291 407 Akt.-Ges. Brown, Boveri, et Cie. Quick-acting regulator of the vibrating type for keeping the current or voltage of generators constant. (1/6/27.)
318 507 Benjamin Electric, Ltd., and G. Campbell. Shock-absorbing mounts for thermionic valves or other electrical devices. (31/5/28.)
318 480 H. H. Berry and C. A. Painton. Changing signs. (1/6/28.)
318 565 J. E. Pollak (Associated Telephone and Telegraph Co.). Systems and apparatus for television. (1/6/28.)
318 569 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Signalling arrangements, particularly for use in telephone systems. (6/6/28.)
318 574 G. T. Church. Electrical heating apparatus particularly for use with incubators. (6/6/28.)
318 666 S. M. Rutnagur. Electric traction for railways. (7/6/28.)
318 667 Standard Telephones and Cables, Ltd., and S. Chapman. Testing arrangements for electromagnetic relays or the like. (8/6/28.)
292 126 T. S. Ramsdell. Automatic overload control device. (14/6/27.)
293 381 British Thomson-Houston Co., Ltd. Methods of and means for driving films in sound recording or reproducing apparatus. (5/7/27.)
318 669 British Thomson-Houston Co., Ltd., F. A. Fossey, C. J. Morton and T. H. Woodfield. Brush-holders for ignition dynamos. (8/6/28.)
318 671 Sir C. A. Parsons and J. Rosen. Ventilation of dynamo-electric machinery. (8/6/28.)
318 672 A. H. Marks and P. Russell (legal representatives of E. C. R. Marks (deceased) (H. N. Jasper). Electric disturbances neutraliser for radio communication. (8/6/28.)
308 749 J. Kremenezky, trading as J. Kremenezky (firm of)). Adjustable high-ohmic resistances and the method of manufacturing the same. (31/3/28.)
295 679 Associated Telephone and Telegraph Co. Train control systems. (17/8/27.)
318 677 H. Garner and G. H. Mulley. Electrically operated bolts or fastenings. (12/6/28.)
318 679 E. J. Wyborn. Variable condensers, and radio-receiving and the like apparatus incorporating variable condensers. (12/6/28.)
318 681 Automatic Telephone Manufacturing Co., Ltd., F. Kessler, and C. R. Woodland. Arrangements for mounting equipment of the kind used in telephone systems. (12/6/28.)
292 128 J. Pintsch Akt.-Ges. Buoys or similar signalling stations fitted with acoustical signalling apparatus. (14/6/27.)
318 683 Igranic Electric Co., Ltd., J. Lyons and Co., Ltd., S. R. Wright, A. Goddard, and G. Douglass. Electric signalling apparatus. (14/6/28.)
294 237 Electrolux, Ltd. Process of treating aluminium or other light metals. (22/7/27.)
292 603 E. Boder. Electric switching systems controlled by timing apparatus. (23/6/27.)
318 690 H. C. Pride. Holder for incandescent strip electric lights. (20/6/28.)
318 693 E. H. Chapman. Coupled electric inductance coils. (22/6/28.)
318 702 I. N. Whitesmith, J. A. Dorratt, and Associated Electrical Industries, Ltd. Electrical heating devices. (6/7/28.)
318 705 Elektro-Thermit Ges., and A. G. Crum. Welding of rails or the like by means of superheated molten metal. (10/7/28.)
297 454 Siemens and Halske Akt.-Ges. Telephone sets incorporating manually operable selectors. (22/9/27.)
318 708 Consulting and Radio Service, Ltd., and N. Turner. Electrical sound-producing device. (13/7/28.)
318 709 Gramophone Co., Ltd., and A. Whitaker. Photographic recording of acoustic or the like oscillations. (14/7/28.)
294 605 Associated Electrical Industries, Ltd. Electrical circuit interrupters. (27/7/27.)
318 716 G. T. McGlashan and G. S. Clark. Switchboards. (28/7/28.)

Applications for Patents.

August 16th.

25 121 Marconi's Wireless Telegraph Co., Ltd. Directional antennæ. (7/9/28, U.S.)
25 122 Marconi's Wireless Telegraph Co., Ltd. Electric discharge devices, etc.
25 065 M. K. Electric, Ltd., and W. E. Watson. Plug and socket connectors.
25 053 J. Monoa (*née* Javellot). Electrical cultivating apparatus.
25 063 A. A. Price. Wireless receiving apparatus.
25 091 Siemens and Halske Akt.-Ges. Transmission systems. (25/8/28, Germany.)
25 112 Siemens and Halske Akt.Ges. Signalling installations. (1/9/28, Germany.)
25 046 G. M. Slight. Transformer cooling tanks, etc.
25 118 Telefunken Ges. fur Drahtlose Telegraphie. Radio direction finding.
25 119 Telefunken Ges. fur Drahtlose Telegraphie. High frequency transmitters and receivers. (10/9/28, Germany.)

August 17th.

25 157 British Insulated Cables, Ltd., and L. B. Wilson. Electric rivet-heaters.
25 175 H. A. Bumke Ges. Manufacture of dollies for dry batteries. (26/7/29, Germany.)
25 128 E. W. Claxton. Electric connector.
25 164 Egyesult Izzolampa es Villamossagi Resvenytarsasag. Electric discharge tubes. (17/9/28, Hungary.)
25 183 L. Emanueli, Soc. Italiana Pirelli. Electric cable system.
25 155 C. Lorenz Akt.-Ges. Control of alternating currents. (4/9/28, Germany.)
25 187 Straight-Lite Reflectors, Ltd., and W. L. Turpie. Mountings for electric lamps.
25 180 Telefonaktiebolaget L. M. Ericsson. Electro-magnetic relays. (24/8/28, Sweden.)

August 19th.

25 212 M. von Ardenne. Radio receiving and amplifying arrangement.
25 277 Automatic Telephone Mfg. Co., Ltd., and H. Jackson. Telephone systems.
25 293 B. A'Wesche. Control of electric motors. (5/6/29, U.S.)
25 278 J. L. Baird and Television, Ltd. Television systems, etc.
25 266 M. Besson. Television. (18/8/28, Luxembourg.)
25 251 British Thomson-Houston Co., Ltd., C. G. Mayo and J. G. Wellings. Electric measuring apparatus, etc.
25 250 Celia, Ltd., and J. J. Drumm. Storage batteries.
25 271 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric supply arrangements. (26/7/29.)
25 273 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Speed controlling devices.
25 274 N. V. Philips' Gloeilampenfabrieken. Thermionic rectifiers. (24/10/28, Holland.)
25 242 A. A. Price. Wireless receiving apparatus.
25 294 W. Row. Electric dimmer switches.
25 204 H. C. H. Smyth. Telephonic loud speakers, etc.
25 255 Soc. Independante de Telegraphie Sans Fils. Picture telegraphy, etc. (22/8/28, France.)
25 256 Soc. Independante de Telegraphie Sans Fils. Electro-optical modulators. (22/8/28, France.)
25 226 Standard Telephones and Cables, Ltd. Means for coupling an auxiliary circuit to transmission system. (21/8/28, U.S.)
25 225 Standard Telephones and Cables, Ltd. (Western Electric Co.). Signal transmission system.
25 232 A. Zajdler. Electrical advertising apparatus. (14/8/28.)

August 20th.

25 335 Akt.-Ges. Brown Boveri et Cie. Apparatus for commutating currents in polyphase windings. (31/8/28, Germany.)
25 399 M. von Ardenne. High frequency amplifier connections. (22/8/28, Germany.)
25 367 Associated Electrical Industries, Ltd., and J. B. Hanselt. Transformers.
25 368 Associated Electrical Industries, Ltd., and N. Dennes. Thermostatic switches.
25 345 T. E. Beaumont and J. N. Waring. Electric heating tubes, etc.
25 377 British Thomson-Houston Co., Ltd. Pressure measuring devices. (21/8/29, U.S.)
25 384 Gramophone Co., Ltd., E. M. Payne and J. White. Electromagnetic acoustic devices.
25 310 C. L. Hodgskin. Electric lamps.
25 379 C. Leven. Electrical contacts.
25 305 R. W. Minshall. Thermionic valves.
25 339 G. Reittinger. Connection for cables. (20/8/28, Germany.)
25 354 J. Sinclair-Ross and J. Zetsche. Electric motors.
25 303 W. A. Stevens. Electric braking.

COMING EVENTS.

Friday, November 29th (To-day).

Institution of Electrical Engineers (South Midland Centre).—Grand Hotel, Birmingham. Annual dinner.

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. Open debate on "The Registration of Reliable Tests of Power-plant Machinery." 6 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, London. Informal meeting. Lecture by Mr. W. C. Freeman on "Modern Welding Systems and Applications." 7.30 *p.m.*

Electrical Association for Women (Bristol Branch).—Fortt's Restaurant. Dance and whist drive. 8 *p.m.*—1 *a.m.*

Saturday, November 30th.

Association of Mining Electrical Engineers (South Wales Branch). Official visit to Engineering Exhibition. 3.30 *p.m.*

Monday, December 2nd.

Institution of Electrical Engineers (South Midland Centre).—University, Edmund Street, Birmingham. Paper by Mr. R. A. Chattock on "The Modern Use of Pulverised Fuel in Power Stations." 7 *p.m.*

E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Twentieth Illumination Design Course. Lecture VII by Mr. W. J. Jones on "Miscellaneous Lighting Problems." 7.30 *p.m.*

Tuesday, December 3rd.

Institution of Electrical Engineers (North-Eastern Centre).—Annual dinner.

Institution of Electrical Engineers (Scottish Centre).—North British Station Hotel, Edinburgh. Paper by Prof. F. G. Baily on "Engineering from the Cape to Kenya." 7 *p.m.*

Electrical Association for Women (South Wales and Monmouthshire Branch).—Womanby Street, Cardiff. Cookery demonstration at the G.E.C. showrooms.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting. 5 *p.m.*

Institution of Electrical Engineers (Students' Section, North-Western Centre).—Engineers' Club. Albert Square, Manchester. Lecture by Mr. F. J. R. Baldwin on "Overhead Line Work." 7.15 *p.m.*

Television Society.—Engineers' Club, Coventry Street, Piccadilly Circus, London. Lecture on "Television: Some Suggested Schemes," by Mr. E. G. Lewin. 8 *p.m.*

Wednesday, December 4th.

Radio Manufacturers' Association.—Savoy Hotel, Strand, London. Annual dinner.

Electrical Contractors' Association (Bath Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Cardiff Branch).2.30 *p.m.*

Institution of Electrical Engineers (Wireless Section).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. G. Shearing and Captain J. W. S. Dorling on "Naval Wireless Telegraphy Communications." 6 *p.m.*

Institution of Electrical Engineers (East Midland Sub-Centre).—Technical College, Derby. Paper by Lt.-Col. H. E. O'Brien on "Electric Traction." 6.45 *p.m.*

Institution of Heating and Ventilating Engineers.—Swedenborg Hall, 20, Hart Street, London. Paper by Mr. R. C. Ching on "Costing Methods for Heating Engineers." 7 *p.m.*

Wednesday, December 4th-Friday, December 6th.

British Institute of Radiology.—Central Hall, Westminster, London. Exhibition and annual meeting. Official opening, Wednesday. 2.30 *p.m.*

Thursday, December 5th.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

Batti-Wallah's Society.—Hotel Cecil, Strand, London. Luncheon. 1 *p.m.*

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Lecture by Dr. H. Norinder on "Surges and Over-Voltage Phenomena on Transmission Lines due to Lightning and Switching Disturbances." 6 *p.m.*

Electrical Society of Glasgow.—30, Gordon Street, Glasgow. Visit to the Electrical Engineering Department of the Royal Technical College, George Street.

Friday, December 6th.

Institution of Electrical Engineers (Meter and Instrument Section).—Institution, Savoy Place, Victoria Embankment, London. Paper by Dr. C. V. Drysdale on "Alternating-Current Potentiometers and their Applications." 7 *p.m.*

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THE ELECTRICIAN

Vol. CIII.—No. 2688. Friday, December 6, 1929. [Registered at the General Post Office.] Sixpence

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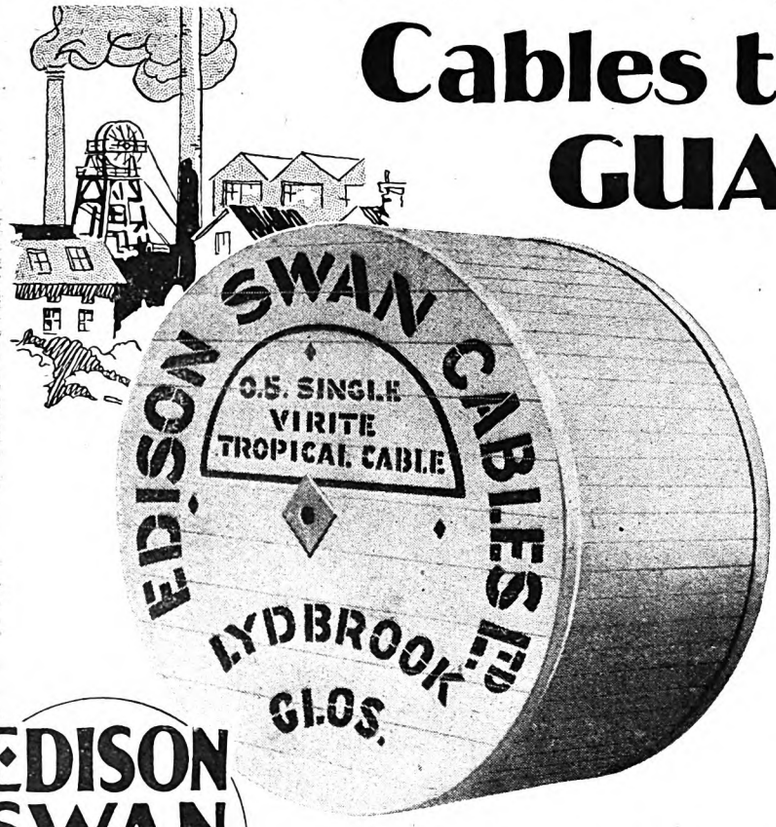

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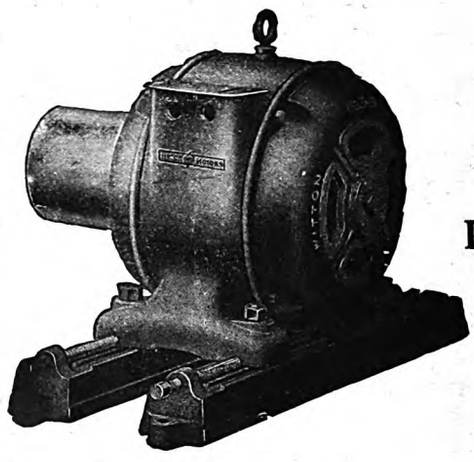

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Current Topics.

The Traffic Scheme.

IT is difficult to offer any useful opinion on the Government's proposed passenger traffic scheme for London, for Mr. MORRISON'S outline of his public ownership plan was singularly vague, while his closing avowal that in view of the intricacy of the matters in question no further statement is to be expected for some time, merely adds to the bewilderment of those who try to deduce the real intention of the Government. The system envisaged appears to be one under which the public will own the electric "tube" railways, the tramways, trains and omnibuses, the whole of which will be controlled by a board of business men appointed by the Government, and given complete control. It has been suggested that this board will operate in much the same way as the Central Electricity Board, but it is obviously impossible to discuss this aspect without fuller details. The scheme, so far as it is at present understood, has met with a decidedly mixed reception, some seeing in it the thin end of the nationalisation-of-everything wedge; others considering it markedly inferior to the co-ordination plans devised by the last Government. In view of the unsettling effect of such nebulous announcements of a scheme affecting capital running well into a hundred millions sterling, it is a pity that Mr. MORRISON did not delay his statement until such time as the further information he spoke of is available. One of the main dangers of the present situation is that certain suburban railway electrification projects may now be discouraged, and in view of the lukewarm attitude these railways have shown in the past towards electrification this eventuality seems more than probable. We should in fairness add that the prospect of being brought into direct competition with the big publicly-owned traffic combine would provide sufficient deterrent for any private enterprise.

Electric Cooking Utensils.

IT is well known that sales resistance against the adoption of electric cooking in the home, when encountered, is generally on the score of operating cost. That such complaints are largely due to the use of incorrectly designed boiling utensils on totally enclosed hotplates is equally familiar knowledge to supply engineers and others having contact with the domestic consumer. The obstacle seems slight, but its effect on cooker sales has been very considerable. Resistance of this kind can only be overcome by educational means, and as the initial cost of properly designed utensils may be somewhat higher than that of those in use the problem is not over easy. An inducement in the shape of the supply of a range of suitable utensils at cost price to all consumers taking electric cookers from the Corporation is being tried out by Mr. J. E. STARKIE at Burnley. Such enthusiasm is commendable, but it is doubtful whether the plan would prove commercially feasible to undertakings and contractors outside the municipal field.

A B.I.F. Inquiry.

MANY of our readers will be glad to hear that the Department of Overseas Trade is appointing a committee to examine the policy and conduct of the British Industries Fair and to consider means to increase its utility to British trade. Since the Warner Committee's report in 1921 new problems have arisen which make desirable an independent review of the whole position. One of the points which most affects British manufacturers of electrical and other goods is that of date, and that again is bound up with the question whether the main intention of the Fair is to attract foreign or purely home buyers. It started, we know, like the big continental trade fairs to assist export trade, but in recent years, at Birmingham, foreign buyers have been conspicuously in a minority, and the stands have been crowded with members of British trade associations who could view the manufacturers' products at any time or place convenient to both. Amongst the electrical exhibitions there has been a growing desire to change the date from February to June or July, in order to attract the many overseas visitors who would not think of coming over here in

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February. These matters have not received very sympathetic consideration in the past, so we hope that they may secure some attention from LORD CHELMSFORD'S committee.

How Many Electrical Uses?

WE commend to the statistically-minded reader an investigation which has been undertaken by Mr. H. C. POWELL, of the Toronto Hydro-Electric System, into the number of different employments of electricity at the Canadian National Exhibition in 1929. Defining an electrical use as "an application of electricity as a means of producing an effect or result," he has succeeded in listing no fewer than 729 distinctly different ways under the general classifications—light, heat, power, sound, measuring instruments, and miscellaneous. As this total—of which Mr. POWELL gives a detailed list—is only concerned with an exhibition, it will be interesting to see if anyone can improve upon it. Gas is claimed to have "a thousand and one uses" though we suspect this to be a figure of speech. Surely electricity can do better than that—and supply chapter and verse to prove its claim.

Good Advice.

LORD BYNG has been responsible for many reforms in the Metropolitan Police, and his recent advice to public lighting authorities to increase the intensity of their street lighting as a means for reducing the frequency of street accidents will, if acted on, result in a further reform of some magnitude. The idea of a central public lighting authority for the Metropolis has been mooted before, but the difficulties in the way of its realisation seem, at present anyhow, to be insuperable. Yet the urgent need for very definite improvement exists in many London boroughs. The extra cost of adequate lighting with modern equipment is insignificant compared with the advantages which it provides. There are some who believe that if only one can get a portion of a street or district properly lighted the contiguous areas of gloom will look by comparison still more gloomy and thus arouse a public desire for an extension of the improved conditions. We do not deny that this may happen eventually. But in the meantime road users emerging from darkness to light or vice versa are unable quickly to adjust their vision to the change in luminosity, and are thus more likely to come to grief than if the lighting had been uniformly bad. In any case it is wrong in principle to expect, as do some local authorities, that motorists and shopkeepers shall light their streets. We hope that the latest warning will stimulate definite remedial action.

Electricity and the Architect.

FOR some time past it has been evident that architects are beginning to take a wider view of their responsibilities to the public, acquainting themselves with the numerous aids to comfortable home-making which electricity provides. The architect who thought that the limit of domestic electrical refinement was the provision of one lighting point in the most inconvenient position in each room is now learning better. He is finding that the mere provision of electric lighting is no greater attraction to his prospective clients than "main drainage" or "company's water." People now expect to be able to use electricity when and how they like, and the more the architectural profession realises this the better will it be for them and all concerned. One outward and visible sign of architectural concern for the details that matter most to the occupiers of houses is visible in the Building Materials Bureau which the Architectural Association opens to-day at its premises in Bedford Square, London. Here samples of various materials and accessories, including electrical goods, will be displayed, so that architects may keep in touch with all the latest developments in the manufacture of materials and articles used in building. This is certainly a step in the right direction, and we hope that it will be followed by other efforts to co-operate with the other professions and trades interested in housing. There is certainly room for closer collaboration between architects and electrical engineers.

Electrical Gifts.

A speaker at a London electrical meeting the other day said that he added a piece of domestic electrical equipment to his home every Christmastide. There is, of course, nothing particularly remarkable in this, unless one speculates on the probable turnover of electrical goods which would take place if every member of the electrical industry would only follow this simple example. Thousands of extra table lamps, kettles, toasters, curling irons, coffee percolators, and such like would be sold, but, what is still more important the families and friends of these electrical people would realise that at last we are beginning to take some of our own medicine. Nobody can ensure that every member of the industry buys himself an electrical Christmas gift, but if every reader of this note takes individual action a useful start will have been made.

Light for Legislation.

IT is interesting to learn that, at long last, an up-to-date system of electric lighting is being tried in the House of Commons. One of the last of the strongholds of gas, it retained the old gas chandeliers, and with such a mixture it is not surprising that the results are not altogether pleasing. Now, it appears, "lay" lighting is being tried in some of the corridors and there is a possibility that the system may find extensive use in the House. Perhaps when the interior lighting has been brought into line with modern practice, attention may be turned to the lighting of Parliament Square.

Fog Signals by Telephone.

A SIMPLE device for minimising the danger to shipping occasioned by foggy weather is at present being tried out on the Clyde. The apparatus is used in conjunction with fog signals and consists of a wireless telephone transmitter fitted with a disc of the gramophone record type, impressed with the words one, two, three, and so on, up to a given number. The operation of the device is based on the fact that whereas sound waves travel comparatively slowly, so-called wireless waves are almost instantaneous. When the fog-horn is blown the sound waves bring into operation the wireless transmitter and start the counting device. The interval between the words represents the length of time that sound takes to travel a mile and when a listener with a wireless receiver on the ship first hears the count he follows the transmission until someone on board indicates direct reception of the sound waves. When these are heard a simple calculation from the last figure received electrically gives some approach to accuracy in estimating the distance in miles between the ship and the fog signal.

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TERMINAL APPARATUS FOR TRANSOCEANIC SUBMARINE CABLE TELEPHONY.*

Technical Details of Transmitting and Receiving Amplifiers Devised to Compensate for Attenuation of Long Submarine Telephone Cables.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

IN commercial land line telephony it is the custom to insert special amplifying apparatus, usually termed a *repeater*, at intervals, so that from, say, London to Edinburgh the speech would pass down the line to a first repeater, thence to a second, and so on. At Edinburgh the speech would have substantially the same quality and characteristics as in a London suburb.

On a two wire circuit where the go and return conversation is conducted on the same line, the attenuation distance between consecutive repeaters is equivalent to about 20 miles of standard cable, whose specification is shown in Fig. 1. When a

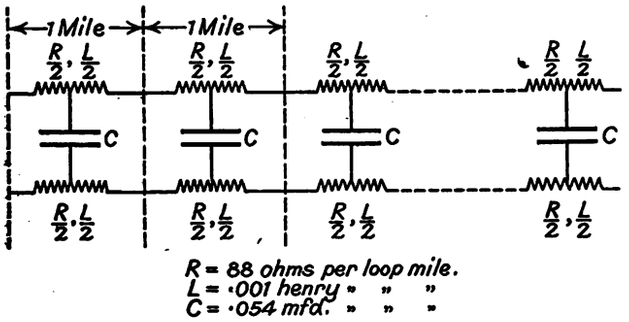

Fig. 1. Specification of standard cable mentioned in paper.

separate pair of wires is used for the go and return conversations, as on a four-wire circuit, the distance between repeaters can be as much as 40 m.s.c.† This represents the limit of modern repeater practice, which is governed by the tendency to self oscillation round the system of the thermionic amplifying valves.

The function of a repeater is twofold: (*a*) it must correct for the variation in the attenuation of the line with frequency,

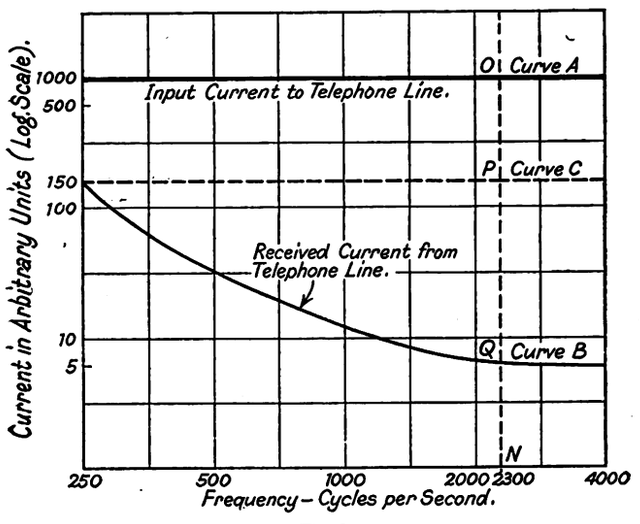

Fig. 2.

(*b*) it must amplify the incoming currents and restore them to a value equal to or greater than that at the microphone transmitter.

In Fig. 2, curve *A* represents a uniform current input at the beginning of a telephone line, whilst curve *B* represents the current at the end of the line. The repeater must correct the current until it is uniform at all frequencies, as in curve *C*; also, it must amplify to reproduce the level of the original curve *A*. If *QN* is 5 and *PN* is 150, the amplification at 2 300 ~ must be 30 times that at 250 ~. Curve *B*, which represents the influence of attenuation, depends upon the type of line or cable prior to the repeater. If Fig. 3 represents the attenuation curve of the landline or cable between two points, then the characteristic of the amplifier must be the same shape

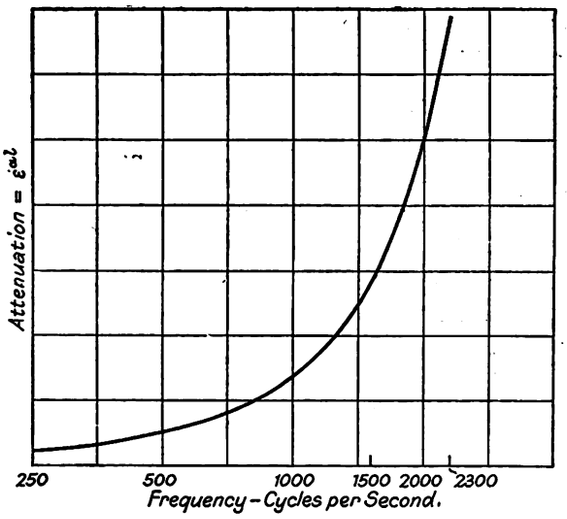

Fig. 3. Typical attenuation curve of landline or cable between two points.
α = attenuation coefficient. l = length of cable. ε = base of naperian logarithms.

to effect the desired result, i.e., to give equal representation to all output frequencies over the commercial telephonic range (250 ~ to 2 300 ~).

In designing end apparatus for long-distance submarine telephony, we are faced with conditions which are quite different from those on land. For a telephone cable across the Atlantic, distances are involved equal in attenuation to about 100 m.s.c. The respective *voltage* amplifications at 250 ~ and 2 300 ~ for 100 m.s.c. are 446 and 26·3 million. It should be observed that this is the voltage, and not the power amplification. At 2 300 ~ the latter is $6{\cdot}9 \times 10^{14}$—an enormous value, which corresponds to 148 transmission units (decibels).

The problem which confronts us in Transatlantic telephony is, therefore, to design end apparatus giving a voltage magnification of only 446 at 250 ~, but the stupendous figure of 26·3 million at 2 300 ~. A single amplifier to accomplish this is not impossible, but it is quite impracticable. Owing to interference at the terminal station of a submarine cable, to the agitation of electrons‡ in the wire of the cable and the

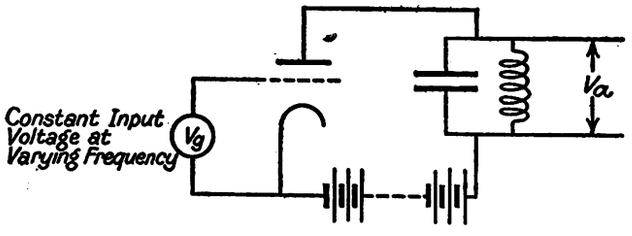

Fig. 4. Diagram showing tuned anode circuit.

transformer coils, etc., and to the irregular emission of electrons from the valve filaments, there would be a basic noise loud enough to render speech unintelligible. Unless special valves are used in the amplifier, the circuits are impulsed sufficiently for distracting noises of high pitch to occur, even with an amplification considerably less than $26{\cdot}3 \times 10^6$.

Moreover, to attain an overall amplification of this magnitude it is imperative to split the amplifier into two parts: (*a*) a power transmitter which raises the input level to the cable

* Manuscript received on June 20, 1929. ED.]

† Throughout this paper the attenuation of the standard cable is *not* referred to 800 cycles, but is taken at the actual frequency.

‡ J. B. Johnson. "Phys. Rev.," July 1925, and July 1928; also Schottky, ibid, July 1926.

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to about +35 m.s.c.; (*b*) a receiving amplifier capable of gaining the equivalent of 65 m.s.c. The voltage magnifications at both ends of the cable are given in Table I.*

TABLE I.

Frequency Cycles per sec.	Voltage Amplification at Transmitter. (Gain = 35 m.s.c.)	Voltage Amplification at Receiver. (Gain = 65 m.s.c.)	Combined Voltage Amplification. (Gain = 100 m.s.c.)	Transmission Units. (Decibels). (Gain = 100 m.s.c.)
250	8·5	52·5	446	53
500	19·6	250	4 900	74
1 000	62	2 140	133 000	102
1 500	144	10 200	$1{\cdot}47 \times 10^6$	123
2 000	279	34 600	$9{\cdot}65 \times 10^6$	140
2 300	398	66 100	$26{\cdot}3 \times 10^6$	148

Above values are for Standard Cable.
Where R = 88 Ω per loop mile,
C = 0·054 μF " " "
L = 0·001 H " " "

It might be thought that one could simulate the radio beam transmitters and, using the cable as a perfect beam, put the transmission level up to kilowatts. This, however, is not so simple as it seems, owing to the large voltages and currents

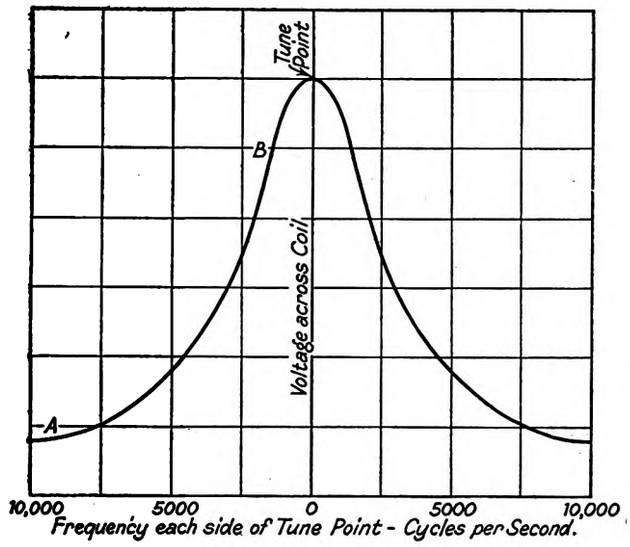

Fig. 5.

which the beginning of the cable would have to withstand. The cable would be of the loaded type, and we can assume for purposes of calculation that its characteristic impedance $\sqrt{\frac{L}{C}} = Z$ is substantially constant for all telephonic frequencies. Taking a normal input current of 1 mA r.m.s.—without previous amplification—the r.m.s voltage on the cable for $Z = 200$ Ω is 0·2. If the input level is raised to 35 m.s.c. the voltage, and therefore the current, is increased about 400 times at 2 300 ~, but considerably less at 250 ~. Assuming an average rise of 200 times over the frequency band, the r.m.s. current to the cable is 0·2 A, and the voltage 40. These quantities are quite unusual in telephone work where the permissible current is only a few milliamperes.

Taking first the case of the current into the head end part of the cable. This has a r.m.s. value of 0·2 A. In speech

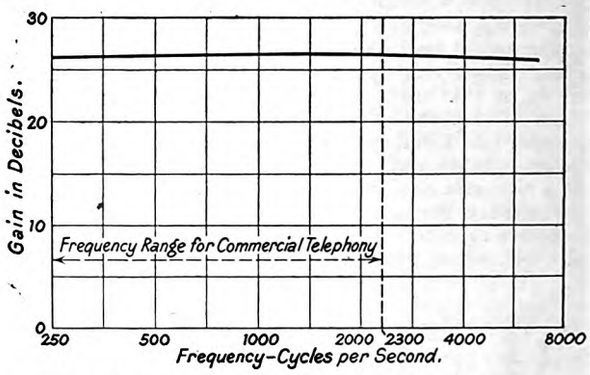

Fig. 7. Input transformer with mumetal core. Tested on cable having z = 600 ohms.

transmission, it is necessary to allow for peaks many times the r.m.s. value, and the maximum current *may* reach 3 A. If the radius of the copper conductor is *a*, and the thickness of the loading material *t*, the value of the magnetising force on the latter can be computed from the well-known formula $H_{max} = \frac{2\,I_{max}}{a + \frac{t}{2}}$ where I_{max} is the maximum current. Putting $I_{max} = 3$ A (0·3 absolute unit), $a = 0{\cdot}25$ cm., $t = 0{\cdot}005$ cm., we get $H_{max} = \frac{0{\cdot}6}{0{\cdot}255} = 2{\cdot}4$ c.g.s.

Alloys of the nickel-iron group as used for submarine telegraph cables have many times the permeability of iron, and are saturated by values of *H* of this order. Moreover, to avoid this condition with consequent distortion, it is essential in a long telephone cable to use a magnetic loading material which has special properties.

Rising Frequency Characteristic.

In the amplification system, the transmitter has a rising frequency characteristic to compensate for a loss equivalent to a certain length of cable. If all speech frequencies are equally represented at the *input* to the transmitter, the output from the transmitting valves to the cable will contain a much greater proportion of high than of low frequencies.

Since the attenuation of the cable increases with frequency, the length of the initial or head end part of the cable which must withstand heavy currents is less with a "shaped input" than it would be if the amplification were uniform throughout the frequency range—for equal r.m.s currents in the cable.

In the latter case (uniform amplification) there would be large low frequency currents which would persist to a considerable distance. Also, if the current at the upper frequencies,

* It is immaterial how the amplification and correction are shared by the receiver and transmitter, provided the attenuation of the cable is offset. The attenuation of a submarine telephone cable will in general differ from that of standard cable. Data pertaining to the latter is given herein by way of example.

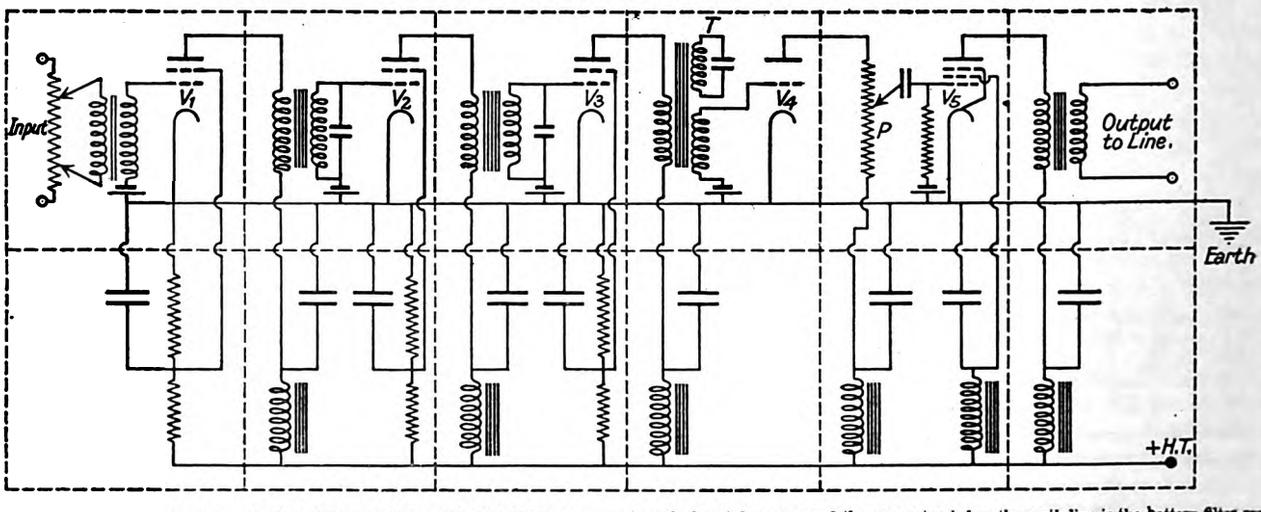

Fig. 6. General circuital arrangement of receiving amplifier. The dotted lines represent earthed metal screens and the apparatus below the earth line is the battery filter system

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say, 2 000 ~, is large enough to cause distortion due to non-linear action of the loading material, the harmonics so created will lie outside the normal speech frequency band. Owing to the large attenuation above 3 000 ~, these harmonics will not be audible at the receiver, i.e., the cable acts as a filter.

Taking the voltage applied to the cable, the peak value to which the dielectric will be subjected is about 600. Special precautions must be taken to ensure that an adequate factor of safety is secured, since a fault in the dielectric of an ocean cable costing over a million sterling is a serious matter. Also, to reduce the attenuation to a low value, it is necessary to use a special dielectric.

The Receiving Amplifier.

Coming now to the receiving amplifier, we have to obtain a voltage amplification varying from 52·5 at 250 ~ to $6{\cdot}61 \times 10^4$ at 2 300 ~. Two problems arise: (*a*) how to vary the amplification progressively over the speech frequency range; (*b*) how to preserve the necessary stability and freedom from self-oscillation.

A discussion of various methods of achieving condition (*a*) would make this paper unduly long, and need not be pursued. To comply also with (*b*) there are definite limitations to most of the possible circuits, and it was essential, therefore, to

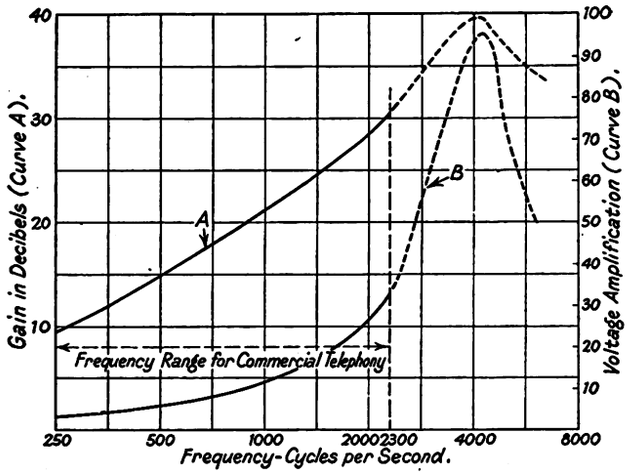

Fig. 8. Typical characteristic of stage comprising screened grid valve and resonant transformer.

devise a new scheme. Bearing in mind that the amplification-frequency curve must be concave upwards, as shown in Fig. 3, one has to find an arrangement which will comply with this condition.

Everyone is familiar with the tuned anode circuit used in radio receivers and illustrated in Fig. 4. When a constant voltage of varying frequency is applied to the grid of the valve, the voltage across the coil varies with the frequency, as shown in Fig. 5. The portion *AB* is concave upwards, and appears to offer possibilities. By using the tuned circuit as the secondary of a transformer whose primary is connected in the anode circuit of the valve, it is possible by manipulation of the circuital parameters to vary the shape of *A B* over wide limits.

Moreover, it occurred to the author that a similar procedure could be followed at audio frequencies to obtain the desired shaping for a cable amplifier. Accordingly, a transformer was designed to work with a triode of 30 000 Ω internal resistance. The characteristic of the combination was found to be quite good.

At the time this work was in progress (August, 1927) the author obtained a sample of a screened grid valve. This was tested in conjunction with a specially designed transformer, and it was found possible to correct for 20 m.s.c. in one stage. Thus it was decided to adopt the combination of a resonant transformer and a screened grid valve as a composite unit for a correction stage.

Although the anode to grid capacity of such valves is a relatively small amount, it is not possible to obtain a voltage magnification of the order of a million, without elaborate precautions. To avoid reaction it is imperative to incorporate various pieces of auxiliary apparatus in the amplifier, and to build the complete system in such a manner that capacity and electromagnetic coupling between stages, added inter-electrode capacity due to wiring, inductive loops and a.c. potential drop in h.t. and l.t. bus bars is reduced to a minimum. Unless precautions are taken, it is quite a simple matter for the h.t. or l.t. bus bars to convey energy (induced) from the output to the input of the apparatus. Only a minute amount of feed-back in a high magnification system is required to set the system into self-oscillation.

The general circuital arrangement of the receiving amplifier is shown diagrammatically in Fig. 6. To avoid reflection the

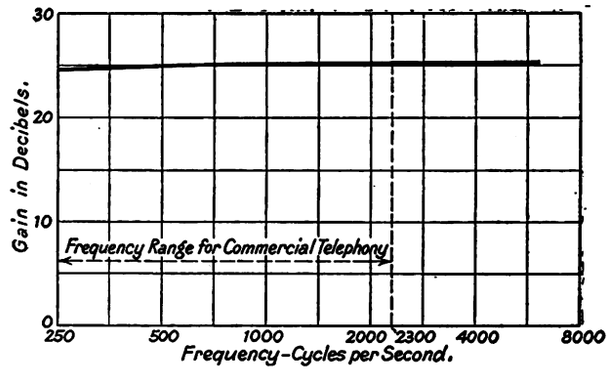

Fig. 9. Output transformer in anode circuit of pentode valve tested on cable having z=600 ohms.

end of the cable is bridged by a resistance equal to the surge impedance, i.e., $\sqrt{L/C}$. The primary of an input transformer having a ratio lying between 20/1 and 30/1 is connected across this resistance. The secondary is connected to the grid and filament of the first screened grid valve of the amplifier.

The characteristic of a typical input transformer with "mumetal" core is shown in Fig. 7. It is flat over a very wide frequency range, a feature attributable to the comparatively small number of turns, which is concomitant with a reduction in the self and mutual capacities of the windings. The high initial permeability of "mumetal" makes this possible. Care must be exercised that the peaks of the low frequency components of the speech are inadequate to cause valve distortion after being stepped up by the input transformer. Unless an adequate grid swing is permissible on the first and succeeding screened grid valves, this may happen.

Minified Lower Frequencies.

Thus in the correction stages, the lower frequencies are—in certain cases—minified rather than magnified. So far as the first valve is concerned the ratio of the input transformer must be selected to avoid valve distortion. It is desirable, however, in order to reduce the relative importance of valve noise, that the turns ratio should be as large as is compatible with a uniform frequency characteristic.

A resonant transformer is connected in the anode circuit of the first screened grid valve, and the combination gives an amplification frequency characteristic of the form shown in Fig. 8. Since the commercial speech band ranges from 250 ~ to 2 300 ~, the fact that the curve falls away on the right-hand side of the maximum value is immaterial, so long as the latter exceeds, say, 2 300 ~. This stage enables a correction equivalent to about 20 m.s.c. to be obtained.

Following this, other units are added until the requisite correction is attained. Where the attenuation of the cable

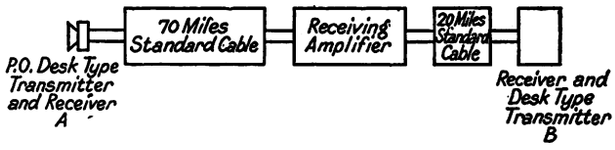

Fig. 10 Arrangement of apparatus for conducting speech tests in laboratory. Transmitter B is connected to receive A via 20 M.S.C. (not shown.)

departs materially from that of the cable of Fig. 1, it is necessary to modify the circuit accordingly.

No attempt is made to obtain very large magnification per stage, since it is desirable to work the valves on the linear portions of their characteristics. Otherwise harmonics of the lower frequencies will occur in that part of the audible range where the ear is most sensitive.

(To be concluded.)

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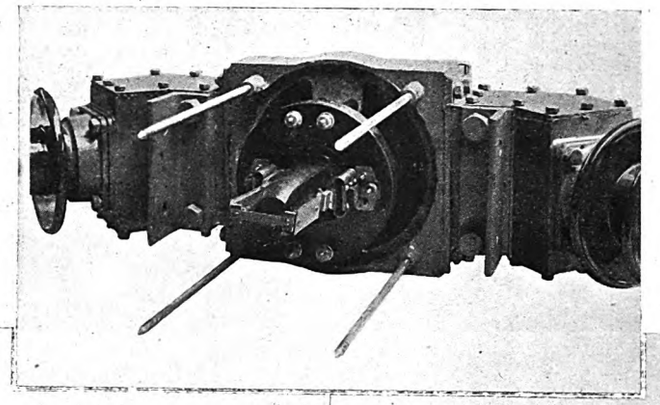
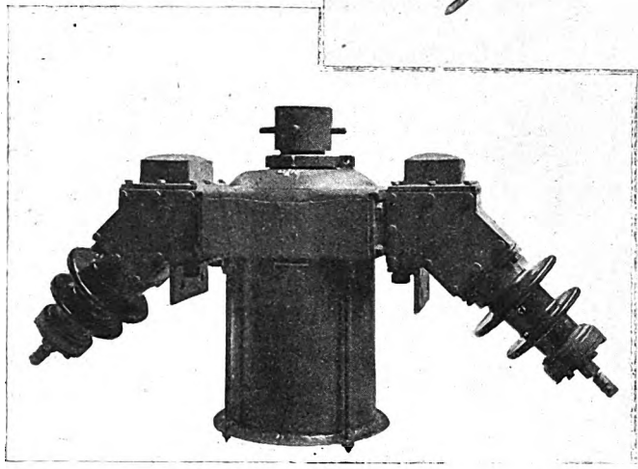
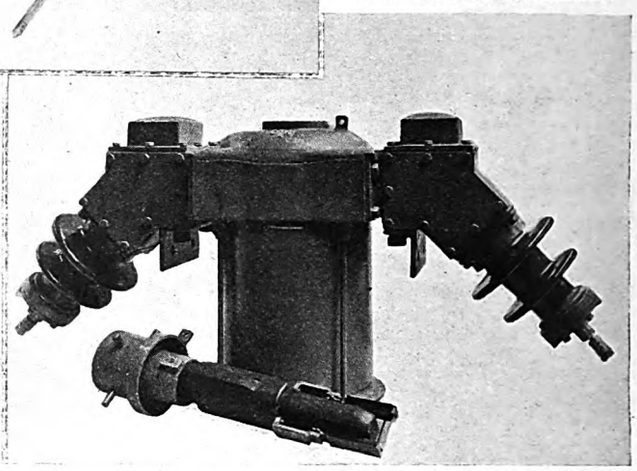
PLUG-TYPE OIL FUSES.

IN these pictures are seen a new plug-type oil fuse for 11 000 V service and for direct connection of the base conductors, produced by Ferguson, Pailin, Ltd. An internal view is seen on the right, while the pictures below illustrate the complete fuse, that on the right having the element withdrawn. The terminals are of bakelite-insulated copper, the external portion being protected by a one-piece porcelain insulator.



THE internal end of the stem ends in a compound - filled connecting chamber fitted with expansion cap. To minimise bird faults the bushing slopes downwards, and the supporting straps are bolted to the underside of the chambers. Langite gaskets are fitted below all external clamping surfaces. Alternative designs have been produced for sealing cables or for terminating both cable and bare conductor connections.





brickwork of the air that passed through the hollow combustion chamber walls was not sufficient to allow the CO_2 content to be raised higher than 14%, with the result that the thermal efficiency obtained was not quite as high as it might have been.

The steam-operated coal driers also proved unable to remove sufficient moisture from the coal, and it has been necessary to select as far as possible those coals which do not normally carry more than 15% of moisture, in order to obtain a resultant moisture content of about 10%. If a higher percentage of total moisture than this is allowed in the pulverised fuel, difficulties are experienced with the packing of the coal in the Fuller-Kinyon pumps, in the pulverised-fuel bins over the boilers, and in the screw feeders to the burners. This tends to uneven feeding of the coal into the furnaces and reduced efficiency of operation. Apart from these two troubles, which can be overcome by careful operation and attention, the plant has worked quite satisfactorily.

A very careful test was carried out on one of these boiler units which was fitted with an economiser, this test being designed to represent as far as possible the ordinary conditions obtaining in a boiler house. Owing to the impossibility of actually weighing pulverised fuel, the raw coal as fed to the coal driers had to be weighed and calculated forward to obtain the net weight of pulverised fuel fed to the furnace, and, in order to eliminate errors in observation as far as possible, the test was carried out over a period of six days, the boiler being steamed for 18 hours a day and banked for the remaining six. The detailed figures of this test are set out in a table in the original paper. From these figures it is seen that, calculated from the gross calorific value of the pulverised fuel entering the boiler, the combustion heat efficiency actually obtained was 80·35%. This, of course, takes into account the period during which the boiler was banked each day. If this banking period is eliminated, the combustion heat efficiency will be slightly higher. This figure of 80·35% compares with a boiler-house combustion efficiency of 72%, covering the operation of stoker-fired boilers only.

Some three years ago it was found necessary to increase still further the boiler capacity at Prince's station, Nechells, and, as the result of the experience on these Vickers-Spearing boilers, it was obvious that there were three considerations which must be taken into account :—

(1) If the bin-and-feeder system was to be retained, the coal must be dried to a lower moisture content.

(2) In order to run with a higher percentage of CO_2 in the furnace, better cooling of the brickwork must be obtained.

(3) The increased capital costs over an installation of mechanical stokers necessitated the employment of much larger boiler units.

It was therefore decided to instal boiler units having a normal evaporation of 150 000 lb. of steam per hour (actual) and an overload evaporation of 180 000 lb. of steam per hour (actual).

The boilers chosen were of the double Stirling type, as this pattern lent itself best to the space available in the existing boiler house.

Four boilers have been installed, each having a heating surface of 16 440 sq. ft. in the boiler proper and being equipped with two superheaters and two economisers. The combustion chamber, which has a volume of 19 000 cu. ft., has all four walls protected by water tubes having a surface of 4 700 sq. ft., which form part of the circulation system of the boiler. These tubes are fitted with firebrick tiles which form a continuous thickness of firebrick between the tubes and the furnace gases in the combustion chamber. No water-screen tubes are employed in these chambers, but the ashes at the bottom are kept in a molten state until they drip into the pit beneath, at the bottom of which they fall into a water sluice which carries them away. The combustion chambers are fitted with three burners at each end, through which the pulverised fuel with its primary air, and also the secondary air, enter the furnace. These boilers were designed by Messrs. Simon-Carves, Ltd.

The pulverised-fuel equipment consists of four large coal driers of the rotary kiln type, which are fired by small pulverised fuel furnaces. These driers reduce the total moisture in the coal from 20% to 6% without driving off any material part of the volatiles contained in the coal. The dry coal is conveyed by means of elevators and screw conveyors to dry-coal bunkers situated in the boiler house proper.

From these bunkers it is fed to four large motor-driven ball mills each capable of pulverising 12 tons per hour. These mills are air-swept, and the fuel is caught in cyclone collectors and stored in pulverised-fuel bins over the boilers. From these bins it is delivered by means of special feeders to the six burners installed in each boiler furnace. Arrangements are made to enable any mill to supply any pulverised-fuel bin by means of cross screw conveyors.

Two of these boilers have now been in operation for about 12 months and, as a result of this experience, it is apparent that the following modifications are desirable. The large

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amount of moisture that is driven off the coal in the coal drier does not all get away through the vent provided, but a quantity of it passes over with the coal through the screw conveyors, which have to be hermetically sealed in order to prevent the dust from getting out. The temperature of the coal and the vapour in the conveyor is about 200 deg. F., and it is found that the moisture condenses on the inside surface of the conveyors and tends to promote clogging. The conveyors, therefore, have had to be lagged in order to prevent contact with the external low-temperature air.

With this coal of low moisture content there is no trouble of any kind as regards packing in the pulverised-fuel bins, and there is no intermittent working of the coal feeders to the burners. In the combustion chamber it was found that if the percentage of CO_2 in the gases is allowed to rise above 14%, the brick tiles in front of the tubes become burnt away, and the tubes become exposed. It has now been decided to leave all the tubes exposed and to insert the brick tiles behind them to form a wall of firebrick between the tubes and the outer casing. In this way it is anticipated that the percentage of CO_2 can be raised to 16% and a higher thermal efficiency obtained.

A test has recently been carried out on one of these boiler units, and here again the coal had to be weighed in its raw state before it entered the driers, and calculated forward to obtain the net weight of pulverised fuel fed to the furnace. On this account, and in order to eliminate errors of observation as far as possible, a continuous run over a period of 54 hours was made at approximately normal evaporation. Taking the gross calorific value of the pulverised fuel entering the combustion chamber, the combustion heat efficiency obtained was 84·69%. This test was carried out over a continuous period, and is not therefore comparable with the test on the Vickers-Spearing boiler. It compares, however, with a stoker-fired boiler combustion efficiency of 80%, obtained under similar test conditions. As explained above, it is hoped to increase the CO_2 percentage and to obtain a still higher combustion heat efficiency on this boiler.

As a result of the experience obtained on these two installations, it was decided for the new Hams Hall power station :—

(1) To adopt still larger boiler units of 200 000 lb. evaporation per hour each.

(2) To form the water walls of the combustion chambers of what are known as Murray fin tubes so as to do away with all possible brickwork in the furnace.

(3) To use unit pulverisers, five mills to be fitted to each boiler (four to run and one spare).

This arrangement is shown diagrammatically on page 706. The boilers are equipped with superheaters and air heaters, the whole of the air required for combustion being heated to a temperature of about 350 deg. F. The Atritor mills are air-swept, the hot air being used for this purpose.

Information has been obtained that both in America and on the Continent this system of firing pulverised-fuel furnaces is being largely adopted, and that satisfactory results are being obtained. It is anticipated, therefore, that this type of equipment will produce even better all-round results than those installations which have already been tested and which are described above.

ELECTRICAL ENGINEERS' BALL.

List of Members of General and Executive Committees.

IT has been arranged to hold the Electrical Engineers' Ball on February 7th next, at the Hotel Cecil, London, and the following committees have been formed :—

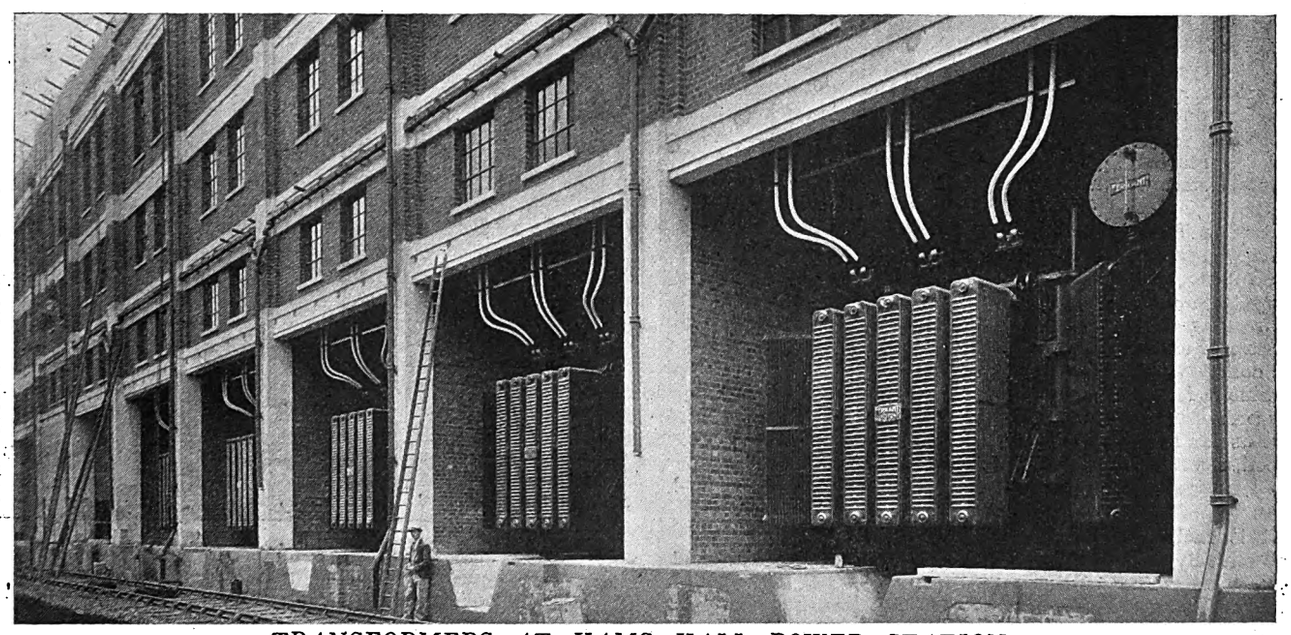
GENERAL COMMITTEE.

Alabaster, H.	Macgregor, J. J.
Alabaster, G. H.	McKinstry, A. E.
Allcock, H.	McClelland, Wm.
Atkinson, Ll. B.	McMahon, P. V.
Baldwin, O. H.	Mason, A. V.
Balfour, George, M.P.	Matthews, W. Lee
Bowden, J. H.	Midgley, H. E.
Callender, Sir T. O., J.P.	Mordey, W. M.
Chattock, R. A.	Moss, E. W.
Cooper, A. R.	Nalder, F. H.
Cramb, A. C.	Nash, Sir Philip A. M.
Crawter, F. W.	New, E. S.
Cridge, A. J.	Noble, Sir Wm.
Couzens, H. W.	Page, A.
Elder, T. C.	Partridge, G. W.
Ferranti, Dr. S. Z. de	Pearce, Dr. S. L.
Fox, E. J.	Pooley, F.
Gatehouse, E.	Purves, Sir T. F.
Gill, Frank	Railing, M. J.
Gillespie, M. M.	Riley, G. E.
Gray, James	Rinder, A. S.
Gregory, J. P.	Rogers, F. M.
Gridley, Sir Arnold	Rowell, P. F.
Hadley, A. E.	Russell, Dr. Alexander
Hardie, Lt.-Col. C.	Sayer, C. E.
Haward, Sir Henry	Scholey, H.
Highfield, J. S.	Siddeley, H. C.
Hill, C. W.	Sillar, A. M.
Hirst, Sir Hugo	Sinclair, Dane
Hunter, P. V.	Snell, Sir John
Hughman, R. W.	Sutton, Sir George
Kerr, M. J. D.	Taite, C. D.
Kingsbury, J. E.	Taylor, G. M.
Kolle, H. W.	Trezise, J. M. G.
Lackie, W. W.	Walton, A. H.
Leaf, H. M.	Wilson, David
Leigh, Lt.-Col. F. A. Cortez	Woodhouse, W. B.
Lonsdale, W. Stanley	Worsdell, F. E.

EXECUTIVE COMMITTEE.

O. H. Baldwin	W. S. Lonsdale
H. W. Cozens	P. V. McMahon
A. C. Cramb	A. M. Sillar
C. W. Hill	A. H. Walton
J. E. Kingsbury	

HON. SECRETARIES : A. M. Sillar, C. W. Hill ; HON. TREASURER : J. E. Kingsbury



TRANSFORMERS AT HAMS HALL POWER STATION.

THE transformer chambers at the Birmingham Corporation's new power station at Hams Hall are arranged along one of the side walls of the building. This picture shows some of the 12 000 kVA three-phase, 25 periods, 11 000/33 000 V transformers which were supplied by Ferranti, Ltd.

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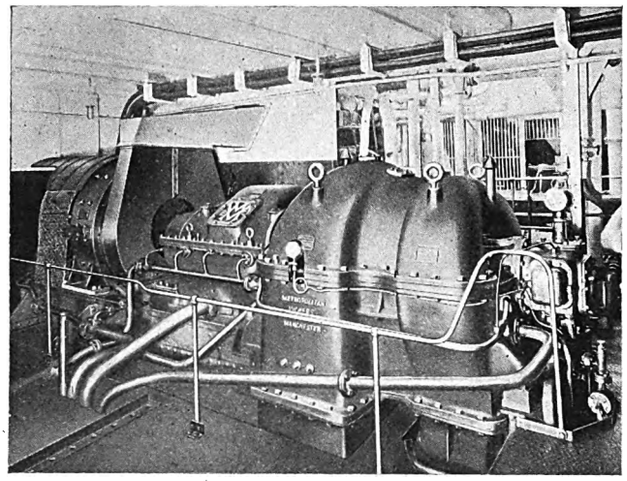
MARINE ELECTRICITY.

Electric "Supercharge"—A New and Most Promising Application of Electricity to Marine Propulsion Work.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Merchant Ship Types.")

THE last month has been quite gratifying as far as marine electrical development is concerned, and has culminated in the placing with a British shipyard of a contract for the construction of a Diesel-electric cement carrying ship for service on the Great Lakes of North America. Particular interest is added to this ship because it is one of the first electric ships to be constructed for the Great Lakes of North America



The turbo-generator on the s.s. "City of Hong Kong," the electrical equipment of which is described in the accompanying article.

in this country since some of the very earliest electrically-propelled ships, which, owing to various mechanical difficulties now happily overcome in modern ships, were by no means the successes their designers intended them to be.

This new ship will have 2 500 H.P. Diesel-driven generator sets and is expected to have a speed of 9 knots, but while one is tempted to discuss this vessel and her possibilities in rather more detail, it is nevertheless necessary to devote the major portion of these notes this month to a discussion of auxiliary turbo-electric propulsion or electric "supercharge," as it has been called.

There are now at sea on their maiden voyages two vessels which have electricity used as an auxiliary to their propulsion in a novel and rather epoch-making manner. One of these is the P. and O. liner "Mooltan," and the other is the Ellerman liner "City of Hong Kong." Each ship is propelled by steam reciprocating engines taking steam from Scotch boilers, and each has on her propeller shaft an electric motor intended to boost the power, and hence the speed of the ship, without in any way increasing the fuel consumption. The electric motor, which is arranged at a suitable position along the length of the shaft where there is not likely to be any shaft vibration, takes its current from a generator, which is in turn driven through gearing by a low-pressure steam turbine. This steam turbine takes it steam from a low-pressure cylinder of the main steam reciprocating engine.

In other words, by this arrangement, low-pressure steam, instead of as in the usual course of events, going straight to the condenser is now as it were by-passed into a low-pressure turbine before reaching the condenser. In going through this low-pressure turbine it generates electrical energy, but at no cost as far as fuel consumption is concerned, but with, it is hoped, a very desirable increase in net operating speed.

British Electrical Enterprise.

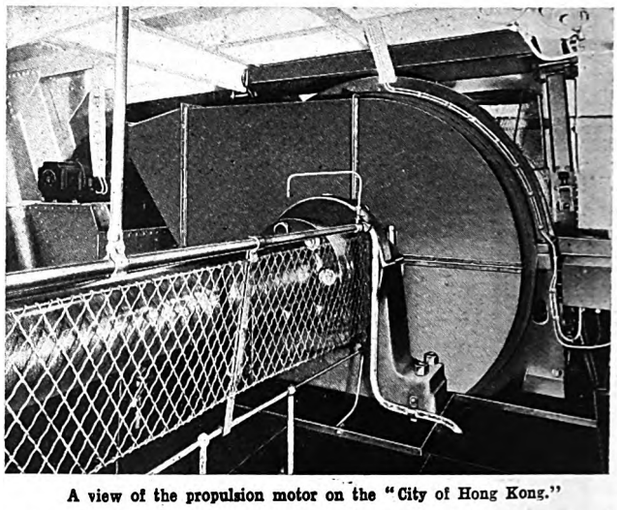
It is rather interesting that this development, (which is due entirely to the enterprise of two big electrical companies, the British Thomson-Houston Co. and the Metropolitan-Vickers Electrical Co., which are now devoting themselves whole-heartedly to the cause of marine electricity, should have come at a time when the Diesel-engined ship is developing so rapidly, and when in Diesel-engined ships "supercharge" effects are being widely employed in the working cylinders to effect an increase in power, and therefore of speed in the ship, again without any material increase in the fuel consumption. The parallel of course, is not mechanically an exact one, but economically speaking, engineers in each case are striving for the same effect, namely, something as far as possible for nothing.

The net result of all this is that a power plant can be designed say for x horse-power at a cost of so much for x plus y horse-power, the cost would be greater, the weight would be greater, and, above all, the fuel consumption would be greater. If now you can still design for x horse-power and with the fuel consumption, weights and sizes of x horse-power, obtain your x plus y horse-power, then you are virtually getting something for nothing, and you are getting it by means, in the Diesel engine, of pressure charging or "supercharge," and in the steam reciprocating engine, by means of electric "supercharge." Of course, in balancing up finally, one has got to consider the cost of, in one case, "supercharge" blowers or pumps, and in the case of the steam reciprocating engine, the cost of turbo-generators and motors on the shafts, but this cost, like all initial capital outlays in any vehicle of transportation whatever, is wiped out in a very short time by the economy of operation which results.

Authentic Voyage Reports.

That, in a nutshell, is what is being aimed at by engineers of the two big companies mentioned above in this electric "supercharge" which has been fitted to the "Mooltan" and the "City of Hong Kong." Both ships are now, as has been mentioned, on their maiden voyages, and it is hoped when they return to their home ports in this country, that for the sake of everybody interested in this new propulsion innovation, the electrical companies concerned will issue authentic voyage reports showing just what results have been obtained.

Meanwhile all we have to go upon is a report of the trials of "The City of Hong Kong" in Belfast Lough, which has been issued in some detail by the Metropolitan-Vickers Co. While these figures are, perhaps, not as full as one would wish from the point of view of stating exactly how the extra speed realised came into line with what the designers hoped, nevertheless, some remarkably interesting facts are revealed, not the least among which is that with the electric "supercharge" in operation an economy was effected in the total steam consumption of 23 per cent., the actual consumption of the engines of "The City of Hong Kong" with electric "supercharge" in operation being 9·085 lb. per indicated horse-power hour, whereas with electric "supercharge" out of operation this same figure was 11·82 lb. per indicated horse-power hour. Although no specific claim is made that an economy in fuel will result from the operation of this system, it seems not unlikely in view of the above figures.



A view of the propulsion motor on the "City of Hong Kong."

It should here be mentioned that the "City of Hong Kong" is a ship of 12 108 tons deadweight on a 28 ft. 10¾ in. draft, and was built in 1924. She had before conversion a normal service speed of about 12 knots and her quadruple expansion

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steam reciprocating engine is rated for about 4 400 I.H.P. at 80 r.p.m. On trials with the new electrical gear in place at 75.2 r.p.m., the main engine was developing 3 190 I.H.P. With the electric "supercharge" operating, the revolutions increased to 84.5 r.p.m., and the power developed by the reciprocating engine rose to 3 385 I.H.P. The "equivalent indicated horse-power" output of the motor was 1 495 H.P., so that the total power developed for the ship was 4 880 H.P. The motor volts were 420 and the amps. 2 550.

It is to be regretted that no figures are available showing what increase of speed was obtained with this extra power. With the electrical gear out of operation, the condensate measured in lb. per hr. amounted to 38 650 lb., whereas with the electrical gear in operation, this figure increased to 44 300 lb. The boiler steam pressure increased from 220 lb. per sq. in. with the electrical gear out, and 221.6 lb. per sq. in. with the electrical gear in. It will be interesting to see in future installations what effect upon the net increase in power is obtained by the use of higher boiler pressures and super-heat.

It is interesting to note that the steam pressure at the main engine exhaust (lb. per sq. in. abs.) with the electrical gear in was 7.915 lb., and the steam pressure at the turbine inlet was 7.19 lb. per sq. in. The sea temperature at the time of the trial was fairly low, being 54.5 deg. F., the circulating water discharge temperature with the electrical gear in being 76.9 deg. F., and the circulating water pump speed 291 revs.

The trials of the ship were exceptionally complete and included a full speed run over a period of 12 hours. At the end of this trial the speed was reduced to about 75% of full speed, and it is interesting to note that the output of the electric "supercharge" was well maintained, the proportion of total power developed by the motor at full speed being 27½%, while at three-quarter speed it is stated the proportion was only reduced to about 20%. A number of reversals were carried out with the vessel steaming at about 80% of full speed. The electric "supercharge" motor was reversed with the main engine and attained full speed astern in approximately 10 seconds from shutting off steam in the ahead direction. In rough weather off the Irish coast with the vessel light and the propeller consequently racing, the load on the electrical machinery forming the coupling between the turbine and the engine varied from 20% to 100% of full load. Full propeller revolutions were maintained and propeller speed fluctuation was barely noticeable.

This variation in load indicates the extent to which the steadying effect of the turbine was being used, and indeed it is said to be a noticeable feature of this system of propulsion that the complete arrangement has a remarkably steadying effect on propeller racing.

We have spoken above of varying conditions under which electrical gear is either "in" or "out." This would appear to indicate that it is readily possible to reduce the ship to a condition of operating without the electric "supercharge," and it will be interesting as a matter of fact to note whether in practice the electrical gear is kept in when the ship is manœuvring.

Control of Auxiliary Equipment.

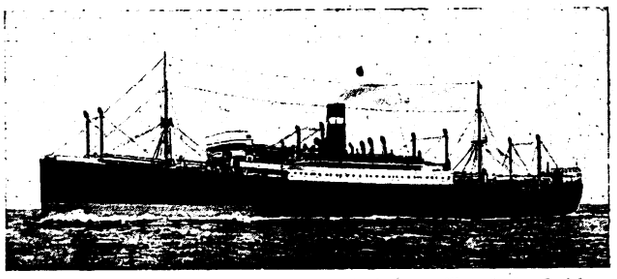
Trial trip experience would appear to indicate that there is no strenuous objection to this, and in fact as is the case with "supercharge" of Diesel engines themselves, it would appear that electric "supercharge" like certain forms of Diesel engine "supercharge" are to be kept in permanent use and are to be considered definitely as part of the main propelling equipment. It is now of interest, therefore, to discuss something of the arrangement adopted for the control of the auxiliary equipment and of the way in which such equipment is arranged.

It should here be mentioned that two types of equipment are available, one which concerns itself mainly with propulsion and which candidly we feel will have its greatest scope in the conversion of existing tonnage, and the other in which the turbine can be suitably proportioned so as to supply from its generator current not only for "supercharge" propulsion effects, but also for handling the whole of the auxiliary machinery load on the ship. This would appear to be particularly desirable where new tonnage is concerned, and may enable the shipowner, as suggested above, to build his engine for a lower power than the actual total power he requires to drive his ship at the designed speed, and at the same time obtain all the power that he requires for driving his auxiliary machinery electrically, practically for nothing. This, of course, can only happen when the ship is at sea, but in port one fells inclined to suggest the use of storage batteries for ship lighting, and perhaps for cooking, and, of course, as steam is always available, probably steam deck auxiliaries.

Automatic Operation.

There are many fascinating combinations of arrangement available for this type of powering, which, it cannot be too much emphasised, is easily one of the most epoch-making developments of the year. It should be stressed that once in commission the turbo-electric equipment functions automatically and requires no control as it adjusts itself to varying power requirements. Control of the equipment is obtained from an oil relay system supplied from an oil pump driven from the turbine shaft. Operation of all valves and safety features is included in this system, the arrangement being such that as long as pressure is maintained in the oil relay system, the requisite steam valves and electric switches are closed, and the turbo-electric equipment is in commission.

Oil pressure failure at once causes the relay operated steam valves to isolate the turbine from the exhaust steam supplied, and to connect the engine exhaust direct to the condenser.



s.s. "City of Hong Kong," the first ship to have auxiliary turbo-electric propulsion equipment.

By this same operation the electrical machinery can also be switched out of commission. The main control gear thus requires the engineer on watch only to open or to close a release valve on the oil relay system, and the emergency tripping devices operate by releasing the oil pressure in this system. A steam driven oil pump is provided to build up the oil pressure required to start the turbo-electric equipment and to flood the bearings. This pump is normally shut down after the equipment is running at full speed, but it may also be used if it is desired to keep the turbo-generator running when the ship is manœuvring in and out of port. This provision is necessary because the speed of the turbine itself might under such conditions fall too low to maintain the necessary oil pressure. This arrangement is not necessary in the case of equipment where the auxiliary machinery is driven from current supplied by the turbo-generator, because this latter runs at constant speed at all propeller revolutions from stop to full speed ahead or astern.

When auxiliaries are supplied in this way, the turbine is fitted with a section designed to take steam at normal boiler pressure and arranged to make up for any deficiency in exhaust steam required to furnish power for the auxiliary load. In this case, too, of course, the turbo-generator may be used to take care of the auxiliary load entirely on its own when the main reciprocating engines are shut down. This, of course, requires certain minor re-arrangements in the auxiliaries belonging to the turbine itself.

A typical single screw installation shows that the turbine is supplied through a separator with exhaust steam from the low-pressure cylinder of the reciprocating engine and exhausts into the common condenser. Because there is no direct mechanical connection between the turbine and the propeller shafting, the position of the turbine may be chosen at any place which best suits the run of the steam piping—a matter of some importance where large volumes of steam at very low pressures are to be dealt with.

A further advantage is obtained from the fact that the turbine may be built with steam connections on the under side, which facilitates inspection, because no steam joints need be broken nor heavy sections of pipe-work moved in opening up the turbine.

Another result of freedom in the choice of the position of the turbine is the small extent to which existing machinery is disturbed when a fast electric "supercharge" is added to an already completed vessel.

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TRANSFORMER FIRE.

Details of the Explosion and Fire at Prince's Station, Nechells.

At midnight on November 18th an explosion and fire occurred in one of the transformer cubicles at the Prince's station, Nechells, in which are housed the 3 500 kW single-phase transformers which step the pressure up from 5 500 V to 33 000 V for transmission through the three-phase 12 000 kW trunk cables. Subsequent examination showed that one of the 33 000 V terminal chambers on the top of the transformer had been blown to pieces owing to the terminal having gone to earth through some bakelite bushing. The oil contained in this chamber and in the conservator tank above was released and set on fire. The force of the explosion blew open the iron doors which are interposed between the cubicle and the outside yard. The intense heat inside the cubicle, due to the blazing oil, burned the jointing between the valve and the transformer tank which is used for draining the oil out of the tank. This allowed the main body of oil in the tank to leak into the cubicle, and the fire was fed in this way. This oil unfortunately found its way through some apertures in the wall, through which the cooling pipes pass, and started a fire in the chamber behind the cubicle, through which the control cables from the main switchboard to the e.h.t. switch cubicles pass, and these control cables were burnt through and the operation of the switchgear was interfered with, thus entirely shutting down the station. The Summer Lane station and the Nechells (temporary) station were immediately got away and supply was restored in this way. Temporary control cables were immediately put in hand and by 7 a.m. three of the turbo-alternators, one trunk cable, and all the e.h.t. cables were at work again, and by the following afternoon the whole of the station was in commission.

Photographs are reproduced on page 719 of the transformer cubicle as it appeared after the explosion and fire, and of the temporary control cables that were run during the night-time to replace those that were burnt out.

CHESTERFIELD CONTRACTORS.

Second Annual Dinner and Dance of Chesterfield E.C.A. Sub-Branch.

The second annual dinner and dance of the Chesterfield Sub-Branch of the Electrical Contractors' Association was held at the Station Hotel, Chesterfield, on November 27th. The chairman, Mr. Edgar R. Morris, presided,

When proposing the toast of the Mayor and Corporation, Mr. Morris strongly favoured compulsory registration. Some unrecognised contractors carried out contracts at prices which did not leave them with a working margin of profit. He would like to know how many more fatal fires would have to occur through defective wiring before the Government was aroused to a sense of duty and protected the public from shoddy electrical work.

The Mayor (Counc. H. J. Watson) said electrical current was as cheap in Chesterfield as in Sheffield, and was cheaper than in most towns in the Midlands.

Ald. H. Varley, chairman of the Corporation Electricity Committee, said that prices for electricity in Chesterfield had been reduced 13½ % during the past year; they had secured 1 800 new consumers, made 383 extensions, and laid 33 miles of cable. During the last four years they had spent £27 000 on hired wiring schemes and during the last year had made an agreement with the Derbyshire and Notts Power Co., and their capacity of supply had been increased 70%.

Mr. D. H. Davies (Chesterfield Corporation Electrical Engineer) gave the toast of "The Electrical Contractors' Association, Allied Associations and Officials." He mentioned that during the last five years they had carried out 5 300 installations for the Corporation at a cost of £37 000.

Mr. T. Beardsall, chairman of the Northern Section E.C.A., and Mr. L. C. Penwill, general secretary E.C.A. and Allied Associations, replied.

The toast of the Northern Section was proposed by Mr. W. H. Burton, secretary of the Chesterfield Sub-Branch, and responded to by Mr. W. A. Shaw (past President), and Mr. H. Moss (member of the Council).

"The Visitors" was proposed by Mr. H. Drabble, and the response was made by Mr. I. Scott Mackenzie and Mr. C. B. Wagstaffe.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

The Legion Book.

[To the Editor.]

Sir,—May I draw the attention of the readers of The Electrician to the words spoken by H.R.H. The Prince of Wales at the Remembrance Festival at the Royal Albert Hall on Armistice Night? In the course of his speech His Royal Highness said:—

> I would appeal to everyone in the United Kingdom who can afford to do so to make a point of including a copy of this book among their Christmas presents.

Nearly all your readers will be engaged at the present moment in buying Christmas presents, and I feel that if they include a copy of "The Legion Book" in their Christmas lists they will not only be helping the cause of our ex-service men, but will also be making a present that will be enormously appreciated by the recipient.—I am, etc.,

Jellicoe,
President, British Legion.

London, S.W.1.
November 28th.

"Electric Cooking is Cheap."

[To the Editor.]

Sir,—Under the above heading in your issue of November 22nd your correspondent "Dubious" asks for a few particulars.

I enclose herewith a few tests taken recently on a Jackson Junior electric cooker, so that "Dubious" can, after finding out the cost of electricity for cooking purposes in his neighbourhood, see if it would pay him to instal an electric cooker.

Electric Cooker Tests.

Oven Loading	.. .. ..	1 360 watts.
Grill ,,	.. .. ..	1 500 ,,
Boiling Plate	.. .. ..	1 500 ,,
Total	.. ..	4 360 ,,

Food Cooked.	Consumption in kWh.
3½ lb. joint, rice pudding, Yorkshire pudding, potatoes (baked), peas (boiled)	2·63
3½ lb. joint, Yorkshire pudding	1·44
Chicken, cabbage, beans, potatoes	*3·36
4 lb. joint, boiled potatoes, beans, baked apples, custard, boiled gravy	2·97
3 lb. joint, baked potatoes, apple tart, and custard tart	2·64
4 lb. joint, pie, stewed plums	2·04
Grilled steak, boiled beans and potatoes and gravy for three persons	1·30
3½ lb. joint, Yorkshire pudding, apple tart, jam tarts, baked potatoes, and cabbage for three persons	2·62
3½ lb. joint, 1 tart and 1 custard pie	1·43
3½ lb. joint, boiled potatoes, cabbage, Yorkshire pudding, stewed fruit (oven still hot enough for cakes, etc., after joint taken out)	2·72
Bacon, eggs, tomatoes and toast for two persons; also 10 pints of water for tea, washing up, etc.	0·88
10 pints water for tea and washing up; also eggs, bacon, tomatoes, and toast for three persons	1·0
3½ lb. joint, Yorkshire pudding, baked apples, 1 lb. sausages	1·44
3½ lb. joint, Yorkshire pudding, baked potatoes, jam roll, baked apples	1·88

* This is unduly high through using enamelled saucepans with concave bottoms.

In my case I am more than satisfied with the results, and think that, if current can be obtained at 2d. or less per unit, it is well worth while to instal an electric cooker.

"Dubious," must not, however, compare costs on meter readings alone, as there are other advantages, such as better cooked food, cleanliness, absence of fumes and intense heat in the kitchen, which gives greater comfort and health to all concerned, the value of which cannot be calculated in mere pounds, shillings and pence.

In addition, I find that meat shrinkage is below 10%, so there is a direct saving in butchers' bills in my case.—I am, etc.,

A. B. Cousins.

Merthyr Tydfil.
November 28th.

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NEWS IN BRIEF.

Price of Current in the U.S.—Electrical Women—Manchester and New Zealand Favour Electric Cooking—Belfast and an I.E.E. Students' Section.

LITTLE Burstead P. C. has decided to adopt street lighting by electricity.

On October 1st, the number of licensed radio sets in Sweden was 416 865, or 68·3 per every 1 000 inhabitants.

Colchester T.C. has applied for a loan of £10 000 for rebuilding premises in Osborne Street, for use as offices, etc., for the electricity department.

The Dominion Coal Co., Ltd., has awarded a contract for the design and construction of a generating station to be built on tide water at Glace Bay, N.S.

Gravesend Watch Committee has approved the Constables' Branch Board's application for electric heaters to be installed in five of the police boxes.

Middlesex County Council has voted £2 500 for furniture, internal telephones, electric bells, fire alarms, etc., at the Great George Street Offices, Westminster.

At the annual meeting of the Industrial Co-partnership Association on November 27th, Mr. F. W. Raffety, hon. treasurer, referred to the scope for big expansion in work of the Association, and appealed to the general public for largely increased support.

Dr. Edward Free, consulting engineer, addressing the Electrical Association of New York, last week, said sound-proof and windowless houses, electrically supplied with light and ventilation, and with medically prescribed artificial atmosphere were possible now, and would be general by 1950.

At a meeting of the Institute of Fuel, at Burlington House, London, on December 11th, a paper by Mr. W. D. Wylde, on "The Coal Burning Art as Applied to Steam Production" will be presented, in the author's absence abroad, by Mr. H. L. Pirie.

A ring of police boxes, equipped with telephones, etc., has been established around London, and came into operation on Monday.

The Government is urged by the London Chamber of Commerce to appoint a Committee of Inquiry into the desirability of setting up an independent statutory authority to administer the internal telephone and telegraph services of the Post Office.

The average price of current in the United States for the twelve months ended September 30th was 6·30 cents per kWh, as against 6·50 cents for the period ending June 30th, and 6·55 cents for the calendar year of 1928. The final average for the whole of 1929 is expected to be 6·2 cents per kWh.

As in the past, the Vienna Spring Fair, 1930 has been fixed for the week, immediately following the Leipsic Fair, *i.e.*, from March 9th till March 16th.

The Electrical Association for Women is about to extend its activities by opening a Bradford branch. Negotiations are going forward, and excellent support is already forthcoming. Miss Eva Moss (daughter of Mr. Harry Moss) is hon. sec. (*pro tem.*), and it is anticipated that the inaugural meeting will be held early in the New Year.

The North Wales Branch of the Electrical Association for Women celebrated its first birthday with a reception and luncheon at Colwyn Bay on November 30th. Mrs. S. Z. de Ferranti presided, and was supported by Dr. Ferranti, Miss Haslett, Lady Brooks, Mrs. Hyde, Mrs. Price-White and a representative assembly of over 100 members and their friends.

The heating of the Corporation tramcars electrically is being considered by Bury Tramways Committee.

The number of hired electric cookers connected to the Manchester mains during September was 81, making a total of 5 605 on circuit.

Guildford Highways Committee has asked the Borough Surveyor to report upon the use of electricity instead of gas for working the tarmac mixing plant at the depot.

Of a total of 457 power stations in Czechoslovakia, 311 are owned by supply companies and 146 by manufacturers. There are 13 000 miles of h.t. lines in the country, and this mileage is increasing at the rate of 17·5% per annum.

The General Purposes Committee of Middlesex County Council has considered resolutions from Newcastle Corporation regarding the certification and stamping of all electricity meters, and considers that the County Council should take no action in the matter.

A meeting of the Northern Ireland Branch of the I.E.E. was held at Belfast on November 27th, with a view to promoting a student section, with Belfast as centre. Mr. T. J. Monaghan, chairman of the Irish Centre, said he believed that such a section would receive every encouragement from the Institution.

It has been reported to Cardiff Electricity Committee that householders have been canvassed by sellers of electrical apparatus who have posed as representatives of the Corporation. Mr. C. G. Morley New, city electrical engineer, said it could not be made too clear that the Corporation did not employ any canvassers to sell any kind of electrical apparatus.

It is estimated that 2 000 electric washing machines and 16 000 electric cookers are in use in New Zealand. The value of electrical imports during the first six months of this year was £1 002 825.

The next monthly Individualist Bookshop luncheon will be held at the Hotel Cecil, London, on Wednesday, December 11th, when the chair will be taken by Sir Ernest Benn. The chief speaker will be the Marquis of Zetland, who will take as his subject "Individual versus Collective Action."

A discussion on "Problems in Illuminating Engineering" will take place at a meeting of the Illuminating Engineering Society at the Home Office Industrial Museum, Horseferry Road, Westminster, S.W.1, on December 10th at 7 p.m. The discussion will be opened by Mr. A. Cunnington, Mr. E. Stroud, Mr. F. C. Smith, Prof. H. Robertson and Mr. B. Ionides.

The Statistical Research Department of the N.E.L.A. estimates the value of plant and equipment of the American light and power industry at approximately ten and one-half billion dollars. The total number of consumers served is nearly twenty-four million, of which more than nineteen and a half million are domestic.

In a paper read at the Transport Congress last week, Mr. W. J. Jones (E.D.A.) drew attention to the need of efficient street lighting. It was difficult, he said, to find a bridge in this country which was worthily lighted, and he suggested luminous parapets and illuminated turrets. In cities where street lighting services were co-ordinated considerable improvement had resulted. In towns where a qualified public lighting engineer had been appointed, the organisation paid for itself in better service and economy.

LOOKING BACKWARD

FIFTY years ago, according to THE ELECTRICIAN, *dated December 6th, 1879 :—*

Following experiments, Messrs. W. and T. Avery were considering the use of the telephone between their Birmingham works and Ryder's Green, over 10 miles distant.

A beacon buoy, for which a British patent was granted, was lit on top "by means of a vacuum tube and an induction coil, the primary current being derived from large battery plates immersed in the sea."

* * *

TWENTY-FIVE years ago it was stated in THE ELECTRICIAN *of December 9th, 1904, that :—*

A proposal to run an electric tramway through rural districts in North Wales was the object of protests in the public press.

* * *

FIFTEEN years ago THE ELECTRICIAN, *for December 4th, 1914, recorded that :—*

The Yorkshire Electric Power Co. was renewing its Parliamentary application for electric lighting powers.

An Electrical Volunteer Force was being organised in Birmingham.

* * *

TEN years ago it was announced in THE ELECTRICIAN, *dated December 5th, 1919, that :—*

The "Daily Mail" had enlisted the services of Lord Moulton to demonstrate the drawbacks which would be caused to the public by the passing of the Electricity (Supply) Bill, one of the grounds being that it would put a premium on the waste of coal.

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PERSONAL.

HERR L. V. Verebely, chief electrical engineer to the Hungarian State Railways, has been appointed Professor of Electrotechnics at Budapest Technical High School.

Mr. F. Forrest, chief assistant electrical engineer to Birmingham Corporation.

Ald. A. Sturgess has been elected chairman of Derby Electricity Committee in place of Ald. J. P. Wilkins, who has held the position for sixteen years.

The many friends of Mr. E. A. Gatehouse will be pleased to hear that he has practically recovered from his recent operation and is again an active member of the industry.

Mr. R. A. Chattock, city electrical engineer to Birmingham Corporation, is due to retire under the age limit at the end of the year. The chief assistant electrical engineer, Mr. F. Forrest, has been recommended for promotion at a salary of £1 800 per annum. (See page 721.)

Mr. Emile Garcke has been elected chairman of the executive committee of the Industrial Co-Partnership Association.

Mr. E. A. H. Bagnall, of the Hewittic Electric Co., Ltd., is sailing on December 13th for an extensive tour of India.

Mr. H. B. Dorrell, mains superintendent to the Bury electricity department, who has retired after over 26 years' service, has been presented by the staff and employees with a trunk and barometer.

Islington Electricity Committee recommends the promotion of Mr. F. W. J. Corbett, relief charge engineer, to the position of charge engineer.

Owing to the resignation of Ald. J. O. Roberts from the chairmanships of Gloucester Electricity and Transport Committees, Coun. H. Farmer has been elected chairman of the Electricity Committee and Ald. Gardner has been invited to become chairman of the Transport Committee.

The marriage of Mr. Richard Macue, of the staff of the Warrington Corporation electricity department, and Miss Winifred Hewitt was solemnised at Higher Lane Baptist Church, Lymm, on November 9th. The bridegroom received from his colleagues an inscribed chiming walnut clock.

Maidstone T.C. has agreed to grant a gratuity of £1 050 to the chief engineer, Mr. E. E. Hoadley, for special services rendered. When this decision was arrived at on November 27th, the chairman of the Electricity Committee mentioned that had the Council obtained other expert advice it would have cost at least £5 000.

Mr. R. F. Dixon, for nearly ten years manager of the Mansfield and District Tramway Co., has been appointed general manager of the Oxford Motor Services, Ltd. Mr. Dixon, prior to coming to Mansfield, was assistant manager of the Southampton Corporation Tramways, and was also formerly on the staff of the Hull Corporation Tramways.

Mr. S. M. Hill, station superintendent of the Lancashire Electric Power Co., has been recommended by Bath Electricity Committee for appointment as station superintendent at Portishead in place of Mr. S. A. Russell, who resigned to take up his appointment of resident engineer with Manchester Corporation. Mr. T. Wells has been recommended for appointment as boiler house superintendent.

Standard Telephones and Cables, Ltd. advise us that Mr. H. C. Trenam has resigned his position as deputy manager in order to accept the appointment of assistant European general sales manager of the International Standard Electric Corporation; Mr. F. J. E. Brake has relinquished his position of sales manager to become technical director of Standard Telephones and Cables, Ltd.; Mr. J. W. Keefe is appointed sales manager of the same company; Mr. H. A. P. Disney has resigned his position as secretary to Standard Telephones and Cables in order to take up special duties with the International Standard Electric Corporation, and Mr. H. G. Paterson has been appointed in his stead.

Obituary.

MR. WILLIAM CLAYTON, aged 40 years. He was a partner in the firm of Messrs. Clayton and Rogers, electrical contractors, of Plymouth.

LEGAL INTELLIGENCE.

Appeal by Manchester Corporation Dismissed by House of Lords.

JUDGMENT was, on November 28th, given by Lords Dunedin, Sumner and Blanesburgh in the House of Lords on the Manchester Corporation's appeal against an adverse decision of the majority of the Judges in the Court of Appeal who, reversing Mr. Justice Talbot, gave judgment in favour of Mr. A. Farnworth, of Barton-upon-Irwell, in his claim to damages and an injunction to restrain the Corporation from continuing a nuisance by the emission of fumes from the chimneys of the generating station near his farm.

Lord Dunedin said the case had given rise to much difference of judicial opinion and its decision was not only of great moment to both the parties concerned, but its aspects brought up a question of the widest public importance, and it would be well indeed if it could be brought home, not merely to those interested in the development of the law but to those who in the future were in the position which enabled them to settle and control the position of large generating stations.

Their lordships arrived at the conclusion that the appeal should be dismissed with certain modifications, and declared that the damages to be recoverable against the defendants should be such as have been sustained by the plaintiff up to the date when the injunction by the order awarded shall have ceased to be suspended, or shall have been dissolved, whichever event shall first happen. That immediately after the injunction there should be inserted in the order the following clause: "With liberty reserved to the defendants to apply to a Judge of the King's Bench Division to dissolve the said injunction (*a*) on their establishing, if it be not admitted by the plaintiff, that they have exhausted all reasonable modes of preventing mischief to the plaintiff, and (*b*) on their submitting in the future conduct of their power station to adopt and use the most effective of these modes until they have replaced them by other reasonable but more effective modes of prevention which may thereafter be discovered and which will hereafter be adopted and used." That the first suspensions of the injunction should continue for one year from the date of the order of this House in lieu of one year from the date of the order of the Court of Appeal.

Lord Dunedin moved that with these modifications of the order of the Court of Appeal, this appeal be dismissed with costs, and that the cause be referred to the King's Bench Division to act in accordance with their lordships' declaration. The respondent to have the costs of the appeal to the House.

TELEVISION DEVELOPMENT.

Intention of Making Apparatus Available to Public in January.

THE Baird Television Development Company, Ltd., makes the following announcement:—

"The granting of further facilities for broadcasting television by the British Broadcasting Corporation to the Baird Co. has altered the whole situation of the television position. The transmissions that have been taking place during past months have been so successful that the night facilities have been granted to us. These experiments have also been of the utmost use in understanding the special conditions obtaining at the London station. We have been assured that very shortly additional wave-lengths will be allotted to us, so that the public will be able to see as well as hear speakers and singers. The apparatus will be available to the public in January. We have received broadcasting facilities from the Irish Free State, and this we regard as of great importance. Irish transmissions are to begin very shortly. These developments enable us to look forward to the future with confidence."

NEW LECTURE SERVICE.

Electrical contractors and others in the industry no doubt hear of radio, scientific, school and other societies with vacant dates in their programmes, and in this connection the Marconiphone Co., Ltd., has prepared three lectures, each illustrated with lantern slides, which may be read by any member. The subjects dealt with are:—Screen grid valves and circuits, a.c. valves and circuits, and public speech and music amplifiers. Each lecture is timed to last from thirty-five to forty-five minutes when accompanied by its series of fifteen to twenty slides.

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BUSINESS ITEMS.

THE address of the Lincoln office of CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., has been changed to 5, Broadgate.

The BRITISH BROWN-BOVERI, LTD., announces that after December 7th the address of the company will be 56, Victoria Street, London, S.W.1.

The electrical installation and the wireless equipment at the new City Hospital at Derby were carried out by C. A. NEWTON AND CO., of St. James's Street, Derby.

Messrs. LAWSON, electrical and radio engineers, of St. Andrew's Street, Bury St. Edmunds, on November 30th opened premises at 67, St. John's Street.

Captain P. P. Eckersley visited Neath on December 3rd for the purpose of giving a public lecture at the Gwyn Hall under the auspices of the MARCONIPHONE CO., LTD.

HEWETSON, SON AND CO., electrical and radio engineers, of 7, Cross Street, London, S.E., have opened a new branch business at 8, King's Road, St. Leonards, Hastings.

Will any reader knowing the London address or agency of the HAMILTON BEACH CARPET WASHING MACHINE CO., of 114, Liberty Street, New York, please communicate with the Editor.

Authority has been granted for the raising of a loan of $495 000 for the erection of new school buildings and extensions and for the equipment of a technical school in Western Canada. Further particulars from the Department of Overseas Trade. (Reference C.X. 3 162.)

GEO. L. SCOTT AND CO., LTD., Morris House, 60-66, Rochester Row, London, S.W.1, announce that they have taken over the representation of the interests of the Forges et Ateliers de Constructions Electriques de Jeumont from Mr. E. E. Garrard, of 82, Victoria Street, London, S.W.1.

The Trade Commissioner in the British West Indies has received an inquiry from Georgetown, British Guiana, for British firms' catalogues of (1) electrical apparatus, including kettles, irons and other articles of household use, and (2) motor driven woodworking machinery. Further particulars from the Department of Overseas Trade. Ref. C.X.

MODERN HOMES.

Further Details Concerning the "Ideal Homes" Competition.

IN connection with the competition organised by the "Daily Mail" and the General Electric Co., Ltd., for British architects, decorative artists and electrical contractors, brief details of which were given in our issue of October 18th, the organisers announce that the framework of the building consists of 4 in. studding, but any thickness can be arranged for door and window openings, the height of the openings on gangway is 10 ft.; no treatment is required of the outside of the Pavilion; designs must include treatment for inside walls, floors, and ceilings; fittings and furnishings are left to the discretion of the competitors, and fittings and appliances must be original. The cost is left to the discretion of the competitor.

In both the sections open to artists and art students a set of fittings suitable for any room may be submitted, and competitors may submit more than one scheme for one room, if they desire; any methods of treatment may be employed and will be regarded as lighting devices; the perspective may be on a separate sheet if desired.

Electrical contractors may, if they desire, suggest decoration schemes. Fittings for the lighting scheme must be shown. The kitchen, the only place available for domestic duties, should be complete. Coloured lines can be used for the wiring diagram. The specification for the wiring can be on a separate sheet.

Each room competed for must be on a separate sheet, and drawings include sketches of fittings proposed to be used. A series of fittings in the artists' and art students' sections should be included in one sheet. Separate sheets should be sent in for the two sections of the competition for artists and art students. The designs for electric light fittings should be in colour. In the architects section the drawings can be ½ in. to 1 ft., but must be contained on one sheet of paper per room, size 22 in. by 30 in. In the artists' and art students' sections the fittings should be shown quarter full size.

Should members of a firm collaborate in the preparation, the scheme should be submitted in the name of the firm.

Competing architects are advised to collaborate with their electrical contractors in order to ensure that entries are not only artistically correct but electrically sound.

INDUSTRIAL COUNCILS.

Meeting of District Council (No. 3) North-Western Area of the Supply Industry.

THE annual conference of authorised electricity supply undertakers in the North-Western Area, for the purpose of electing employers' representatives on the District Council and District Joint Board, took place on November 26th, at the Town Hall, Manchester. The Conference, representing some 80 undertakers, was well attended.

The Secretary (Mr. A. H. Banks) explained the unavoidable absence of the chairman, Ald. T. E. Higham, this being the first occasion since the creation of the Council (ten years ago) upon which the chairman had been absent.

Ald. W. Walker, who was appointed to preside at the Conference, dealt with the salient points in the annual reports upon the work of the Council and Board during the past year, after which the reports were unanimously approved and adopted.

Three vacancies had arisen in the group of the largest undertakers, owing to the retiring representatives having ceased to be members of the Councils of the constituent undertakers, and new representatives were appointed by that group. The remainder of the retiring representatives were re-elected.

The members of the Council for the current year are:—GROUP A.—Mr. H. C. Lamb (Manchester); Mr. P. J. Robinson (Liverpool); Ald. G. Billington (Salford); Ald. W. E. Freeman (Oldham). GROUP B.—Ald. T. E. Higham (Accrington); Mr. B. T. Hawkins (Wallasey); Mr. F. V. L. Mathias (Warrington). GROUP C.—Ald. E. Boothman (Nelson); Mr. C. L. E. Stewart (Rawtenstall); GROUP D.—Mr. A. J. Hutchinson (Farnworth). GROUP E. (COMPANIES).—Mr. C. D. Taite (Lancashire Electric Power Co.); Mr. W. Fennell (Mid-Cheshire Electricity Supply Co., Ltd.). Alderman W. Walker (Manchester) co-opted member.

The same members are elected to the District Board, with the substitution of Ald. E. Porter (Blackburn) for Mr. Robinson, and Coun. J. Lund (Radcliffe) for Mr. A. J. Hutchinson.

GARCKE'S MANUAL.

Features of the New and Enlarged Edition Just Issued—Continued Progress of Industry.

THE 32nd annual edition of "Garcke's Manual of Electrical Undertakings," which is called the 1928-29 edition because it deals with the accounts of the undertakings for the period ending September 1929, has just been published. The book has grown to nearly 2 250 pages, and the data contained therein relates to 5 500 undertakings in Great Britain and all parts of the British Empire, and has been carefully revised. Two useful new features are particulars of new generating stations sanctioned, under construction, etc., which have been added to the "Progress of the Year" section, and an amplified "Contractors" section which now comprises practically every town and urban area in which supply is available, and the name of the electricity supply undertaking. The entries of the individual undertakings contain commercial, financial and engineering particulars, and the Directory section includes about 20 000 names and addresses of directors, managers, engineers and other officials. The five sections of the book dealing with individual undertakings or persons, are: (I.) Electric Supply and Traction; (II.) Telegraph and Telephone; (III.) Electrical Manufacturing and Miscellaneous; (IV.) British Dominions and Possessions; and (V) Directories of Officials, Contractors, etc.

The summaries in the "Progress" section show that the capital subscribed in 1 618 undertakings in the industry in Great Britain is over £944 000 000, including loans for municipal undertakings, an increase of over £70 000 000 over last year's figure.

Summaries of the technical data show that the total capacity of generating plant installed in 707 generating stations in Great Britain amounts approximately to 6 245 490 kW, against 5 577 125 kW last year.

Other features are details of Government departments and associations concerned with the industry; a list of electrical joint-stock companies recently incorporated; a Buyers' Guide; and 29 maps of electricity supply areas, and railway and tramway routes. The price of the volume, which is published by the Electrical Press, Fisher Street, Southampton Row, London, W.C.1, is, as usual, 35s. net, post free in Great Britain.

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IN PARLIAMENT.

Grampian Electricity Supply Bill again before a Select Committee.

PARTIES interested in the Grampian electricity scheme met in a Committee Room of the House of Lords on November 25th to present their respective cases to the Select Committee. It was announced that the Earl of Clanwilliam, one of the members of the Committee, was unwell and would be unable to attend meetings of the Committee until the next week. Since the proceedings were cut short earlier this year by the death of Viscount Younger, the chairman of the Committee, which was then dealing with the Bill, the original scheme has undergone drastic modification; many of its prominent features have been eliminated, and the opposition to the existing scheme has considerably lessened. Viscount Chaplin was appointed to the Committee in the place of Lord Clanwilliam, to avoid any further delay.

Case for the Promoters.

Mr. E. Tyldesley Jones, K.C., for the promoters, said they had been able to make agreements with many of the landowners in the district, and the opposition was now of a vastly different character. The company was already in existence, and was supplying electricity in many parts of the North of Scotland. It was seeking an extension of the area of supply, and to that there was no opposition. It also sought authority to construct certain additional works in Strathglass. There was no question of State aid in this case. There would be no difficulty in raising the necessary capital. The company was creating a substantial rateable hereditament, and in this connection they were going to ask for some consideration from the Committee in the way of some relief from rating. In the Act of 1922, when they got extensive powers, they were authorised to raise £1 750 000 with further conditional powers up to £4 000 000. In this Bill they were going to ask for authority to increase the capital at once to £2 500 000 and to remove the £4 000 000 limit. There were also borrowing powers up to one-half of the issued capital. The Central Electricity Board had entered into agreement with the company to take a supply from the Rannoch and Tummel station not later than December 31st, 1930. The agreement was to continue until the Board's scheme for the North of Scotland was adopted, when the company's stations would become selected stations. The Cannick dam would hold up the water in Loch Mullardoch, from which 4 000 000 gallons per day would be turned into the Cannick from April to September and 2 000 000 gallons daily for the rest of the year. The remainder of the water would be diverted along a viaduct to the river Affric and finally discharged into the river after it had done its work at the power station. There was to be a continuous flow of 30 000 000 gallons per day turned into the river from September to April, and 75 000 000 gallons per day for the rest of the year. The works were now confined to a single generating station at Affric.

Mr. William M'Gill, director of the Grampian Electricity Supply Co., said they would be in a position to supply under the agreement with the Central Electricity Board some time before the time limit. The company proposed a maximum charge of 8d. per kWh in towns and 1s. in rural areas.

Mr. E. Murray, a director of the Scottish Power Co. and other similar power companies, said under the Grampian scheme ordinary consumers would get electricity for cooking, heating and lighting for 2d. to 3d. per kWh.

Mr. W. T. Halcrow, consulting engineer to the promoting company, said the estimated total cost of the scheme was £1 777 000.

Mr. Ian Macpherson, M.P., supported the scheme, and produced resolutions in its favour from the number of burghs in the district.

Mr. Harry Richardson gave technical evidence, and expressed the view that the hydro-electric station was more economical than a coal and steam generating scheme on the same scale.

London Traffic Facilities.

In the House of Commons on Monday Mr. Herbert Morrison, Minister of Transport, announced that the Government would immediately explore a plan for the consolidation of the present transport agencies now providing bus, tramway or local railway services in London. The Government agreed generally that a measure of unification under public control was essential to progress. There was little doubt that the elimination of wasteful competition would result in sufficient revenue being obtained to leave a margin available to attract fresh capital sufficient to provide for steady and continuous development of the traffic facilities. They had come to the conclusion that the ends in view could be achieved and the public interest could be safeguarded only if existing sectional financial interests were consolidated by the substitution of a single and simple form of public ownership for the complicated network of separate interests, private and municipal, which now added to the difficulties of the situation. They held that in any such scheme all the existing municipal interests should be included from the start. The relations to be established between the consolidated enterprise and the amalgamated railways was an important point, which merited and would receive careful consideration. While the Government had decided that the principle of public ownership should be applied, their intention would be to provide for the principle of commercial management of a self-supporting consolidated transport system.

On the same day Mr. Morrison informed a deputation which urged improved travelling facilities for the North Middlesex area that the London Electric Railway Co. had decided to seek powers in this session of Parliament to extend the tube from Finsbury Park, through Manor House, Turnpike Lane, Wood Green, Bounds Green, Arnos Grove, Chaseside and East Barnet to Cockfosters. He added that he had urged upon the London and North Eastern Railway Co. the desirability of electrifying its suburban systems. He was now more hopeful that in the near future the company would find it possible to electrify part of the suburban lines from King's Cross.

Wireless Telegraphy Act.

During the discussion in the House of Commons in Committee on the Expiring Laws Continuance Bill, the Wireless Telegraphy Act of 1904 was passed under review.

Captain Bourne who moved the omission of the Act from the Expiring Laws Continuance Bill, thought it was time a new Act should be passed.

Mr. Lees-Smith (Postmaster-General) said the Act had worked satisfactorily, and the Postmaster-General had been able to act fairly as the "policeman of the ether." An amending Act would no doubt be needed before many years. He mentioned that there were now 2 800 000 licences issued for wireless sets. Replying to questions, he said with regard to the transatlantic telephone service, the channels of communication were to be increased from three to five. A revision of fees was under consideration. On the recent breakdown of two cables belonging to the Imperial Communications Co., owing to storm, the beam system rendered invaluable service. It was decided to retain the Act in the Expiring Laws Continuance Bill.

Electricity Orders Approved.

The House of Commons has approved Electricity Supply Special Orders in respect of (1) part of rural district of Worksop; (2) urban district of Cudworth and township of Billingley in rural district of Barnsley; (3) urban district of Trawden; (4) parts of rural districts of Chipping Sodbury and Thornbury and part of rural district of Keynsham; (4) amendment of Burnham-on-Crouch and District Order, 1927; (5) increase of capital and borrowing powers of Leicestershire and Warwickshire Electric Power Co.; (6) rural districts of Escrick and Pocklington, Easingwold, Flaxton, Malton and Great Ouseburn; (7) borough of Congleton and urban district of Buglawton; (8) part of rural district of Runcorn; (9) rural districts of Cuckfield and Chailey; (10) part of rural district of Aysgarth; (11) urban district of Wimborne Minster and parts of rural districts of Poole, Wimborne and Cranbourne; (12) parts of rural districts of Salisbury and Fordingbridge; (13) burgh of Dunoon; (14) parts of rural districts of Aysgarth and Reeth; and (15) parish of Downton, in rural district of Salisbury.

DIESEL ENGINE USERS' ASSOCIATION.

The address of the new headquarters of the Diesel Engine Users' Association is now 307, Abbey House, Westminster, London, S.W.1, and all subscriptions for the year 1929 should be sent to the newly appointed honorary treasurer, Mr. F. A. Greene.

Mr. Percy Still has been obliged to give up the work of the honorary secretaryship, after serving the association in that capacity for fifteen years. His successor is Eng.-Capt. J. Hope Harrison, R.N., and Mr. C. O. Milton, who has been co-honorary secretary for the last two years, will continue to give his assistance. Mr. G. T. Greenland, assistant secretary, is also giving up his office.

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POWER EQUIPMENT.

THE power factor compensators manufactured by the ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2, are primarily intended for application to new or existing induction motors and are of the type known as a.c. exciters. They may be driven by an independent motor or coupled to the main motor by direct drive or by belt. Their purpose is to generate an e.m.f. at slip frequency and to impress this on the rotor circuit of the main induction motor so as to correct the power factor of the rotor and consequently of the stator also. The revolving part of the machine consists of an armature and commutator similar to that of a d.c. exciter, but with the difference that the winding span is shorter to suit the three-phase connections. This armature runs in a laminated stator, having main poles, commutation poles and compensating windings; the number of main poles is three or a multiple of three. Normally, the fields are of the compound-wound type, the ends of the shunt field coils being connected across the brush arms through an adjustable resistance. The armature is supported in roller bearings and the shaft is extended to take a half-coupling or pulley. The speed adopted depends on the particular performance required, and may be 1 000 to 3 000 r.p.m.

Overload Capacity.

The overload capacity of an induction motor fitted with a compensator of this type, it is claimed, is somewhat improved due to the decreased impedance of the motor and power factor compensator circuit permitting an increased maximum input to the motor, while the speed characteristics will be practically unchanged, that is, the speed will drop slightly with increased torque.

Normally there will be no loss in efficiency, and for motors working at 2 200 V and over, the manufacturers state, there will be an increase in efficiency for a motor and compensator, compared to a motor of the same output without compensator. The simple form of starting gear consists of an open-star or straight-through type of liquid startor, the three connections on one side going straight to the rotor slipring terminals and the three connections on the other going to the compensator, the latter forming the neutral point. When the compensator is driven by an auxiliary motor the latter is supplied from the stator leads, if necessary, through a small transformer. Hence it is started and stopped automatically by the operation of the main oil switch. An overload relay trips the main oil switch in case of excessive current in the auxiliary motor circuit. A comparison between a motor with compensator equipment and a motor without will sometimes show that the improvement in power factor is obtained with little difference in cost.

We have received from H. BRAMMER AND CO., LTD., of 207, Kirkstall Road, Leeds, particulars of "Brammer" V belting for fan, dynamo driving and power transmission. This type of belt is constructed on the fish scale principle, thus giving only one single complete unit, which is interchangeable and detachable. The unit consists of a leather or rubber-impregnated fabric link, at one end of which are three holes, one large and two small, connected by a slit, while a stud is rivetted to the other end. The belt is built up by threading the stud through the large hole and pushing it back into the small one. When three or more links have been placed this way, the top overlapping end links are threaded on to the stud in the same way, and pulled into the front small hole, and so on. Among the claims made for this belting are no slip, no stretch, extreme durability, and flexibility.

The ELECTRO DYNAMO CONSTRUCTION CO., LTD., 733 Old Kent Road, London, S.E.15, draws our attention to the suitability of the company's variable speed polyphase motors for printing press drives. These machines have shunt characteristcs throughout the speed range which may be as great as 4—1, and the motor can exert twice full load torque at starting. There are no moving brushes, the single set of brush gear having a fixed position, and the armature has only one winding and no sliprings. The motor is started and speed controlled by a single combined startor-regulator of the inductive type giving an infinite number of steps and smooth acceleration from zero up to the maximum speed. The regulator has no sliding or moving contacts or sliprings and is of simple construction, whilst remote control by push button can be arranged for. Inching features are incorporated in the machine and are obtained without the use of resistances or switches.

SOUTH MIDLANDS I.E.E.

Annual Dinner of the Centre—Views on Overhead Lines

THERE was a large attendance at the annual dinner, at the Grand Hotel, Birmingham, on November 28th, of the South Midland Centre of the Institution of Electrical Engineers. Mr. G. R. J. Parkinson, chairman of the centre, presided.

Mr. NEVILLE CHAMBERLAIN, M.P., proposing the toast of "The Institution," said the labours of members of the Institution were indispensable to the country. For good or evil we had deliberately made ourselves dependent for our prosperity, and possibly even for our existence, upon commerce and trade. It was therefore vitally necessary if we were to maintain our position, that we should keep ourselves in the van of progress in electrical development. It was a fact that we lagged behind other countries in the extended use of electricity, and this might partly be due to the fact that we were the early pioneers.

The Electricity Act of 1926, Mr. Chamberlain added, was passed by the late Government to remove some of the disadvantages and some of the difficulties which had naturally arisen out of haphazard distribution and the various types of equipment of the earlier power stations. In passing that Act the Government had three objects in view. They desired to concentrate the power stations, pool the power resources, and standardise as far as possible the electrical equipment.

Alluding to the complaints about the erection of overhead systems on Sussex Downs, Mr. Chamberlain said he was frankly glad to see the public conscience awakened to this question of the preservation of what was left of the amenities of the country. He did not think, however, that the most serious danger in this direction arose out of the activities of Sir Andrew Duncan and his colleagues.

Sir T. F. PURVES, President of the Institution, responding, said the electrical science was going to play an increasing part in the extension of the amenities of civilisation and the progress of the human race. The Institution was faced with new problems, but he looked forward with great confidence to the help of the provincial centres in finding solutions for them.

Sir ANDREW DUNCAN, chairman of the Central Electricity Board, responding to the toast of "Kindred Societies and Guests," proposed by the chairman, said members of the Board were fully conscious of the very great interest with which the electrical question was being studied in Birmingham. No industry in this country was more alert, he claimed, than the electrical industry. Within the industry they were looking forward confidently to a great expansion in connection with railway electrification, and he was glad to find that members of the South Midland area of the Institution were determined to help forward the national electricity scheme.

THE SOCIAL SIDE.

The annual staff and employees' dance of the Mullard Companies was held at the new Royal Horticultural Hall, Westminster, on November 29th. Mr. and Mrs. S. R. Mullard received the guests, who included many well-known members of the electrical and radio trades. The attendance was little short of 2 000, this putting the function on a par for size with the Metropolitan-Vickers' carnival dances at Manchester. Paper hats and caps were provided in a surprising variety of shapes and sizes, and balloon showers fell from the roof at intervals during the evening.

Bouverie House, the Fleet Street headquarters of Benn Brothers, Ltd. (publishers of THE ELECTRICIAN), and associated companies, was the scene on November 28th of a very successful bazaar held in aid of the funds of the John Benn Hostel, an institution established in the East End some years ago in memory of the late Sir John Benn, the founder of the firm. The bazaar, which was organised entirely by the staff and held after office hours, was opened by Lady Benn, who said it was an excellent idea that every business organisation should have some piece of social work in which all the members could take a personal interest. She believed that the Bouverie House bazaar was the first of the kind to be organised by a staff and held after office hours in a business house in the heart of the city. There were nine stalls in the Reception Hall, and numerous side-shows in various parts of the building. The public attended in large numbers, and the proceeds amounted to about £200.

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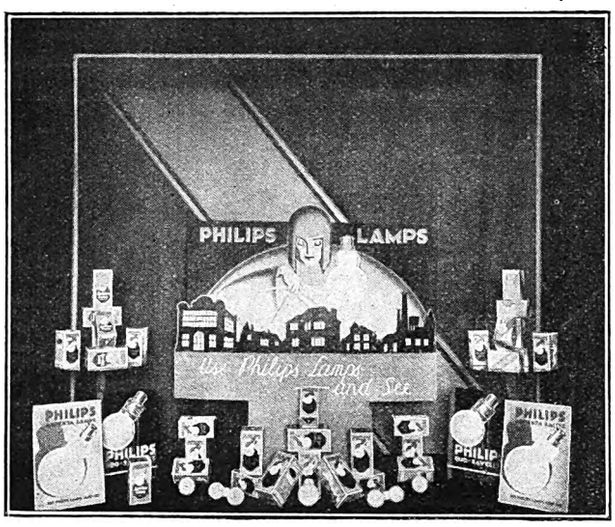
BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

BRADFORD EDUCATION DEPARTMENT.—Electric lighting installation at Bolling Secondary School for Girls. Particulars from the City Architect.

BRECONSHIRE STANDING JOINT COMMITTEE.—Electric light installation at Brecon Police Station. Particulars from Mr. H. C. W. Strickland, county architect, County Offices, Brecon.



AN attractive window display, the materials for which may be obtained from Philips Lamps, Ltd.

GLASGOW CORPORATION, December 7th.—Electrical work in connection with erection of observation ward at Belvedere Hospital. Specifications, etc., from the Office of Public Works, 64, Cochrane Street, Glasgow; deposit £3 3s.

BRAINTREE RURAL DISTRICT COUNCIL, December 10th.—Supply and fixing of electrically driven pumping plant. Specification, etc., from Mr. J. D. Haworth, 3, Central Buildings, Westminster, S.W.1; deposit £5.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, December 10th.—Extra high and medium pressure cable extensions (contract No. 48). Specification, etc., from Mr. R. W. Willis, electrical engineer and manager, 37, High Street, Cheadle, Cheshire; deposit £2 2s.

MANCHESTER CORPORATION, December 10th and December 17th.—(*a*) Delivery and placing into position, at Barton power station, of twelve single-phase feeder reactors (specification No. B. 71); (*b*) supply and erection, within Manchester area of supply of one 6 600 V sheet steel type transformer kiosk and switchgear (specification No. 259); (*c*) supply and placing in position, within Manchester area of supply of 125–250–500–750–1 000 kVA, 6 400/400 V, three-phase, oil immersed, self-cooled transformers (specification No. 260). Specifications, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s. for each. Tenders for (*a*) and (*c*) by December 10th, and for (*b*) by December 17th.

DUNDEE CORPORATION, December 11th.—Supply of three and four core, e.h.t. and l.t., paper insulated, lead covered and double steel tape armoured cable, for 6 600 and 660 V, respectively. Specifications from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

WANDSWORTH (LONDON) GUARDIANS, December 11th.—Supply of 18 electric sterilisers, inside size approximately 12 in. by 6 in. by 5 in.; with hinged lid, inside tray and automatic cut-out; finished chromium plating; loading 1 kW. Further particulars from the Engineer, St. James' Hospital, Ouseley Road, Balham, S.W.12.

BELFAST EDUCATION COMMITTEE, December 13th.—Electric lighting installation at North Road P.E. School. Specification from the Education Architect, Victoria Street, Belfast; deposit £1 1s.

MANCHESTER CORPORATION, December 13th.—Supply of electrically propelled tower ladder vehicles. Specification, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., December 17th.—Rewiring for electric lighting at the Patent Office and the Public Record Office, London, W.C. Specification from the Contracts Branch, King Charles Street, S.W.1; deposit £1 1s. in each case.

KIRKCALDY EDUCATION AUTHORITY, December 18th.—Electric and heating installations, in connection with extensions of St. Agatha's R.C. School, Methil, and Bell-Baxter School, Cupar. Schedules from Mr. E. Sandilands, Education Offices, Kirkcaldy; deposit, £1 1s.

WEST RIDING MENTAL HOSPITALS BOARD, December 18th.—Electric light wiring in connection with erection of a sanatorium at Wadsley Mental Hospital, near Sheffield. Specification, etc., from Mr. W. E. H. Burton, West Riding Mental Hospitals Board, Wakefield.

HULL CORPORATION, December 19th.—Supply of electricity meters (contract No. 148). Forms of tender, etc., from Mr. J. N. Waite, city electrical engineer, Electricity Works, Sulcoates Lane, Hull; deposit £2.

MILLOM URBAN DISTRICT COUNCIL, December 20th.—Haverigg extension scheme, comprising e.h.t. and l.t. cables. pillar box, etc. (section A); and e.h.t. and l.t. switchgear, transformers, etc. (section B). Specification, etc., from Mr. A. Lawrence, solicitor, clerk to the Council.

CENTRAL ELECTRICITY BOARD, December 21st.—Supply and erection of 132 000 V transformers in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.F.T.1) and form of tender from Mr. R. H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

HALIFAX CORPORATION, December 21st.—Electrician's work in connection with erection of new Girls' High School at Craven Lodge. Names of intending contractors to be sent by December 21st to Mr. A. C. Tipple, borough engineer, Crossley Street, Halifax; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, January 6th.—Supply and erection of 132 kV overhead transmission lines (special crossings and high spans), in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.—P.L. 2) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

IRISH FREE STATE DEPARTMENT OF INDUSTRY AND COMMERCE, December 7th.—Supply of pumping plant in connection with Shannon power development. Specifications (£1 1s.) from the Chief Engineer, 88, Merrion Square, Dublin.

VICTORIAN ELECTRICITY COMMISSION, December 9th.—Supply of 3 000 kVA transformers and spares (specification No. 29/119). (Reference B.X. 5 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Switchboard keys and parts (schedule No. C.496). (Reference B.X. 5 776.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 10th.—Supply of electric lamps, lamp caps and sockets for the Government telephone service (schedule C. 497). (Reference B.X. 5 783.)

ROUMANIAN POSTS, TELEGRAPHS AND TELEPHONES, December 10th.—Bronze wire, hard and soft copper wire and copper sleeves. (Reference A.X. 8 809.)

BELGIAN POSTS AND TELEGRAPHS, December 11th.—Supply and laying of telephone cables between Mouseron, Wevelghem and Dottignies and between Ostend and La Panne. Cahier des Charges (No. 3 452) from the offices of the department, La Salle Madeleine, Brussels; charge 18 frs.

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GATOOMA (SOUTHERN RHODESIA) MUNICIPALITY, December 12th.—Two fire-tube boilers, steam engines, alternators and switchboard, etc. (Reference A.X. 8 749.)

CHRISTCHURCH DRAINAGE BOARD, December 13th.—Supply and installation of four electrically-driven automatically-controlled pumping plants, each consisting of two horizontal centrifugal pumps with direct-coupled electric motor (contract No. 29/420); and two horizontal type, 3 H.P. a.c. motors direct-coupled with centrifugal sewage pumps (contract No. 29/421). (Reference A.X. 8 788.)

DUBLIN CORPORATION, December 14th.—Electric lighting and power installation at City Abattoir, North Circular Road, Dublin. Specification from the City Engineer, 28, Castle Street, Dublin, or Mr. F. McArdle, architect, 29, Rosemary Street, Belfast; deposit £3 3s.

JOHANNESBURG MUNICIPALITY, January 4th.—Supply of automatic traffic signals (contract No. 305). (Reference B.X. 5 924.)

CAPE TOWN MUNICIPALITY, January 7th.—Supply of 3-core 11 000 V cable (specification No. 482/1929). (Reference B.X. 5 925.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 14th.—Two air compressors (capacity not less than 800 cu. ft. of free air per min.), and two electric motors. (Reference A.X. 8 784.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of contact pressure testers (schedule No. C. 516). (Reference B.X. 5 821.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of telephone hand sets (schedule C. 526). (Reference B.X. 5 823.)

BLOEMFONTEIN MUNICIPALITY, January 10th.—Supply of automatic electric traffic signals (contract No. 5). (Reference B.X. 5 887.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 16th.—Supply of crude oil engine driven electric generating sets (tender No. 1589). (Reference B.X. 5 926.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 28th.—Supply of induction coils and register plates (schedule No. C. 533). (Reference B.X. 5 899.)

Overhead Lines.

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

Tenders Accepted.

BRIGHTON CORPORATION.—Edison Swan Electric Co., Ltd., supply of gasfilled lamps.

SHEFFIELD CORPORATION.—Hackbridge Electric Construction Co., Ltd., supply of four 500 kVA transformers, £969.

AUCKLAND (N.Z.) TRANSPORT BOARD.—British General Electric Co., supply of 104 Witton tramway motors and accessories, £15 000.

MANCHESTER-ALTRINCHAM RAILWAY.—Edward Wood and Co., constructional work, in connection with electrification of line, £50 000 (approximate).

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—British Electric Transformer Co., Ltd., four 1 000 kVA transformers, £1 590; A. Reyrolle and Co., Ltd., £641 3s,; h.t. switchgear, £641 3s.

BEXHILL CORPORATION.—Edison Swan Electric Co., Ltd. 390 ordinary meters, £1 057 6s. 6d.; Chamberlain and Hookham, Ltd., ten prepayment meters, £33 12s. 6d.; Enfield Cable Works, Ltd., six months' renewal of cable contract. (All recommended.)

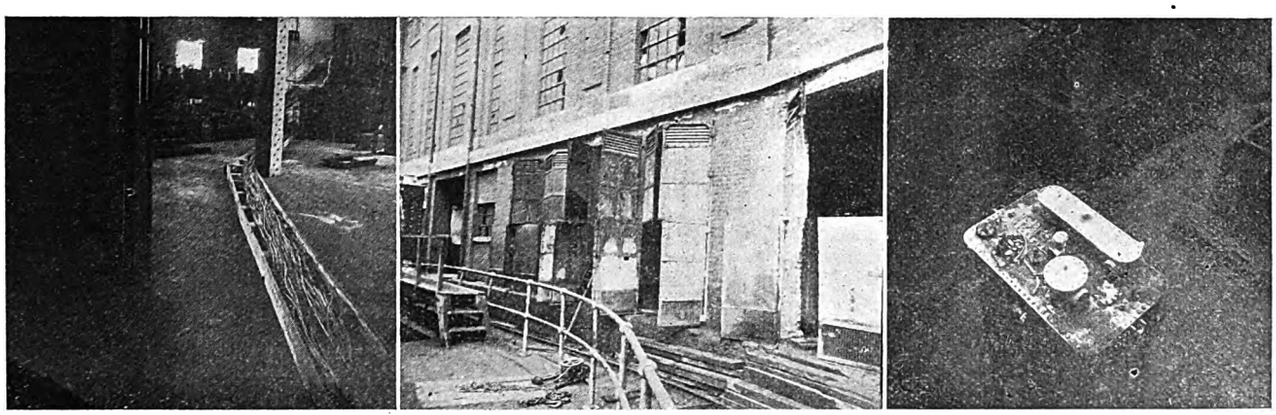
MANCHESTER CORPORATION.—S. H. Heywood and Co., Ltd., supply of electric overhead travelling crane, for the transport department; Ferguson, Pailin, Ltd., supply of 3-phase 33 000 V switchgear; Ferranti, Ltd., supply of two 10 000 kVA transformers.

GENERAL POST OFFICE.—Telephone exchange equipment, Silverthorn (Chingford) and Southend (multi-area), Standard Telephones and Cables, Ltd.; Basford (Nottingham multi-exchange area), Automatic Telephone Manufacturing Co., Ltd.; Telephone repeater equipment, Canterbury, General Electric Co., Ltd.

LEEDS CORPORATION.—Yorkshire Switchgear and Engineering Co., Ltd., supply of sub-station fuse panels, £346 10s. Supply of cables: W. T. Henley's Telegraph Works Co., Ltd., £1 824; Enfield Cable Works, Ltd., £1 611; Macintosh Cable Co., Ltd., £4 280; Hackbridge Cable Co., Ltd., £1 156 2s. 9d.; Derby Cables, Ltd., £1 995.

GLASGOW CORPORATION.—British Insulated Cables, Ltd. insulated bolts; R. Johnston, Clapham and Morris, Ltd., d c.c. wire; Dyer and Young, Ltd., armature coils; Titan Trackwork Co., Ltd., Edgar Allen and Co., Ltd. and Hadfields, Ltd., tramway special work (tongues and switches); Edgar Allen and Co., Ltd., special work (junctions).

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—Enfield Cable Works, Ltd., 5 000 yds. twin-armoured cable 0·01, £530; 500 yds. three-core cable, 0·0145 by 0·007 by 0·0145, £76. (Recommended). Also tendered: Siemens Bros. and Co., Ltd., £536 and £77; W. T. Henley's Telegraph Works Co., Ltd., £540 and £78; Macintosh Cable Co., Ltd., £545 and £79: Pirelli-General Cable Works, Ltd., £548 and £79; British Insulated Cables, Ltd., £550 and £79; W. T. Glover and Co., Ltd., £550 and £80; Callender's Cable and Construction Co., Ltd., £550 and £79.



VIEWS of the damage done and temporary measures taken at the Prince's station, Nechells, after the fire there on November 18th. The left-hand picture shows some of the temporary control cables, replacing those burnt out; the centre picture shows the effect of the explosion and fire in the transformer cubicle, and on the right is an illustration of the exploded terminal chamber on top of the transformer tank. *See page 712.*

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ELECTRICITY SUPPLY.

London Power Co.'s Cable Tunnel—Overhead Lines in Doune—Loans for Mains and Machinery at Battersea—Change of System at Bolton—Electric and Gas Street Lighti g at Stoke Newington—Lowestoft Extensions.

THE Central Electricity Board is to erect a sub-station in Tottenham Lane, Hornsey.

Bedford Electricity Committee has acquired land in Prebend Street, for the extension of the generating station.

Whitehaven T.C. is to apply for a Special Order to supply current to Preston Quarter, Sandwith, and Hensingham.

Plymouth Electricity Committee has authorised cable extensions in 21 streets of the city, involving an expenditure of £3 660.

The Leicestershire and Warwickshire Electric Power Co. is to erect overhead cables at Lightbourne, to which the Southam U.D.C. offers no objection.

Barking Electricity Committee has received sanction to borrow £3 092 for mains; £2 682 for hired wiring, and £120 in connection with Becontree sub-station.

Application to the Commissioners for a loan of £57 079 is recommended by Preston Electricity Committee. The money is to be spent on the river wall, buildings and plant.

A new 1 350 H.P. Diesel engine at the Ashford (Kent) electricity works was started on November 22nd by Mrs. Wilson, wife of the Urban District Council's electrical engineer.

Maidstone T.C. is to give a supply of current to the West Kent Hospital, on the Hospital Committee undertaking to pay the capital charges on the actual expenditure for a period of 25 years.

Formby U.D.C. is to borrow £3 000 for sub-station equipment, meters, etc., and £1 000 for the free wiring scheme. £340 is also to be spent on the laying of a cable to the Villa de Marley.

Blackburn Ratepayers' Association has passed a resolution urging the T.C. to consider the high cost of electricity and calling on them to discontinue the extra 10% imposed during the coal strike.

St. Pancras (London) Electricity Committee has obtained sanction to borrow £8 715 for mains and services; £3 831 for meters; £2 214 for hired wiring and £2 580 for domestic apparatus for hire.

The London Power Co., Ltd., has obtained consent to construct a cable tunnel under the River Thames at Battersea, to carry cables from the new Battersea power station to the north side of the river.

Stoke-on-Trent Electricity Committee has obtained sanction to borrow £3 300 for the erection of sub-stations at Hem Heath, Porthill, etc.—The Committee is to seek sanction for a general loan of £10 000 for services.

The South Metropolitan Electric Light and Power Co., Ltd., has submitted for approval a standard price of 2d. per kWh for street lighting, and this is recommended for approval by the Public Control Committee of London County Council.

Glasgow Corporation Streets Committee recommends refusal of permission to Messrs. Harland and Wolff, Ltd. to carry seven overhead lines across Hydepark Street, in connection with the Diesel engine works, which are situated on both sides of the street.

Guildford Electricity Department has been unable to obtain the consent of the Lord of the Manor of Shere (Mr. Bray) for the erection of overhead lines on any of his lands. A deputation from the Council to interview Mr. Bray, and, if necessary, to take steps to obtain authority for the compulsory erection of the lines.

The Electricity Commissioners have sanctioned the borrowing by Battersea (London) B.C. of £11 721 in respect of mains and services. Sanctions are now to be sought for mains and services, £78 000; buildings, £18 164 and machinery £3 579.—The Electricity Committee has considered the detailed estimate of the Borough Surveyor, amounting to £29 608 13s., for the erection of the boiler house extension at the generating station' and recommends that the work be carried out.

The demand for power in Toronto and vicinity has long outgrown the capacity of the Niagara power plants, and some time back contracts were entered into for the supply of power from the Gatineau River in the Province of Ontario. The Gatineau Power Co.—a subsidiary of the Canadian Hydro-Electric Corporation, has just begun delivery of an additional 50 000 H.P. for transmission to Toronto. This new contract increases the total energy to be carried over the 220 000 V line from Paugan Falls to Leaside, Toronto, to 130 000 H.P.

The increased demand for current in Bolton district has necessitated a change in the system of supply. The three-phase system is to be adopted in place of d.c., involving an alteration to much apparatus. The residential district, and practically all the mills, are already on the three-phase system. To supply d.c., converting apparatus has been necessary. The existing plant is barely adequate to cope with the demand, and it is thought a standardisation of system would be preferable to adding fresh converting plant.

Bangor (co. Down) T.C. received last week a report from Mr. R. S. Irwin, electrical engineer and manager, following communications with Messrs. Sayers, the Council's consulting engineers, with regard to the method to be adopted in the laying of service cables on opposite sides of the street from the main distribution cables. The scheme now put forward by Messrs. Sayers, while satisfactory, would require a further capital expenditure of about £10 000. It was resolved that application be made to the Electricity Commissioners for sanction to this expenditure.

Swanscombe U.D.C. has received a communication from A.P.C.M., Ltd., stating that they propose to erect, subject to the Council's consent, line poles in connection with the transmission of current from Johnson's Works to their Alkerden clay plant, the poles which would probably be of concrete, and 26 ft. in height.—The Lighting Committee recommends that the tramway standards, which would be required if it were decided to light the streets by electricity, be earmarked, and that the question be fully considered next April.—The Committee recommends that the offer of the Kent Electric Power Co. to erect a trial lamp be accepted.

Stoke Newington (London) Electricity Committee is to extend mains at a cost of £540, and instal free wiring at a cost of £828.—The Committee has approved plans prepared by Messrs. Hobman and Porri for the new southern sub-station, and is to obtain tenders for its erection.—The Borough Engineer has prepared a scheme for lighting Green Lanes, Seven Sisters Road and Amhurst Park by 500 W electric or 900-c.p. gas lamps, spaced at intervals of 180 feet, on columns and brackets 18 ft. high to the source of light, the lanterns to overhang the carriageway. The Highways Committee considers it advisable to erect gas and electric lamps alternately.

An inquiry was held by Mr. A. D. Erskine on behalf of the Ministry of Transport at Doune, last week, when evidence was heard in an application by the Grampian Electricity Supply Co., to erect overhead lines in several main streets of Doune. Objections were entered by Doune Town Council and the Western District Committee of Perth County Council that these overhead works would affect the amenities of Doune. The objectors maintained that the footpaths generally in the burgh were too narrow to render them safe for pedestrians if poles were erected. After the hearing of the evidence the Inspector visited the streets in which it is proposed to erect the overhead wires.

Lowestoft Electricity Committee has received sanction to borrow £10 572 for mains and services and £3 410 for plant in connection with the supply of electricity to Kessingland.—In order that the payments to Yarmouth Corporation in respect of bulk supply of current may not be unduly inflated by the operation of the peak load charge, the General Manager, Lowestoft electricity department, is to circularise consumers of current for heating, power and cooking purposes, suggesting that they should reduce consumption to a minimum between 4.30 and 6 p.m. during November and December. The lighting of Normanton Drive is also being reduced by one-half until after 6 p.m. during these months.

Torquay Electricity Committee has approved a proposal by Mr. Selvey and Mr. Hollyer that a further main transmission line be provided between Newton Abbot and Torquay, to deal with the increasing demands of the borough. They propose a 33 000 V line, erected overhead from Newton Abbot to Lawes Bridge, and there laid underground and connected with the distribution system.—The Electricity Committee seeks sanction to borrow £15 000 for unspecified works in connection with l.t. mains and services.—A further cable is to be provided to give a supply to the Teignmouth Electric Lighting Co., Ltd., at the boundary of the urban district of Newton Abbot and the parish of Haccombe-with-Combe.

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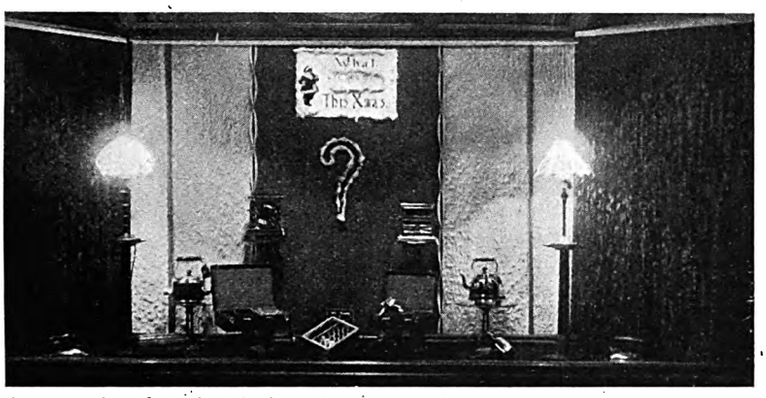
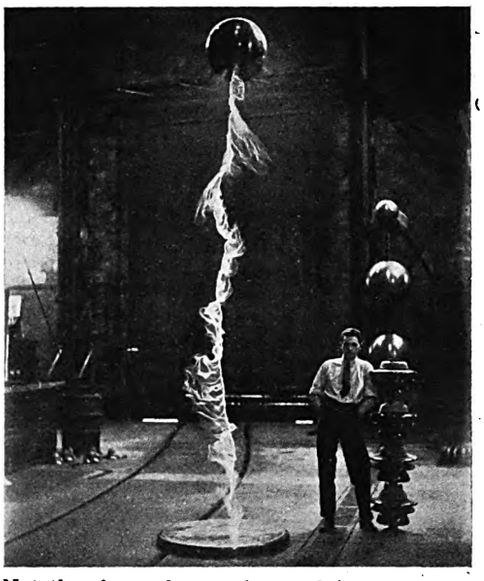
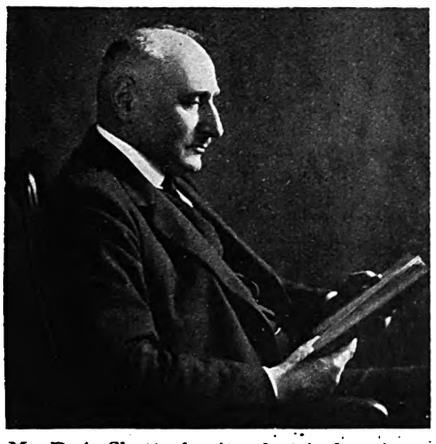
ELECTRICAL NEWS OF THE WEEK IN PICTURES.



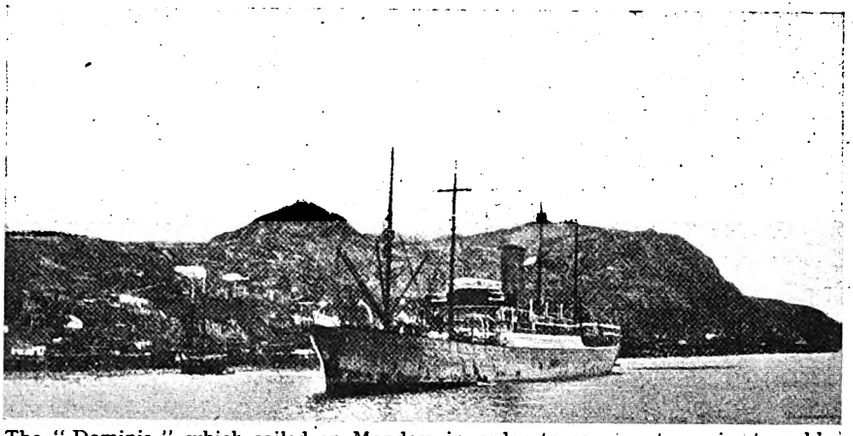
A suggestion that electrical goods are suitable as Christmas gifts is provided in this window at the Bradford electricity showrooms. The mark of interrogation is made of cotton wool on a red paper background, while the show-card above, edged with cotton wool, has a small picture of Santa Claus and bears the words " What are you giving this Xmas ? "



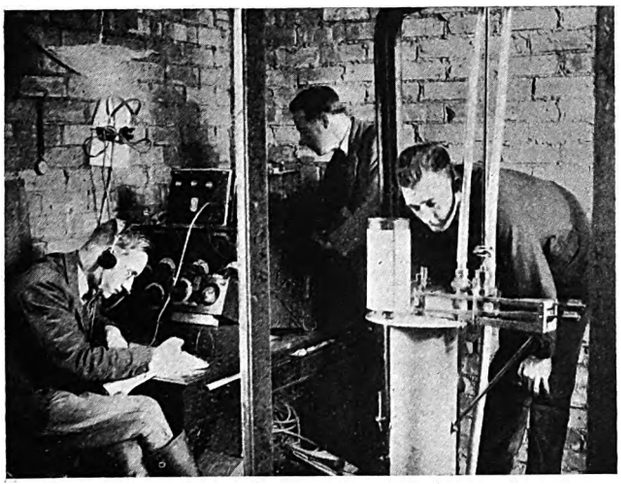
Not the ghost of some departed engineer, but the result of a demonstration with the 1 000 000 V testing transformer at normal frequency at the e.h.t. laboratory of the Metropolitan-Vickers Electrical Co., Trafford Park.



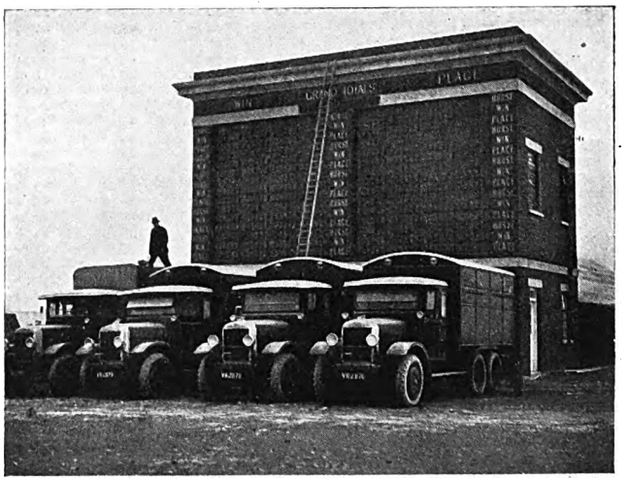
Mr. R. A. Chattock, city electrical engineer of Birmingham, who is due to retire under the age limit at the end of the year. As announced on page 714, he is to be succeeded by Mr. F. Forrest, the chief assistant.



The " Dominia," which sailed on Monday, in order to carry out repairs to cables damaged in the recent earthquake below the Atlantic. The " Lord Kelvin " and the " Cyrus Field " are already at work, and the Cunard s.s. " Ausonia " left Southampton on Saturday, November 30th, with 105 miles of cable on board. The c.s. " Cambria " will meet the " Ausonia " at Halifax, N.S., where the cable will be transferred and carried to the scene of repairs.



All ready for the launching of the R100. The meteorological offices and wireless station at Howden, where preparations are being made for the maiden trip of the latest British airship.



The latest six-wheeled Crossley vans, each with 100 V 400 A charging equipment on board, charging batteries at the central control board of the totalisators at Hurst Park race-course.

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COMPANY NEWS.

India Rubber Co., Declares Ordinary Dividend—Radio Corporation's Big Profit for September Quarter—Reports and Dividends—New Companies.

THE announcement on Monday by the Minister of Transport, in the House of Commons, of the Government's intention to take over the London passenger transport undertakings, caused nervousness on the part of holders of shares in the various companies concerned, and rises which had already occurred in prices were in several instances lost. Few changes in quotations, however, are shown as compared with a week ago. The ordinary shares of the Underground Electric Railways Company of London have been sold, and, at the time of writing, are quoted at 21s. 6d., a fall of sixpence. District Railway Ordinary stock at 72 is half a point down, but Metropolitan Railway Consolidated stock at 62 is a point to the good. The ordinary stock of the British Electric Traction Co. has fallen two points, from 119½ to 117½.

In the manufacturing section interest appears suddenly to have evaporated. Callender's, Henley's and other cable companies' securities exhibited no change. International Automatic Telephone shares have moved up from 35s. to 36s. 3d., and General Electrics at 47s. 6d. are also 1s. 3d. higher.

Cables and Wireless stocks have weakened, the 7½% "A" ordinary stock from 81½ to 78½, and the "B" ordinary stock from 44½ to 40½. Radio Corporation of America shares have moved up a point to 37, and Marconi's International Marine shares are 1s. 3d. higher at 46s. 3d. American Telephone and Telegraph capital stock has lost the 5 points gained last week.

Movements in the electrical supply department have been irregular. Clyde Valley shares have improved another half-a-crown to 38s. 9d., Metropolitan Electrics 1s. 3d. from 36s. 3d. to 37s. 6d., Midland Counties 6d. from 27s. 6d. to 28s., and Yorkshire Electric Power 3d. from 33s. 6d. to 33s. 9d. Tokyo Electric Light sterling bonds have improved ½ to 94. Calcutta Supply shares have fallen 1s. 3d. to nearly 50s. 6d., County of London at just over 48s. are 7½d. down and Brompton and Kensington ordinary and Lancashire Electric Light and Power 7% participating preference shares are each 6d. lower, at 25s. 6d. and 27s. respectively. Hydro Electric Securities are unchanged at 38 and International Holdings at 5¾ are ½ down.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	20/6	22/6	19/9
6¼	" " C. Cum. Pref. ..	20/6	20/6	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	58/9	58/9	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	26/-	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	50/7½	51/10½	56/-	32/6
5	" " 5% Cum. Pref.	21/3	21/3	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	92½	92½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	38/9	36/3	41/6	26/6
8	" " " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	48/1½	48/9	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	48/1½	48/1½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	45/-	26/9
4	Fife Tram. Lt. & P Ord.	12/6	12/6	23/6	10/-
6	" " " " 6% C.P. ..	15/-	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " 4½% 1st Mt. Deb. Stk.	89	89	92	80½
—	Hydro Electric Securities	38	38	87	20
—	International Holdings	5¾	6¼	35¼	6¼
(c)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref...	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/6	28/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	27/-	27/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	97	97	104	95
10	Melbourne Electric Ord. Stk. ..	170	170	180	150
1/9½	Metro. Elec. Sup. Ord.	37/6	36/3	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/-	27/6	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(e)	St. James & P.M. Ord. (£1) ..	26/-	26/-	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	25/6	25/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	94	93½	98½	86½
7	Urban E.S. Ord.	35/-	35/-	46/6	18/-
5	Victoria Falls Power Ord. ..	58/9	58/9	69/-	46/3

(a) 29.9d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. *Ex dividend. (g) 2s. 2½d. per share.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/-	25/-	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
7½	Whitehall Elec. Inv. Pref. ..	23/6	23/6	25/3	18/9
6	" " 1st Mt. Deb. ..	100½	100½	106	97½
8	Yorks Elec. Power Ord.	33/9	33/6	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	81½	81½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	87½	87½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	117½	119½	152	117
7·67	" " " " 6% Pf. Stk.	123½	123½	133	103½
6	Calcutta Trams Ord.	14/4½*	14/4½	24/-	14/6
5	" " " 5% Cum. Pf.	13/9	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb. ..	77	77	83	77½
5	City & S. London, Cons. Ord. ...	67	67	64	52
4	" " 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	74	74	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	62	61	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	72	72½	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	81½	82½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	21/6	22/-	28/2	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	83½	83½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	28/9	30/-	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb.	75½	75½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	75/-	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	23/3	23/3	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-	20/-	22/9	21/-
4	" " 1st Mt. Deb. ..	66½	66½	75	68
20	Enfield Cable Works Ord. ..	97/6	97/6	82/-	60/-
7½	" " " 7½% Cum. Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	6/3	6/3	15/9	5/-
—	" " 6% C.P.	8/9	8/9	18/9	7/-
5½	" " 1st Mt. Deb. ..	88	88	103½	86
6	" " Conv. Deb. ..	71½	71½	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/-	19/-	92/3	18/1
10	" " 7% Partic. Pref. ..	29/-	29/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	47/6	46/3	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P. ..	25/-	25/-	27/9	22/9
7	" " 1st Mt. Deb. ..	103½	103½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	117/6	117/6	120/-	69/3
10	International Auto. Telephone Ord	36/3	35/-	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord. ..	26/3	26/3	36/6	24/9
10	" " " Cum. Pref.	32/6	32/6	34/3	28/9
4½	" " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/3	21/3	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ...	225	230	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Tele. Ord. Stk. ..	60½	60½	63½	56½
6	" " " 6% Prefd. Stk...	99½	99½	105½	91
1½	" " " Deferred Stk...	24½	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	78½	81½	—	—
—	"B" Ord. Stk.	40½	44½	—	—
—	5½% Cum. Pref. Stk. ..	96	96¼	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	75	75	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Great Northern Telegraph (£10)	29	29	43½	26
10	Indo-European (£25)	52½	52½	48½	30
—	International Teleph. & Teleg. ..	$75	$75	161½	48½
15	Marconi Int. Mar.	46/3	45/-	90/-	16/6
4½	New York Tele. 4½ % Mt. Bds. ..	96½	96½	101	96
12	Oriental Telephone Ord.	38/9	38/9	65/-	41/-
—	Radio Corporation of America ..	37	36	115½	18½
4½	United R. Plate Tele. 4½ % Deb.	87½	85	89½	82
4	Western Tel. 4% Deb. Stk. ..	76	76	82	76

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Directors' Reports, etc.

GREAT NORTHERN TELEGRAPH CO., LTD.—Div. of 2½%, less tax (same rate as last year) will be payable on Jan. 1.

ERNEST BENN, LTD.—Directors have declared intm. divs. of 3½% on pref. shs. and 2½% on ord. shs., both less tax.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—Div. of 10%, tax free, on "A" and "B" ord. has been declared.

ATLAS LIGHT AND POWER CO.—The company will henceforth be known as the Atlas Electric and General Trust, Ltd.

ELECTRIC CONSTRUCTION CO., LTD.—It has been decided not to recommend an intm. div. on ord. shs. (agst. 3% last year).

PENNSYLVANIA WATER AND POWER CO.—Div. of $\$\frac{3}{4}$ for qrtr. endg. Dec. 30, 1929, on common shs. (agst. $\$\frac{5}{8}$) will be payable on Jan. 2.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Qrtrly. div. of 1½% on outstandg. cum. pref. shs. will be payable on Jan. 2.

CANADIAN GENERAL ELECTRIC CO., LTD.—Qrtrly. div. of 1¾% on pref. stk. for three months endg. Dec. 31st, 1929, will be payable on Jan. 1st, 1930.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO. OF BALTIMORE.—A qrtrly. div. of 90 cents (agst. 75 cents) for qrter. endg. Dec. 31, 1929, will be payable on Jan. 2.

GLOBE TELEGRAPH AND TRUST CO., LTD.—Usual qrtrly. intm. div. of 5s. p. sh., tax free, on ord. shs. will be payable on Dec. 31, 1929. Transfer books will be closed from Dec. 10 to 16, inclusive.

LIGHTING TRADES, LTD.—Pft. for year ended March 13 was £1 311, agst. £16 963, plus £3 125 brt. in, makg. £4 436, which is carried fwd. A further £16 500 of 1st charge deb. has been repaid, leavg. £118 500 outstandg.

UNITED ELECTRIC TRAMWAYS CO. OF CARACAS, LTD.—Net rev. for year ended June 30, 1929, £7 843, agst. £4 947. Owing to loss of £8 857 on workg. of omnibuses, no div. is recommended. Fwd. £53 698, includg, £45 854 brt. in.

MANX ELECTRIC RAILWAY CO., LTD.—Gross receipts for year ended Sept. 30, 1929, £43 535, agst. £42 007; net receipts £11 893, agst £12 515; debt service £9 437 agst. £9 752. Pref. div. 2%, less tax, for half year to Sept. 30, agst. nil. Fwd. £3 492, agst. £3 641.

CALLENDER'S SHARE AND INVESTMENT TRUST, LTD.—Rev. for year ended Aug. 31, 1929, £45 598, agst. £35 156; net pft. £37 219, agst. £27 681; to res. £500 (same as previous year); to special res. £3 000 (nil). Div. 20%, less tax, agst. 15%. Fwd. £36 364, agst. £29 110.

RADIO CORPORATION OF AMERICA.—Gross income of corporation and subsidiaries for qrtr. ended Sept. 30, 1929, $63 272 926. After provisn. for exes., depreciatn, estimated income tax, and res. for year end adjustmts., pft. was $8 729 389, makg. total surplus for nine months, $13 725 876.

BURMA ELECTRIC SUPPLY CO., LTD.—Net pft. for year ended July 31, 1929, £13 611, agst. £13 995, after placing £5 000 to res. and depreciation fund, makg. the total £77 949. Pref. divs. absorbed £7 200. Fin. div. on ord. shs., 2½%, makg. 5% for year, agst. 6%. Fwd. £7 246, agst. £6 835. Earngs. of tramways have again been seriously depleted by bus competition. Rules for regulating omnibus traffic have not yet been effected.

S. SMITH AND SONS (MOTOR ACCESSORIES), LTD.—Tradg. pft. £164 793 for the year to Aug. 3, 1929, agst. £160 937 for previous year. After providg. for depreciatn., directors' fees, bank int. and income-tax, net blce. is £114 089 (agst. £110 521. Pref. div. absorbs £30 000. Div. 17½% on pfd. ord. and 37½% on dfd. ord. shs., same rates as last year. To res. £25 000, makg. £225 000. Written off patents £10 000. Fwd., £47 368, agst. £43 079. Premium of £53 000 resultg. from issue in Dec. last of 50 000 £1 pfd. ord. and 280 000 1s. dfd. has been transferred to share premium acct. after deductg. exes. £1 417. Transfer books closed until Dec. 10, inclusive.

LA PLATA ELECTRIC TRAMWAY CO., LTD.—An *ad referendum* agreement has been made for sale of company's undertakg. to La Nacional, a rival system operatg. in City of La Plata. La Nacional is to pay £375 000 plus an amt. to be fixed for certn. stores, and transfer will be effected on Jan. 1, 1930. On that date £45 000 will be paid in cash and remainder by issue of £330 000 5½% 1st mtge. debs. of La Nacional. Scheme of arrangemt. put fwd. is that cap. be cut from £450 000 to £250 000 by reducg. ord. shs. from £1 to 4s.; to pay on pref. div. at rate of 6% p.a. for the year endg. Dec. 31, 1929; to cancel arrears of pref. div. (totallg. £133 000), and to transfer 60% of ord. to pref. hldrs. at rate of three ord. for four pref. held.

BRITISH COLUMBIA POWER CORPORATION.—Expansn. in all departmts. during year ended June 30, 1929, is reported by this Corporation, which was formed in 1928 to acquire control of British Columbia Electric Railway and power and lighting systems. Gross rev. for twelve months, $14 681 263 (£2 936 252). Operatg. exes., $10 064 867, includg. municipal taxes $7 825 626, depreciation and renewals $1 825 467, and income taxes $413 773, leaving net rev. $4 616 396 (£923 279). Int. on bonded debt and div. on pref. stks. of subsidiary companies absorbed $1 983 415, and divs. on class "A" shs. $2 000 000, leaving blce. $837 763, which raises surplus fund to $66 203 528 (£13 240 705). Growth of freight traffic over inter-urban lines, resultg. from inter-connectns. with other steam lines, shows increase of $100 000 over last year, rev. from this source being now approximately $1 000 000. Passengers on railway system 77 694 731, compared with 77 063 656 in 1928, while freight tonnage was 533 391, against 487 896.

Company Meeting.

INDIA RUBBER GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD.—Sir John Ferguson, presiding at the general meeting on November 28th, said the profit for the year, including dividends and profits on the sale of shares of subsidiary companies, after making due provision for depreciation and bad debts, was £22 828, and the disposable balance was £52 982. The directors saw no reason to delay longer a return to the ordinary shareholders, and it was proposed to declare a 2½% dividend to them, free of tax. With regard to Silvertown, sales had had a much larger drop than had been the case in the previous year. The work of erecting the new steam and power plant was well in hand, and there was every indication that they would have the whole installation in working order by the beginning of December. The total sales showed a decrease of 11·4%, Silvertown manufactures showing a decrease of 12·7%. As there had been an average drop in selling prices of between 12 and 13%, the decrease of 12·7% in sales meant that the volume or quantity of goods turned out had been roughly the same as for 1927–28. The current year had started under somewhat more promising conditions than had prevailed twelve months ago; the work of a general character awaiting manufacture stood at 11% higher. Submarine cable work had practically dropped to zero. At the Burton works they had to report a slight improvement, the turnover, however, having been insufficient to meet overhead charges. At Persan during the year there had been an improvement, within twelve months, equivalent to about £40 000. The year's trading showed a moderate profit, the first for a number of years, and the most substantial since 1920. The report and accounts were adopted.

METAL AND CHEMICAL PRICES.

		Tuesday, December 3rd. Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£75 10 0	—	£1 10 0
Electro Wirebars	,,	£84 0 0	—	—
H.C. Wires, basis	per lb.	11⅛d.	—	—
Sheet	,,	11⅛d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis ..	per lb.	1s. 2½d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,, ...	,,	10½d.	—	—
Wire ,, ...	,,	10½d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£22 15 0	—	—
Foreign or Colonial	,,	£21 7 6	—	2s. 6d.
Tin—				
Ingot	per ton	£174 10 0	—	£15 15 0
Wire, basis	per lb.	2s. 4½d.	—	2d.
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£19 15 0	—	12 6
Mercury	per bottle	£23 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 *Copper Sulphate* .. Ton £25 to £25 10 0
,, Roll, ,, £10 10 0 *Boric Acid* (Crystals) ,, £20 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2½d.
Sodium Bichromate—Per lb., 3½d.
Rubber—Para fine, 8½d.; plantation, 1st latex, 8d.

∴ The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

THE LEAD MARKET.

After the previous week's declines the market has, according to James Forster and Co., been comparatively steady. The American market is also quiet, with the price unchanged at 6.25 cents per lb.

Closing prices on November 29th were £21 10s. for all positions, or practically unchanged on the week.

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NEW COMPANIES.

DALLAS (AYR), LTD.—Cap., £5 000. Motor, mechanical and electrical engineers, etc. Reg. office: Burns Statue Square, Ayr.

SAM SHARPLES, LTD.—Cap., £1 000. Electrical and mechanical engineers and contractors, etc. Solicitor: M. Rigby, 15, Cooper Street, Manchester.

WIBERG TRUST, LTD.—Cap., £5 000. Electricians and mechanical engineers, etc. Solicitors: Reynolds, Sons and Gorst, 7, Arundel Street, Strand, London, W.C.2.

D. F. M. MANUFACTURING, LTD.—Cap., £1 000. Manufacturers of and dealers in electric fuse wire, fuse wire holders, etc. Reg. office: 7, Royal Bank Place, Glasgow, C.1.

TRADERS TOOLS, LTD.—Cap., £1 000. Tool makers, mechanical and electrical engineers, etc. Solicitors: Buckeridge and Braune, 3-4, Clements Inn, Strand, London, W.C.2.

FAIREST AND CO., LTD.—Cap., £250. Railway, tramway, electrical, mechanical and general engineers, etc. A permanent director: M. Fairest, 141, Worrall Road, Sheffield, engineer.

PERLA COMPOSIZIONE CO., LTD.—Cap., £100. Manufacturers of non-inflammable compositions used in manufacture of lamp shades, etc. Reg. office: 89, Gray's Inn Road, London, W.C.1.

C. E. GREENWOOD, LTD.—Cap., £2 000. Electrical engineers, manufacturers of, and dealers in, wireless and electrical apparatus, etc. Reg. office: Walmer House, 296, Regent Street, London, W.1.

CHIMICMAINE CO., LTD.—Cap., £100. Manufacturers of, and dealers in, electrical and scientific apparatus, appliances and instruments, etc. Reg. office: 7, New Court, Lincoln's Inn, London, W.C.2.

ARROW (PRESTON), LTD.—Cap., £100. Electrical, wireless, telephone and telegraph engineers, manufacturers of electric lamps, valves and wireless apparatus, etc. Reg. office: 17, Winckley Square, Preston.

DOVER COAL, GAS AND POWER CO., LTD.—Cap., £100. Colliery proprietors, manufacturers and suppliers of electricity, etc. A subscriber: G. T. Hannaford, Adelaide House, King William Street, London, E.C.3.

TRIUMPH RADIO CO., LTD.—Cap., £800. Radio or wireless telephony and telegraphy contractors, electrical engineering contractors, engineers, etc. Reg. office: 223, Vauxhall Bridge Road, London, S.W.1.

VUL-K-LEC, LTD.—Cap., £1 000. To acquire the business of electric vulcaniser manufacturers and suppliers carried on by B. Griffith, H. de Lisle Crawford and W. H. Fawcett, at 58, South John Street, Liverpool.

GRAPHONES, LTD.—Cap., £500. Wireless, electric lighting, telephone and general engineers, wireless experts, repairers of and dealers in radio and telephone apparatus, etc. Reg. office: 70, Cowbridge Road, Cardiff.

CHORISTER RADIO, LTD.—Cap., £100. Manufacturers of and agents for and dealers in wireless goods and in particular as manufacturers and sellers of Chorister Radio Products, etc. Reg. office: 15, Queensway, Ponder's End.

A. E. COLLIER AND CO., LTD.—Cap., £100. To acquire business of electricians, radio and wireless engineers, etc., carried on in Southport as Collier and Illingworth, Ltd. Solicitor: R. Hodge, 18, Hoghton Street, Southport.

STANDARD SWITCHGEAR, LTD.—Cap., £1 000. Marketers of electric light, cooking, heating, power and other electrical fittings and equipment, etc. J. B. Rudkin (managing director), Mount Joy, Hill View Road, Rayleigh, Essex.

ELITE IRON AND WIRE WORKS CO., LTD.—Cap., £1 000. Manufacturers and workers of, and dealers in, wire, cable, mechanical, electrical, telegraph, telephone and wireless engineers, etc. Reg. office: 34, Upper Cyprus Street, Holt Town, Manchester.

MASON (ELECTRO-MEDICAL), LTD.—Cap., £2 000. Manufacturers of and dealers in electrical apparatus and appliances; to promote and encourage study and investigation of electrical and electro-medical science, X-rays, etc. Reg. office: 96, Wigmore Street, London, W.1.

HEATH ELECTRICAL AND GRAMOPHONE CO., LTD.—Cap., £1 500. To acquire the business carried on by J. Cavendish, at 9, South End Road, Hampstead, N.W.3, as Heath Electrical Co., and to sell, purchase, let or hire, manufacture, fit, instal and maintain wireless and other electrical apparatus, etc.

ENGINEERING DISTRIBUTORS AND FINANCE, LTD.—Cap., £100. To carry on business as an issuing house for shares and securities of companies, and that of capitalists, financiers, concessionaires, merchants, contractors, engineers, manufacturers of electricity for light and power, etc. Reg. office: 419, Oxford Street, London, W.1.

BRITISH UNIVERSAL ILLUMINATIONS, LTD.—Cap., £100. To acquire business of the British Illuminations Co. and H. Stanley Smith and Co., electrical contractors, and to carry on same and business of electrical installation and other illuminating contractors, etc. A first director: H. S. Smith, 61, Southwater Road, St. Leonards-on-Sea, electrical contractor.

HUNTER AND PIQUART, LTD.—Cap., £300. Manufacturers of, agents for, and dealers in apparatus and accessories for use in connection with radio or wireless, in particular cables, wires, batteries, detectors, switches, pulleys, coils, condensers, head telephones, valves, rece,ivers, amplifiers and aerial and other insulators. Reg. office: 21 Glasshouse Yard, Aldersgate Street, London, E.C.1.

TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., *Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

SILOLUXE. B505 144. Class 6. Electric vacuum cleaning machines. C.C.A. (Vacuum Cleaners), Ltd., Swinton House, 324, Gray's Inn Road, London, W.C.1; merchants.—August 8th, 1929. The applicants undertake that this mark, when registered, and the marks Nos. B505 143 and 505 145, shall be assigned or transmitted only as a whole and not separately. User claimed from April 9th, 1927.

ELECTRAC. 499 883. Class 6. Toothed gearing, being parts of machines, for use in connection with electric railways and tramways. The Moss Gear Co., Ltd., Crown Works, Chester Road, Tyburn, Birmingham; manufacturers.—February 9th, 1929.

CADENZA. (Sign.) 505 062. Class 8. Sound reproducing instruments. May Small, 4, Bridge Street, Oakengates, Shropshire; manufacturer.—August 6th, 1929.

GOVERNOR. 503 919. Class 8. Electric accumulators and batteries (not for medical purposes), electrical measuring instruments, electric cables. John Shaw and Sons, Wolverhampton, Ltd., Fryer Street, Wolverhampton; manufacturers and merchants.—June 25th, 1929.

KOH-I-NOOR. 505 325. Class 8. Philosophical and scientific instruments, but not including crystals, detectors or instruments or apparatus for use in wireless telegraphy and telephony. Hunter-Penrose, Ltd., 109, Farringdon Road, London, E.C.1; printers' engineers.—August 16th, 1929.

NOVOTONE. 505 488. Class 8. Instruments and apparatus for radio-signalling, sound reproducers and thermionic amplifiers, gramophones, gramophone pick-ups and parts of same. Gambrell Bros., Ltd., 307, Merton Road, Southfields, London, S.W. 18; manufacturers.—August 23rd, 1929.

GNOME. 506 062. Class 8. Radio receiving sets and loud speakers. Rees Mace Manufacturing Co., Ltd., 39A, Welbeck Street, London, W.1; manufacturers of electrical apparatus.—September 13th, 1929.

K.O. (Sign.) B506 244. Class 8. Electric batteries, not for medical purposes. Julius Toubkin, 33, Long Millgate, Manchester; merchant.—September 19th, 1929. User claimed from May 1st, 1923.

BARKROLE. 506 246. Class 8. Philosophical and scientific instruments. John Barker and Co., Ltd., 83, Kensington High Street, London, W.8; general merchants.—September 19th, 1929. To be associated with No. 482 386 (2 584).

BURCO. (Sign.) 503 503. Class 13. Electric urns and wash boilers, all being goods of ordinary metal not included in other Classes. Burnley Components, Ltd., Accrington Road, Rose Grove, Burnley; engineers.—June 10th, 1929.

INVERCONE. 506 145. Class 13. Electric light shades and reflectors, all being goods of ordinary metal not included in other classes. The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.17.; manufacturers.—September 17th, 1929.

HOROLUX. 506 146. Class 13. Electric light shades and reflectors, all being goods of ordinary metal not included in other Classes. The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.17; manufacturers.—September 17th, 1929.

ALPHA. 502 004-6 741 S. Class 18. Electric radiators and stoves. Wright Bindley and Gell, Ltd., North British Steel Works, Penistone Road, Sheffield, and Premier Works, Percy Road, Greet, Birmingham; manufacturers.—April 20th, 1929. To be associated with 502 003-6 740 S, xiii (not yet advertised).

ISOMONA. 504 019. Class 8. Parts of wireless telephonic apparatus. Haw and Co., Ltd., 845 to 850, Salisbury House, London Wall, London, E.C.2; merchants.—June 28th, 1929.

VIVA-RADIO. 505 387. Class 8. Instruments and apparatus for use in connection with wireless telephony and telegraphy and wireless telephonic apparatus in combination with gramophones. Columbia Gramophone Co., Ltd., 102 to 108, Clerkenwell Road, London, E.C.1; manufacturers.—August 17th, 1929. To be associated with No. 471 115 (2 523) and another.

VALUNDA. 506 104. Class 13. Electric switches of ordinary metal. Frederic Richard Francke, 28, Blomfield Road, Maida Vale, London, W.9; engineer.—September 16th, 1929.

LIVEJUICE. (Sign.) 506 025. Class 1. Electrolyte for lead-plate electric storage batteries. The Livejuice Manufacturing Co., 42, South Lambeth Road, London, S.W.8; manufacturers.—September 12th, 1929.

TROJAN.—505 760. Class 8. Wireless telephonic apparatus. The British Homophone Co., Ltd., 67 to 69, City Road, London, E.C.1; manufacturers. September 3rd, 1929.

OSTAR.—495 023. Class 13. Incandescent electric lamps (ordinary) electric switches (ordinary) and switch holders. Percy Thomas, 37, New Road, London, E.1; importer and dealer in electrical goods. September 14th, 1928.

H.M. (Monogram).—495 374. Class 50. Knobs (ungraduated), ammeter and voltmeter cases, battery cases, panels and the like fittings for radio receiving sets; switch covers and moulded parts of electrical control gear, all being goods (not included in other classes) made from moulding powders composed chiefly of synthetic resins, and all being made in Great Britain. Healey Mouldings, Ltd., 239 and 241, Great King Street, Birmingham; manufacturers. September 27th, 1928.

D.C. (Monogram).—504 121. Class 8. Electric cables. Derby Cables, Ltd., Alfreton Road, Derby; cable manufacturers. July 2nd, 1929.

PAM.—505 170. Class 8. Thermionic valve amplifiers. Claude Lyons, Ltd., 76, Old Hall Street, Liverpool; manufacturers. August 9th, 1929. (By consent.)

B.S.R. SELHURST RADIO (sign).—505 321. Class 8. Wireless telephonic loud speakers and transformers and components parts thereof. Arthur Baker, trading as Bakers Selhurst Radio, 89, Selhurst Road, South Norwood, London, S.E.25; manufacturer. August 15th, 1929. Registration of this trade mark shall give no right to the exclusive use of the word "Selhurst."

VIKING.—502 909. Class 13. Electric lamps for cycles. Luke Killick Ioft, 525, Canterbury Street, Gillingham, Kent; merchant; May 21st, 1929.

MEP.—506 327. Class 13. Electric head lamps for use on motor vehicles, motor cycles, bicycles and locomotives. Maurice Edgar Power, 41, Queensborough Terrace, Hyde Park, London, W.2; of no occupation. September 23rd, 1929.

NORMAL.—B503 557. Class 16. Insulators of porcelain for connecting electric wires. Naamlooze Vennootschap Ramie Union, 48, Haaksbergerstraat, Enschede, Holland; manufacturers. June 11th, 1929. User claimed from April 26th, 1926.

SIEMENS SCHUCKERT. (Sign.) 487 004. Class 8. Philosophical and scientific instruments. Siemens-Schuckertwerke Aktiengesellschaft, 101 to 110, Nonnendamm-Allee, Berlin-Siemensstadt, manufacturers.—December 21st, 1927. To be associated with No. 472 258 (2 553) and others. (By consent.) Registration of this trade mark shall give no right to the exclusive use of the words "Siemens-Schuckert."

TRICHORD. 505 825. Class 8. Wireless telephonic apparatus, gramophones and parts thereof. The British Homophone Co., Ltd., 67-69, City Road, London, E.C.1; manufacturers.—September 5th, 1929.

EXWELL.—506 681. Class 8. Philosophical and scientific instruments. Erich Cahn, Frohsinnstrasse 25, Aschaffenburg, Bavaria; engineer.—October 7th, 1929.

D. P. B503 296. Class 8. Electric batteries, not for medical purposes. The D.P. Battery Co., Ltd., Bakewell, Derbyshire; manufacturers.—June 1st, 1929. User claimed from December 1st, 1891.

CIFEL. 507 047. Class 8. Philosophical and scientific instruments. Fonteyn and Co., Ltd., 2, 4, 5 and 6, Blandford Mews, Baker Street, London, W.1; merchants.—October 18th, 1929.

PHOEBUS. 490 632. Class 13. Electric lamps (ordinary). The British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2; electrical engineers and manufacturers.—April 20th, 1928.

MAXIPHONE.—506 811. Class 8. Philosophical and scientific instruments, but not including electrical instruments for magnifying sounds. Lugton and Co., Ltd., 133 and 135, Old Street, London, E.C.1; factors. October 10th, 1929. (To be associated with No. 368 312 (1 952) and others.)

TROJAN (Sign).—506 762. Class 8. Wireless telephonic apparatus and gramophones and parts thereof and gramophone records. The British Homophone Co., Ltd., 67-69, City Road, London, E.C.1; manufacturers. October 9th, 1929. (To be associated with No. 505 760 (2 690).) Registration of this trade mark shall give no right to the exclusive use of the letter "T."

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BIBBY, Arthur S., 135, Church Street, Preston, wireless dealer.—£17 2s. 5d. October 25th.

DICKIE (A.), LTD., Station Road, Portslade, wireless dealers £11 18s. 7d. October 9th.

ELECTRICAL ENGINEERING AND SUPPLY CO., 28, The Bank, Barnard Castle, wireless dealers. £37 16s. 6d. October 9th.

FERRIDAY, Lance, Arcade Wireless Shop, Stockton-on-Tees, wireless engineer. £18 13s. 2d. October 14th.

FREER, Mr. H. A., 110, Humberstone Drive, Leicester, wireless dealer. £28 18s. 10d. October 17th.

IRVING, R., 4, Bridge Road, Kirkstall, Leeds, wireless dealer. £18 5s. 6d. October 9th.

J. D. WIRELESS CO., 195, Breck Road, Liverpool, wireless dealers £46 16s. October 9th.

MAISEY, A. G., 280, Allerton Road, Allerton, wireless dealer. £14 10s. October 21st.

MITCHELL, Mr. D. C., Stein Road, Southbourne, wireless dealer. £15 0s. 10d. October 8th.

NEEDHAM AND PERCIVAL, 54, Nansen Road, Sparkhill, wireless dealers. £20 10s. 8d. October 8th.

SUMMERS, L., 30, London Road, Romford (trading as SOUTH ESSEX ELECTRIC CO.), electrical engineer. £22 2s. 5d. October 18th.

SPURR, E., 19, Bridge Street, Earlestown, wireless dealer. £10 17s. 10d. October 9th.

Bills of Sale.

BARNETT, Joseph, 126, High Road, Leyton, wireless dealer. Dated November 22nd, filed November 29th. £50.

BUCKLEY, Horace, Electricity House, Station Road, Marston Green, electrical engineer. Dated November 21st, filed November 23rd. £60.

CROSS, Alfred George, 134, Pope's Lane, South Ealing, electrical engineer. Dated November 21st, filed November 23rd. £40.

DIXON, Arthur Henry, 3, Powis Place, Great Ormonde Street, trading, in partnership, as electrical engineer. Dated November 22nd, filed November 28th. £60.

Receiverships.

MIDLAND RUBBER CO. (1913), LTD. (formerly MIDLAND RUBBER GOODS MANUFACTURING CO., LTD.). C. H. Smith, of Phœnix Chambers, Colmore Row, Birmingham, was appointed receiver on November 20th, 1929, under powers contained in first mortgage debenture dated November 15th, 1923.

REPRODUCTION, LTD.—O. F. Falk, of 19, Ironmonger Lane, E.C., was appointed receiver and manager by order of Court dated November 15th, 1929.

London Gazette, etc.

Winding-up Petition.

IDEAL WIRELESS CO., LTD. A creditors' petition for winding up has been presented by A. Risl (1927), Ltd., and is to be heard at the Royal Courts of Justice, Strand, London, W.C.2, on Monday, December 9th.

Company Winding-up Voluntarily.

TELEPHONE MANUFACTURING CO., LTD. By special resolution, Nov. 25th, F. C. T. Lane, 2, Norfolk Street, Strand, W.C.2, chartered accountant, appointed as liquidator for the purposes of reconstruction.

Bankruptcy Information.

HUDSON, Rex Chadwick, 1 and 2, Bridge Road, Chatburn, Lancashire, electrical contractor. Receiving order, November 25th, debtor's petition. First meeting, December 6th, 3.15 p.m., Official Receiver's Office, District Bank Chambers, Blackburn. Public examination, January 15th, 10.30 a.m., County Court House, Victoria Street, Blackburn.

Notice of Dividend.

SKIPPER, Sydney Harold, 35, Broad Bridge Street, Peterborough, lately trading as SKIPPER (S.H.) AND CO., electrical engineer. First and final dividend, 1s. per £, payable December 10th, Official Receiver's Office, 41, Sidney Street, Cambridge.

Orders Made on Applications for Discharge.

KELLY, Morris, 12, Jackson's Road, Manchester, radio apparatus dealer. Discharge refused, November 4th, with liberty to file a fresh application after the expiration of two years.

SANDGROUND, Arthur, 32, Allerton Road, Lordship Park, London, wireless factor. Discharged, October 16th, subject to consenting to judgment for £40.

Partnership Dissolved.

TOWER RADIO SUPPLIES (Morris DAVIS and Alfred BOWMAN), wireless dealers, 5, High Street, Shoreditch, E., by mutual consent as from November 19th, 1929. Debts received and paid by A. Bowman.

Bankruptcy Proceedings.

BATES, Victor Harold, trading as "THE LINTON RADIO SERVICE," High Street, Linton, Cambs., wireless engineer. The first meeting of creditors in this matter was held recently at the Official Receiver's Office, 1, Sidney Street, Cambridge, when a statement of affairs was filed showing liabilities ranking at £204 against assets of £56, thus leaving a deficiency of £148. The debtor attributed his failure to spending £30 on erecting a workshop; repairs of machinery and drawing sums in excess of profits made. The matter was left in the hands of the Official Receiver as trustee.

CLARKE, Harry Bell, 2, Devonshire Road, Carrington, Nottingham, electrical engineer. This debtor's application for discharge was heard on November 21st at the County Court House, Nottingham. The Receiving Order had been made in May of this year, when a statement of affairs was returned showing liabilities of £1 750, against assets that had realised £72. A dividend was to be paid of a little over 3½d. in the £. The discharge was suspended until such time as a dividend of 10s. in the £ was paid.

COLES, Allan James, 424, Pinner Road, lately 2A, Pinner Road, both Harrow, Middlesex, electrical engineer and contractor. The receiving order herein was made recently on the debtor's own petition. The first meeting of creditors was held recently at 29, Russell Square, London, W.C.1, when a statement of affairs was filed showing liabilities of £223, and assets estimated to produce £45, thus leaving a deficiency of £178.

GRIFFITHS, Philip Arthur, 124, Lodge Road, Redditch, late 2, Prospect Place, Redditch, and late Church Lench, near Evesham, Worcs, electrician. The public examination of this debtor was held on November 20th at Birmingham, when a statement of affairs was returned showing ranking liabilities of £451 and a deficiency of £423. Debtor said that he commenced trading as an electrical engineer in January, 1928, at Church Lench, having a capital of £300. At the end of March he estimated his loss at £5, and he then acquired the tenancy of thirteen acres of arable land and fifteen acres of pasture land adjoining his premises, and commenced trading as a market gardener. He later gave up the business and started as a greengrocer at Prospect Place, trading until January last, but owing to ill-health he was unable to attend to his work. He became aware of his position in November, 1928. The examination was closed subject to the signing of notes.

SANDS, Chaloner Wilkinson, High Street, King's Langley, Hertfordshire, electrical and wireless contractor. The public examination of this debtor was held on November 27th at the Court House, St. Albans, when a statement of affairs was filed showing ranking liabilities of £369, against assets estimated to produce £105, thus leaving a deficiency of £264. The debtor attributed his failure to lack of capital, keen competition, law costs of suing creditors and household and personal expenses in excess of profits. It would seem that for many years he was in employment and in May, 1926, when owing £95 for law costs, he purchased a retail wireless business for £50, which he paid out of £100 borrowed on the security of his reversionary interest under the will of his late grandfather. In the May of 1927 he added to his business that of an electrician, raising another £100 on the reversionary interest, but he did not have the benefit of that sum as the solicitors to whom he was owing £95 sued him for the recovery of that amount, which he paid. He was fairly successful, and the business provided him with a living until about eighteen months ago, but since then, owing to local competition, he had experienced difficulty in meeting his creditors' accounts as they became due. He had kept a fairly complete set of books with stocktaking sheets and a balance sheet made out to May, 1928. He had been drawing about £3 a week out of the business. He stated that he became aware of his position in October, 1928. The debtor was questioned regarding a sum of £1 17s. 6d. which he received after the Receiving Order had been made and which he stated he had used to get necessities at home. He had written to the Official Receiver stating that he would make it good, but he had not done so up to the present. The hearing was adjourned.

WRIGHT, Ronald Reginald, trading as WRIGHT BROS., 36, Normanton Road, Derby, wireless dealer. The public examination herein was held recently at the Court House, 20, St. Peter's Churchyard, Derby, when a statement of affairs was returned showing liabilities of £243, against assets of £146, thus leaving a deficiency of £97. The debtor, and a relative, it appeared, commenced trading in November, 1924, each contributing £30 capital, and a sum of money was borrowed from their parents and put into the business. In 1925 the relative withdrew, but received no payment. The failure was attributed to depreciation of stock, want of capital, and pressure by a creditor. The examination was closed.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

318 720 H. L. KIRKE, B. N. MACLARTY, and T. C. MACNAMARA. Thermionic valve circuits. (2/8/28.)
295 931 ELECTRICAL RESEARCH PRODUCTS, INC. Methods of and apparatus for applying material to cores. (20/8/27.)
305 643 T. M. HARRISON. Electrically heated vessels and the like. (10/2/28.)
318 728 H. G. LANDIS. Electric heater. (11/8/28.)
318 734 A. LANE. Cells for the production of gases by electrolytic processes. (21/8/28.)
297 456 ALLGEMEINE ELEKTRICITATS-GES. High speed synchronous motor combined with a gear-wheel transmission gearing for driving clocks, and for the control of tariff apparatus of all kinds. (23/9/27.)
300 177 SIEMENS-SCHUCKERTWERKE AKT.-GES. Electric current transformers for use in electric switchgear installations. (5/11/27.)
318 762 GENERAL ELECTRIC CO., LTD., and D. H. COCKBURN. Transportation of pulverulent materials. (27/9/28.)
318 764 A. PORDAGE. Automatic fire alarm. (3/10/28.)
318 768 BRITISH ELECTRIC PARI-MUTUEL, LTD., and F. HOWARD. Totalisators. (9/10/28.)
318 785 MULLARD RADIO VALVE CO., LTD., and P. W. S. VALENTINE. Electric circuits including smoothing elements. (25/10/28.)
318 786 H. H. THOMPSON, A. E. DAVIES, and W. E. BOX. Magnetic separators. (31/10/28.)
301 078 SIEMENS-SCHUCKERTWERKE AKT.-GES. Arrangement for switching off loads on extra high tension networks. (24/11/27.)
301 323 ELECTROLUX, LTD. Absorption refrigerating apparatus. (25/11/27.)
306 117 ALLMANNA SVENSKA ELEKTRISKA AKTIEBOLAGET. Current transformers. (17/2/98.)
316 204 AKT-GES. BROWN, BOVERI ET CIE. Means for equalising different torque effects on the working-shaft common to a combined power plant. (25/7/28.)
303 415 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Train control systems. (17/8/27.)
303 416 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Train control systems. (17/8/27.)
318 817 W. MCGEOCH AND CO., LTD., and C. W. FRASER. Globe fittings for electric lamps. (12/1/29.)
318 575 BENJAMIN ELECTRIC, LTD., and G. CAMPBELL. Shock absorbing mounts for thermionic valves or other electrical devices. (31/5/28.)
304 212 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Rotary shearing machines for cutting off lengths of continuously moving material. (16/1/28.)
304 614 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Potential supply devices for use with thermionic valves and the like. (20/1/28.)
307 032 INTERNATIONAL GENERAL ELECTRIC CO., INC. Shuttles of looms for weaving. (1/3/28.)
308 823 D. S. LOEWE. Indirectly heated thermionic cathode. (25/6/27.)
313 607 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electric switches. (16/6/28.)
319 024 C. NEFF. Method of producing oscillations by means of two or more co-operating generators. (12/3/28.)
318 841 A. H. MARKS and P. RUSSELL (legal representatives of E. C. R. MARKS, deceased). (Western Union Telegraph Co.) Telegraph systems. (6/3/28.)
288 630 SIEMENS-SCHUCKERTWERKE AKT.-GES. Arrangement in asynchronous machines with commutator machines mounted in cascade. (14/4/27.)
288 987 BRITISH THOMSON-HOUSTON CO., LTD. Alternating-current commutator motors. (16/4/27.)
318 903 J. P. NAYLOR. Electric luminous signs and signalling apparatus and their controllers. (4/5/28.)
296 774 LANDIS AND GYR SOC. ANON. Means for varying the temperature co-efficients of induction-measuring instruments. (9/9/27.)
319 032 W. E. BEATTY (BELL TELEPHONE LABORATORIES, INC.). Telegraph systems. (14/5/28.)
319 033 A. E. WHITE (FANSTEEL PRODUCTS CO., INC.) Electrolytic condensers. (15/5/28.)
304 582 ALADDIN INDUSTRIES, LTD. Lamp fixtures. (21/1/28.)
318 847 C. H. VERITY. Synchronisation of machines for recording sounds and movements. (5/6/28.)
318 876 E. REISZ. Electrostatic loud speakers and the like. (8/6/28.)
292 077 ELECTRICAL RESEARCH PRODUCTS, INC.) Carrier frequency signalling systems. (11/6/27.)
319 037 H. N. MARVIN. Means for tuning radio sets. (9/6/28.)
318 942 J. NEALE. Means of mounting for light-sensitive bridges. (12/6/28.)
318 944 STANDARD TELEPHONES AND CABLES, LTD. (G. DEAKIN). Automatic and semi-automatic telephone exchange systems. (13/6/28.)
318 945 STANDARD TELEPHONES AND CABLES, LTD. (G. DEAKIN and L. POLINKOWSKY). Automatic and semi-automatic exchange systems. (13/6/28.)
318 946 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.). Signalling systems. (13/6/28.)
318 947 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.) Electric resistance units. (13/6/28.)
318 948 J. H. ST. H. MAWDSLEY. Dynamo-electric generators for electric welding. (13/6/28.)
318 950 A. WRIGHT. Electromagnetic devices. (13/6/28.)
292 597 ELECTRICAL RESEARCH PRODUCTS, INC. Synchronising systems for use in television systems. (23/6/27.)
318 953 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and P. N. ROSEBY. Magnet cores. (13/6/28.)
292 130 MONTECATINI SOC. GENERALE PER L'INDUSTRIA MINERARIA ED AGRICOLA. Electrolytic cells. (14/6/27.)
319 046 STANDARD TELEPHONES AND CABLES. LTD. (L. J. J. SCHREIBER). Switching mechanism for automatic or semi-automatic telephone systems. (14/6/28.)
319 050 ELECTROLUX, LTD. (PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG). Evaporator units for refrigerating apparatus. (15/6/28.)
319 051 C. F. BURTON and H. BURTON. Dials or the like for electrical condensers or other electrical instruments. (15/6/28.)
319 055 STANDARD TELEPHONES AND CABLES, LTD. (BELL TELEPHONE LABORATORIES, INC.). Aerial systems. (15/6/28.)
319 058 J. B. TUCKER. Electrical plug and socket connections. (16/6/28.)
319 061 RADIO INSTRUMENTS, LTD., and W. L. SHAW. Iron-cored inductances. (16/6/28.)
292 600 C. LORENZ AKT.-GES. Maintenance of constant frequency in high-frequency electric circuits. (21/6/27.)
319 072 BRITISH THOMSON-HOUSTON CO., LTD., and R. D. PARRY. Control of electric motor generator sets. (19/6/28.)
319 074 GENERAL ELECTRIC CO., LTD., and R. J. KAULA. Electric terminals. (19/6/28.)
319 080 J. DURHAM. Amplifiers of sound-producing instruments. (25/6/28.)
319 085 C. E. FRY. Coin-freed mechanism, particularly applicable to prepayment devices for use with electric meters. (29/6/28.)
319 088 N. E. GOODRICH. Massaging machine with electromagnetic engines. (3/7/28.)
319 095 R. NEITL. Electric lampholders. (16/7/28.)
319 100 P. D. TYERS. Portable wireless receiving apparatus. (19/7/28.)
319 115 L. TSCHORNER. Television apparatus. (15/8/28.)
299 865 SIEMENS-SCHUCKERTWERKE AKT.-GES. Induction motors. (3/11/27.)
319 120 E. QUARTIER. Means for automatically controlling an electromagnetic device. (20/8/28.)
319 121 M. TROUTON and WIRELESS MUSIC, LTD. Electromechanical vibrating devices for use, for example, in loud speakers. (21/8/28.)
319 133 A. H. SEABROOK and A. AVIS. Poles, masts and the like for supporting overhead electric wires and for similar purposes. (8/9/28.)
297 388 TELEFONAKTIEBOLAGET L. M. ERICSSON. Impulse senders of the finger disc type. (20/9/27.)
319 141 A. E. BOWYER-LOWE. Wireless receiving apparatus. (21/9/28.)
297 847 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Thermionic valves. (29/9/27.)
298 202 E. BECK. Timepiece with electric driving mechanism. (5/10/27.)
298 241 SIEMENS AND HALSKE AKT.-GES. Electromagnetic relays with two armatures. (6/10/27.)
298 490 RHEINISCH-WESTFALISCHES ELEKTRIZITATSWERK AKT.-GES. Protecting device for current distributing plants. (7/10/27.)
319 156 H. H. THOMPSON, A. E. DAVIES and W. E. BOX. Magnetic separators. (30/10/28.)
300 124 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Apparatus for amplifying and for rectifying oscillations. (5/11/27.)
302 286 ASSOCIATED ELECTRICAL INDUSTRIES, LTD. Electrical control devices. (13/12/27.)
319 167 J. FELDMAN. Construction of transformers, choking coils and other parts of wireless apparatus to facilitate assemblage. (13/12/28.)
302 908 BRITISH THOMSON-HOUSTON CO., LTD. Electron discharge devices. (22/12/27.)
319 175 E. F. SCHAFER. Combined table lamp and loud speaker. (24/12/28.)
319 176 W. GUY-PELL. Lamp shades. (2/1/29.)
304 656 SIEMENS-SCHUCKERTWERKE AKT.-GES. Projecting screen, more particularly for daylight projection. (23/1/28.)
305 049 SIEMENS AND HALSKE AKT.-GES. Power supply apparatus suitable for use in supplying thermionic valves and the like. (27/1/28.)
305 935 H. GRENGEL WEICHENBAU GES. Tramway points. (10/2/28.)
318 956 STANDARD TELEPHONES AND CABLES, LTD. (G. DEAKIN and L. POLINKOWSKY). Automatic and semi-automatic exchange systems. (13/6/28.)
318 957 STANDARD TELEPHONES AND CABLES, LTD. (G. DEAKIN and L. POLINKOWSKY). Automatic and semi-automatic exchange systems. (13/6/28.)
319 063 STANDARD TELEPHONES AND CABLES, LTD. (G. DEAKIN and L. POLINKOWSKY). Automatic and semi-automatic exchange systems. (13/6/28.)

Applications for Patents.

August 21st.

25 507 F. AND I. BERGOLZ. Pedestals for telephone instruments, etc.
25 461 A. D. BLUMLEIN and STANDARD TELEPHONES AND CABLES, LTD. Variable mutual inductances.
25 489 O. BRUNNGUELL. Light diffusers for incandescent lamps.
25 402 BUTLER MACHINE TOOL CO., LTD., and A. KERSHAW. Control of electrically actuated feed motions.
25 403 BUTLER MACHINE TOOL CO., LTD., and A. KERSHAW. Control for use with motor-generator drive.
25 473 L. P. HANSSAUER. Electrically heated domestic ovens.
25 457 H. F. JOEL. Portable battery lamps.
25 474 LISSEN, LTD., and R. P. RICHARDSON. Wireless receiving sets.
25 510 C. LORENZ AKT.-GES. Telegraphic systems. (28/2/29, Germany.)
25 426 MILLAR, PRESTON AND WALMSLEY, LTD. Electrical warming device for side or rear lights.
25 513 W. F. RANDALL and F. L. AND W. S. SMITH. Manufacture of signalling conductors.
25 502 G. WALL. Maximum demand indicators.

August 22nd.

25 526 M. VON ARDENNE. High frequency signalling. (23/8/28, Germany.)
25 567 E. A. BITTON, H. BRANTOM, H. A. STORRY, LTD., and H. G. BAWTREE-WILLIAMS. Electrical sound reproducing apparatus, etc.
25 638 M. BOSS. Telephones.
25 587 BRITISH THOMSON-HOUSTON CO., LTD. Electric cable systems. (22/8/28, U.S.)
25 590 BRITISH THOMSON-HOUSTON CO., LTD. (GENERAL ELECTRIC CO. OF N.Y.). Electric condensers.
25 545 A. G. BULLEN. Electric sign lamps.
25 593 H. S. COLEMAN and SIGN CONSTRUCTION CO., LTD. Electric signs.
25 534 S. O. COWPER-COLES. Recording sound.
25 585 ELECTROACUSTIC GES. Preventing cross talk in sub-aqueous sound installations. (4/10/28, Germany.)
25 629 GRAMOPHONE CO., LTD., and A. WHITAKER. Wireless receivers.
25 616, 25 617 G. D. L. HORSBURGH, H. S. LEVICK, and S. LEVICK AND SONS, LTD. Permanent magnets.
25 615 A. LESTER and C. MARQUIS. Self-contained electric lamps.
25 586 C. LORENZ AKT.-GES. Telegraphic systems. (7/2/29, Germany.)
25 636 S. RUPPEL. Electric switches.
25 624 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Multi-frequency generators, etc. (1/10/28, Germany.)
25 625 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Multi-frequency generators, etc. (15/10/28, Germany.)

August 23rd.

25 782 ARCTURUS RADIO TUBE CO. Photo-electric cells. (24/8/28, U.S.)
25 783 ARCTURUS RADIO TUBE CO. Photo-electric cells. (23/8/28, U.S.)
25 712 BRITISH THOMSON-HOUSTON CO., LTD. Magnetic cores. (23/8/28, U.S.)
25 713 BRITISH THOMSON-HOUSTON CO., LTD. Transmission of pictures. (23/8/28, U.S.)
25 714 BRITISH THOMSON-HOUSTON CO., LTD. Metal electrode arc lamps. (23/8/28, U.S.)
25 715 BRITISH THOMSON-HOUSTON CO., LTD. Multiple conductor electric cables. (25/8/28, U.S.)
25 716 BRITISH THOMSON-HOUSTON CO., LTD. Making electric lamps. (25/8/28, U.S.)
25 766 C. G. CARROTHERS and R. O. KAPP. Electric protective arrangements. (9/11/28.)
25 764 H. S. COLEMAN and SIGN CONSTRUCTION CO., LTD. Electric signs
25 674 ELECTRICARS, LTD., C. E. JONES and J. W. TREECE. Refuse collecting vehicles.
25 718 ELECTROACUSTIC GES. Sub-aqueous sound installations. (16/10/28, Germany.)
25 759 FERRANTI, LTD., and E. D. T. NORRIS. Regulation of voltage of power supply systems, etc.
25 784 J. F. GRIMBLEY, R. J. W. KENNELL, and TELEPHONE MFG. CO., LTD. Intercommunication systems.
25 692 F. H. HEDBURG. Burglar alarms, etc.
25 688 JACKSON ELECTRIC STOVE CO., LTD. Thermostatic devices for electric heaters.
25 756 N. V. FABRIK VAN ELECTROCHEMISCHE INDUSTRIE. Electrodes for electrolytic purposes. (28/8/28, Holland.)
25 673 W. L. ORD. Connector fitting for cable joint.
25 738 J. SINCLAIR-ROSS and J. ZETSCHE. Electric fans.
25 768 J. L. ROUTIN. Wireless receiving apparatus. (7/3/29, Germany.)
25 688 F. SMITH. Thermostatic device for electric heaters.
25 667 W. A. STEVENS. Electric braking.
25 755 H. D. WHEELER. Braking of electric winches, etc. (4/7/28.)
25 733 F. WOODS. Radio direction finders, etc.

(*Continued on page* 728).

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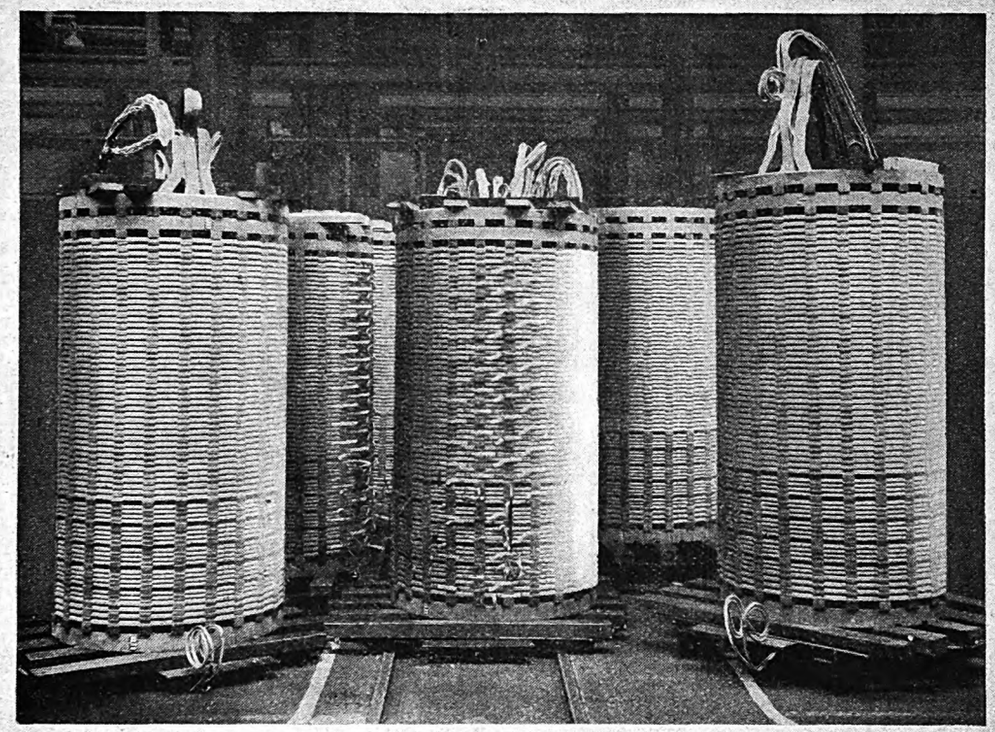

40,000 K.V.A. of "Grid" Coils for Berry Transformers.

Advertisement of the British Electric Transformer Co. Ltd.

Hayes, Middlesex, England.

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August 24th.

25 845 British Thomson-Houston Co., Ltd. Multiple conductor cables. (25/8/28, U.S.)
25 819 W. G. Fox. Device for meshing electric startor drive gear to internal combustion engine.
25 795 K. T. Hardman. Radio receiving installations.
25 808 Harris and Sheldon, Ltd., and R. G. Turner. Means for actuating electric switches on motor vehicles.
25 850 A. E. Mason. Shields for microphones, etc.
25 816 J. L. Musgrave. Magnetically operated valves.
25 856 E. A. Roberts. Electrical condensers.
25 840 S. Ruppel. Electric switches.
25 817 R. H. Cricks. Speed control device for motors.
25 816 R. Crittall and Co., Ltd. Magnetically operated valves.

August 26th

25 875 K. S. Addie. Remote control of wireless apparatus, etc.
25 876 K. S. Addie. Electric switches.
25 955 W. E. Beatty.(Bell Telephone Laboratories, Inc.). Television, etc., systems. (26/4/28.)
25 911 S. H. Boss and Standard Telephones and Cables, Ltd. Electrical condensers.
25 899 A. D. de Castro. Electric lamp.
25 928 W. Curran. Electric fuse boxes.
25 887 H. E. Dance. Electrical measuring instruments. (11/4/28.)
25 952 Electrical Research Products, Inc. Transmission systems. (27/11/28, U.S.)
25 967 Domestic Electric Co. Exercising mechanisms. (29/10/28, U.S.)
25 912 C. C. Hartley, Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic telephone systems, etc.
25 926 B. G. Holt. Wireless receiving apparatus.
25 956 Igranic Electric Co., Ltd. Radio, etc., apparatus. (22/4/29.)
25 954 Lignes Télégraphiques et Téléphoniques. Manufacture and installation of long distance cables. (31/8/28, France.)
25 900 E. W. Long. Reflectors for electric lamps.
25 931 M. A. E. S. Bey Moharram. Waterpower plants. (28/8/28, Germany.)
25 910 Standard Telephones and Cables, Ltd. (Western Electric Co.). High frequency transmission systems.
25 950 A. A. Thornton (Radio Frequency Laboratories, Inc.). Electrical amplifier circuit.
25 963 A. G. D. West. Indicating scales for wireless receivers.

August 27th

26 078 Allgemeine Elektricitats Ges. Electric switches. (4/10/28, Germany.)
26 073 Automatic Telephone Manufacturing Co., Ltd. Totalisators.
26 074 Automatic Telephone Manufacturing Co., Ltd., and C. Gillings and W. H. Paulett. Telephone systems.
26 036 D. A. Christian, W. G. Patterson and Siemens Bros. and Co., Ltd. Automatic telephone systems.
26 037 D. A. Christian and Siemens Bros., Ltd. Control of electrically operated apparatus.
26 103 Concordia Elektrizitats Akt.-Ges. Miners' electric lamps. (19/7/29, Germany.)
26 050 A. Cooymans. Electrical apparatus for drying the hands.
26 052 Electrical Research Products, Inc. Motion picture films, etc. (25/9/28, U.S.).
26 038 Electrolux, Ltd. Transference of heat. (2/3/29. Sweden.)
26 039 Electrolux, Ltd., and E. W. Young. Controlling devices for refrigerating apparatus.
26 100 Etablissements E. Jaeger. Electric switches. (1/9/28, France.)
26 044 International General Electric Co., Inc. Choke coils. (27/8/28, Germany.)
26 045 International General Electric Co., Inc. Electric motor control. (27/8/28, Germany)
26 070 M. Latour. Aerial systems. (27/8/28, France.)
26 048 Radio Frequency Laboratories, Inc. Audion detector circuits. (20/7/29, U.S.)
26 075 H. Seabrook (C. H. F. Muller Akt.-Ges.). X-ray tubes.
26 096 R. F. Tack. Sound amplifiers for telephone receivers.
26 007 W. W. Triggs (Bunke Ges.). Machine for filling and cooking dry batteries.
26 025 S. B. Wilks. Electrical installations.

August 28th.

26 239 Akt.-Ges. Brown, Boveri et Cie. Luminous indicators. (28/8/28, Austria.)
26 215 Automatic Telephone Manufacturing Co., Ltd., and W. H. Paulett. Traffic control signals.
26 188 British Thomson-Houston Co., Ltd., and L. Griffiths. Coil ignition for motor cycles.
26 189 British Thomson-Houston Co., Ltd., and C. S. G. Lucas. Coupling circuits for amplifiers.
26 190 British Thomson-Houston Co., Ltd. Apparatus for producing sound. (31/8/28. U.S.)
26 191 British Thomson-Houston Co., Ltd. Electrical discharge devices. (26/9/28, U.S.)
26 145 Chamberlain and Hookham, Ltd., and S. James. Power factor, etc., measuring instruments for alternating currents.
26 193 H. J. Charman and E. F. Entwisle. Telephone mouthpiece.
26 171 D. A. Christian and Siemens Bros., Ltd. Automatic telephone systems.
26 139 Graham Amplion, Ltd., and P. K. Turner. Multiple switches.
26 204 F. W. Hall, Hall Telephone Accessories (1928), Ltd. Coin freed apparatus.
26 168, 26 129 J. H. O. Harries. Radio signalling.
26 211 G. Little. Electric tell-tales for lubricating systems of engines.
26 197 R. Maassen. Dynamo-electric machines.
26 175 A. T. C. Moore. Electric signalling systems.
26 135 A. F. and D. A. Pollock. Manifolding phonograms of magnetic materials.
26 175 Siemens Bros. and Co., Ltd. Electric signalling systems.

August 29th.

26 397 S. F. Adams. Wireless, etc., apparatus.
26 285 R. H. Barfield. Determination of distances of electrically reflecting surfaces, etc.
26 358 British Talking Pictures, Ltd. Light-sensitive cells, etc.
26 305 Compagnie Lorraine de Charbons pour l'Electricite. Means for compressing and shaping plastic materials. (14/9/28, France.)
26 375 Electrical Research Products, Ltd. Interpolating systems. (31/12/28, U.S.)
26 376, 26 377, 26 378 Electrical Research Products, Ltd. Electrical signalling systems. (11/6/29, U.S.)
26 243 P. Friedman. Cathodes for thermionic devices.
26 282 A. Hawkyard. Electrolysis of alkali chlorides, etc.
26 300 B. E. Hobbs. Wireless apparatus, etc.
26 385 L. Kecskemeti-Kaye. Light-sensitive cells.
26 369 F. Kraushaar. Soldering wires to dry batteries.
26 247 J. B. Tucker. Electric switches.

August 30th.

26 423 Akt.-Ges. Brown, Boveri et Cie. Mercury vapour rectifiers. (31/8/28, Germany.)
26 487 A. Booden and N. V. Hengelosche Electrische en Mechnaische Apparatenfabrick. Rotors for three-phase motors.
26 446 British Thomason-Houston Co., Ltd. Suspension and vacuum tubes. (31/8/28, U.S.)
26 384 T. H. Butterworth and J. R. Penney. Apparatus for wireless reception.
26 448 R. H. Cricks. Speed control device for electric motors.
26 488 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Rectification of alternating currents.
26 469 F. A. Fraser and W. T. Lack. Antiseptic attachments for telephone mouthpieces.
26 447 International General Electric Co., Inc. Electric switches. (31/8/28, Germany.)
26 438 F. A. Lindemann. Photo-electric reproduction of sound.
26 403 Loewe-Andion Ges. and E. Römhild. Dielectric condenser. (31/8/28, Germany).
26 443 A. B. McKinlay. Remote control switches.
26 483 Marconi's Wireless Telegraph Co., Ltd. High frequency signalling. (30/8/28, U.S.)
26 441 G. Pedrazzo. Alternating current machines. (26/2/29, Italy.)
26 496 G. Viard. Process for manufacturing telegraph cables. (10/9/28, France.)

COMING EVENTS.

Friday, December 6th (To-day).

Institution of Electrical Engineers (Meter and Instrument Section).—Institution, Savoy Place, Victoria Embankment, London. Paper by Dr. C. V. Drysdale on "Alternating Current Potentiometers and their Applications." 7 *p.m.*

Monday, December 9th.

Electrical Contractors' Association (Hastings Sub-Branch).—Ordinary meeting. Lewcock's Restaurant.

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting. 3 *p.m.*

Institution of Electrical Engineers (Western Centre).—Cadena Café, Eastgate Street, Gloucester. Paper by Mr. B. L. Goodlet on "The Testing of Porcelain Insulators." 6 *p.m.*

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "To Earth or not to Earth." (Opened by Mr. W. R. Rawlings and Mr. T. C. Gilbert.) 7 *p.m.*

Institution of Electrical Engineers (Mersey and North Wales—Liverpool—Centre).—The University, Liverpool. Paper by Lieut.-Col. S. E. Monkhouse, and Mr. L. C. Grant on "The Heating of Buildings Electrically by Means of Thermal Storage." 7 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Paper by Messrs. B. A. G. Churcher and A. J. King on "The Analysis and Measurement of the Noise Emitted by Machinery." 7 *p.m.*

Sheffield Illumination Society.—Lecture Hall, Y.M.C.A., Fargate. Annual general meeting. 7.30 *p.m.*

Tuesday, December 10th.

Electrical Contractors' Association (Leicester Branch).—Ordinary meeting.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Electrical Association for Women (Bristol and District Branch).—Electricity Offices, Colston Avenue. Lecture by Mr. F. L. Thomas on "Protective Devices."—Fuses, Faults, Safety First Methods. 3 *p.m.*

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, King Street, Leeds. Paper by Lieut.-Col. S. E. Monkhouse and Mr. L. C. Grant on "The Heating of Buildings Electrically by Means of Thermal Storage." 7 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Engineers' Club, 17, Albert Square, Manchester. Twentieth Kelvin Lecture by Dr. G. C. Simpson, F.R.S., on "Lightning." 7 *p.m.*

Illuminating Engineering Society.—Home Office Industrial Museum, Horseferry Road, Westminster. Discussion on "Problems in Illuminating Engineering." 7 *p.m.*

Electrical Power Engineers' Association.—Junior Institution of Engineers, 39, Victoria Street, London. Paper by Mr. R. Livingstone on "Turbo-Alternators." 7.15 *p.m.*

Institution of Electrical Engineers (South Midland Students' Section), Coventry. Paper by Mr. A. H. Slade on "Routine Testing of D.C. Machinery." 7.30 *p.m.*

Electrical Contractors' Association (Bournemouth Branch).—Ordinary meeting. 7.30 *p.m.*

Wednesday, December 11th.

Electrical Contractors' Association (Eastbourne Sub-Branch).—South Street. Ordinary meeting.

Electrical Association for Women.—Visit to Messrs. Berry's Electric, Ltd., Touchbutton House, 85, Newman Street, London. Lecture-Demonstration on "Electric Christmas Cooking," by Mrs. A. Mole. 3 *p.m.*

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting. 5.30 *p.m.*

Institution of Railway Signal Engineers.—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. F. A. Downes on "Some Notes on A.C. Rectifiers." 6 *p.m.*

Institution of Civil Engineers.—Great George Street, Westminster. Informal meeting. Discussion on "The Heating of Buildings by Electricity off Supply Mains, with Special Reference to the Problem of Heat-Storage and Off-Peak Loads," by A. H. Baker and Mr. S. B. Donkin. 6 *p.m.*

Electrical Development Association (North-Western Area).—Lighting Service Bureau, 4, Fountain Street, Manchester. Paper by Mr. R. C. Hawkins on "The Value of Exhibitions to the Electrical Industry." 6.30 *p.m.*

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Joint meeting with the British Section of the Société des Ingénieurs Civils de France. Paper by Messrs. L. A. E. Sekutowicz and A. Evain on "The Electrical Plant and Network of the Société Electrique de la Sidérurgie Lorraine." 6 *p.m.*

Institution of Electrical Engineers (Dundee Sub-Centre).—University College, Dundee. Paper by Mr. A. F. Stevenson on "Cable Design." 7.30 *p.m.*

Thursday, December 12th.

Institute of Patentees.—Caxton Hall, Westminster. Lecture by Sir Wm. Arbuthnot Lane on "Inventions as an Aid to Health." 8 *p.m.*

Friday, December 13th.

Institution of Electrical Engineers (North-Eastern Centre, Students' Section).—Visit to the Newcastle Breweries. 7 *p.m.*

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. General meeting. 6 *p.m.*

Radio Society of Great Britain.—Institution, Savoy Place, Victoria Embankment, London. Lecture by Dr. N. W. McLachlan on "Tone Compensation and Control for Electic Gramophones with Demonstration." 6 *p.m.*

Paisley Association of Electrical Engineers. Visit to Messrs. Babcock and Wilcox, Dumbarton. 7.30 *p.m.*

Saturday, December 14th.

Association of Mining Electrical Engineers (South Wales Branch).—South Wales Institute of Engineers, Park Place. Lecture by Mr. W. T. Anderson on "Mining Cables." 6 *p.m.*

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Vol. CIII.—No. 2689. Friday, December 13, 1929. [Registered at the General Post Office.] Sixpence

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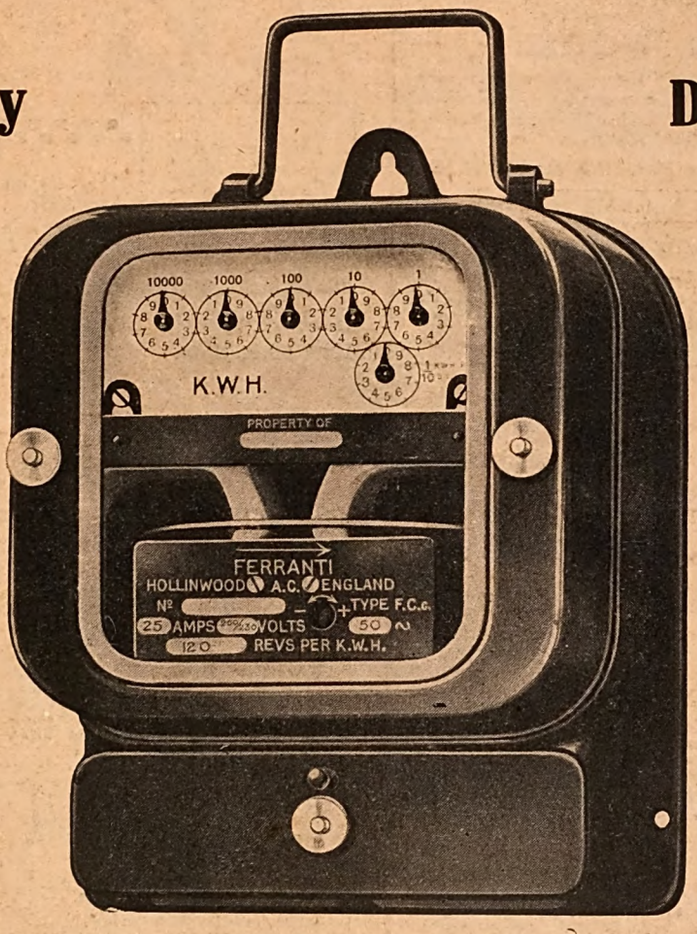

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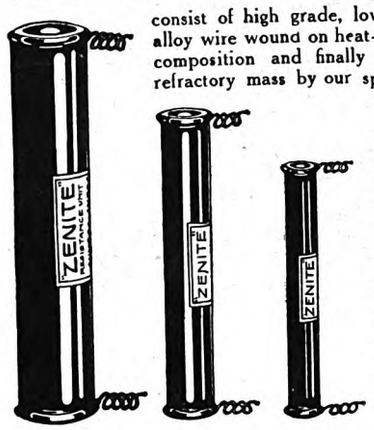

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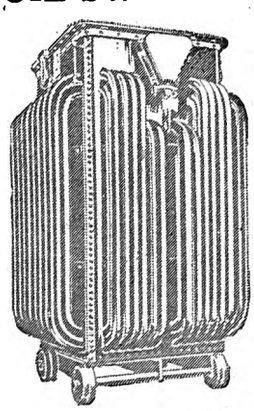

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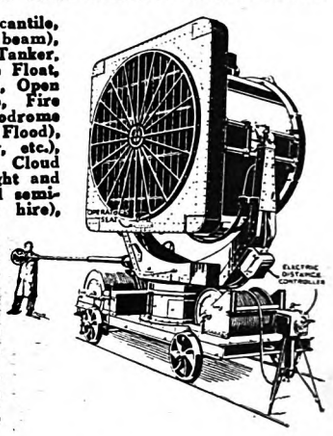

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[*The offices of* THE ELECTRICIAN *are closed on Saturdays in accordance with the "Five-Day Week" plan adopted by Benn Brothers, Ltd., and its associated publishing organisations.*]

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Current Topics.

The Commissioners' Statistics.

IT would be useless to attempt to deal at length with the data which occupies nearly 600 pages of the Electricity Commissioners' "Return of Engineering and Financial Statistics" relating to authorised undertakings in Great Britain for 1927–28, as readers' individual interests in this annual publication vary so widely. Although it is not easy to visualise the work as a Christmas gift "best-seller," it contains a wealth of information which is unobtainable from other sources, though one must regret so comprehensive a record should be arbitrarily confined to authorised undertakings only. In the year under review 490 generating stations had a plant capacity of 5 258 257 kW (an increase of 576 188 kW on the previous year) and sold to consumers a total of 7 003·4 million units (or nearly 19% more than the sales for 1926–27), which raises the per capita consumption to 158 units, a figure which is, of course, considerably below the actual consumption when unauthorised, traction and other unrecorded supplies are taken into account. As indicating the work ahead in the direction of frequency and voltage standardisation, it is of interest to note that while more than 77% of all the a.c. generating plant installed was of the accepted standard frequency of 50 cycles, the remaining 23% included equipment of 13 different frequencies with distribution at 17 different frequencies, and that the declared voltages at consumers' terminals for low and medium pressure a.c. and d.c. supplies, taken collectively, numbered 44. The aggregate values of the individual maximum loads on authorised generating stations were approximately 3 235 188 kW, a figure which does not necessarily constitute an accurate measurement of the combined simultaneous maximum load on the generating plant of all the undertakers. The ratio of this aggregate to the total capacity of generating plant installed indicates a plant capacity some 62% in excess of the maximum demand upon it, a figure we hope to see materially reduced in the near future. The combined load factor remained, as in the previous three years, at about 30%, but 12 more undertakings come into the 35–45% class and three more have attained 45% and over. The maximum was 59·5%, and load factors in excess of 50% were also recorded in four other cases. The average cost of generation for all undertakers, viz. 0·335d. per unit, is the lowest yet recorded, and 0·205d. cheaper than the cost for 1926–27.

The International Illumination Congress.

THE International Illumination Congress and the session of the Commission held in the United States last year probably formed the most important conference on lighting matters ever held. It was marked by great enthusiasm, and was attended by 500 delegates from Austria, Belgium, France, Germany, Great Britain, Holland, Italy, Japan, Sweden, Switzerland and the United States. As has already been announced, the next International Illumination Congress is to be held in Great Britain in 1931, and it is gratifying to note that all interested in the cause of better lighting are uniting to render this congress an outstanding success. In this country the machinery for the study of illumination is perhaps more perfectly organised than in many other places, and the aid of all the leading scientific, technical and commercial bodies concerned is being secured. The National Illumination Committee of Great Britain, in co-operation with the Illuminating Engineering Society, will be responsible for the event, and several committees are already at work on the detailed arrangements. The Congress will take place during the period September 3rd to 13th, 1931, and will be combined with a "voyage d'étude" of places of interest in England and Scotland, so that other cities beside

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London will share in the work of the Congress. Papers dealing with the most varied aspects of lighting will be presented, and these will be grouped so as to ensure that topics of special local interest will be dealt with at each centre. The Congress will be followed by the technical meetings of the International Commission on Illumination, which will be held in Cambridge from September 13th to 19th.

Bad Debts.

On another page we publish an analysis of the annual bankruptcy report of the Board of Trade, which, published on the threshold of 1930, gives particulars of the insolvencies—both bankruptcies and deeds of arrangement with creditors—of 1928. The report is not nearly so communicative as it might be with regard to the electrical trades, and, indeed, its compilers seem to have overlooked the immense importance to which the industry has attained. The total annual failures in England and Wales appear to have settled down at something over six thousand, with liabilities of between 12 and 13 millions, the latter being much larger than the pre-war figure. There is also the uncomfortable feature that whereas, before the war, creditors might look forward to recovering, on the average, something like 3s. 6d. in the £, they now have to write off a figure approaching 90% of their liabilities to insolvent debtors.

A Warning Note.

With so much talk in the air concerning the development of our home and export trade it is interesting to observe that the United States looks upon the United Kingdom as " the most important " market in Europe for the sale of fractional horse-power motors, portable electric tools, bare and insulated copper wire and cables and domestic appliances. Confirmation of this view is given in the latest available export figures, which show that American electrical exports to this country during September increased by over £100 000 in value when compared with the same month last year. On the other hand, the *total* value of electrical imports into the U.S.A. during the same month reached the low figure of £50 000. The total value of similar imports into this country during September was £782 931, and though we have no available data as to the value of electrical goods exported solely to the United States during that month, the total value was £148 038 less than for the same month of 1928. Consequently, whereas the United States for September showed an increase in export trade with this country of over £100 000 in electrical goods alone, we in our world trading declined by nearly £150 000. Admittedly, these figures do not induce a spirit of cheerfulness, but we draw attention to them in the hope that our manufacturers will appreciate the keen competition that is being offered by the American manufacturer in our own domestic market.

The Radio Manufacturers.

The annual report for 1929 of the Radio Manufacturers' Association shows that the Executive Council has put in a very useful year's work. Not only has a satisfactory basis been found upon which to establish new licence terms with respect to royalties, but considerable headway has been made in standardising equipment among its members and in bringing into line with the I.E.E. Regulations much of the apparatus which hitherto has depended for its safety upon the foresight of the individual manufacturer. Membership of the Association increased during the year by 51, and it is interesting to note that many of the new-comers have both radio and gramophone interests; others are associated with the talking film industry. It was suggested at the annual meeting that the Association should impress upon the B.B.C. the necessity for advertising any special feature which was to form part of a future programme, for it has been found by members that the inclusion of some outstanding item in the programme has an immediate effect upon sales. One member went so far as to suggest that the R.M.A. should contract special expenditure in this direction, while still further sums should be spent on propaganda, the E.D.A. being quoted as an exemplary Association in this connection. The idea has a strong appeal, and possibly the R.M.A. will give it serious consideration. At the same time it must be recognised that the Executive Council has found little time for anything outside the royalty problem during the last twelve months, while even now there is much to be settled. With a satisfactory licence in operation the radio industry will doubtless regain a little of its lost enthusiasm. Until then let all electrical contractors concentrate their efforts on " Radio Week," confining further publicity efforts to the new year when regional broadcasting starts in earnest. Propaganda is very well for the future, but for the moment the best things possible for the industry are—Christmas and Sales.

The Advertising Broadcast.

While we have the greatest admiration for the enterprise of the daily paper which arranged the broadcast of the Carnera-Stribling fight in Paris last Saturday—it provided a service which was much appreciated by English listeners and few people would take exception to the mention of the newspaper's name by the B.B.C., which relayed the programme—we object to it, as we see in such an arrangement the thin end of the advertising wedge, which has detracted so much from the listener's enjoyment of American broadcasting. Any enterprising organisation which goes to the trouble and expense of arranging a special broadcast is entitled to have the fact mentioned. On the other hand, the B.B.C. has ample resources to enable it to make its own arrangements for such broadcasts. There was no advertising in B.B.C. programmes when the service was controlled by the radio manufacturers, and there is still less reason for its inclusion under the present regime.

Electricity and Natives.

There was a touch of unconscious humour in a daily paper's announcement of private members' business in the House of Commons this week, which mentioned that two Labour members would " call attention respectively to the demand for a cheap and abundant supply of electricity, particularly in the rural areas, and the need of protecting the welfare of the native population in the Colonies." This bracketing of widely different problems would be ludicrously funny but for the fact that neither the rural areas nor the natives are likely to benefit much from this attention. Except in the very few districts where rural electrification is being practically attempted, little has been done since the initiation of the experimental rural scheme in Bedfordshire. There must be quite a number of undertakings which have shelved development plans pending announcements of the results of the Bedford experiment. We do not suggest that nothing will be learnt from this effort, but we do feel that sufficient is known of the rural problem to permit immediate electrical development on sound lines.

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METER MANUFACTURING PROBLEMS.*

Possible New Methods—Accuracy versus Cheapness—Maximum Demand Measurement—Metering Super-tension Supplies.

By E. W. HILL, M.I.E.E.

IS there something fundamentally wrong with our methods of measuring electrical energy? What do we do now in measuring energy by our meters? Do we not conduct an operation which for indirectness is comparable with the following hypothetical but possible method of measuring a distance? Suppose that, instead of straightforwardly applying a measuring scale to determine the distance between A in London and B in Edinburgh, for example, we traversed the distance in a vehicle, the while making determinations of its velocity as it varied from time to time, and of the duration of the journey; and that we then performed a complicated integration of velocity/time, and in that way ascertained the length of the journey. That would be measuring a scalar quantity, distance, by determining derived quantities—rates of motion—and integrating with respect to time; exactly, in principle, what practically all electricity meters do. Can no way be found of substituting a direct form of attack for this indirect one?

Nearly all the outward manifestations of electronic activity—electrostatic, thermal, chemical, magnetic—have been laid under contribution for effecting electrical measurements. The magnetic manifestation is the one now almost exclusively used for energy measurements. Is it beyond all bounds of possibility to utilise new combinations of these, or even hitherto neglected ones such, for example, as gaseous conduction or radiation phenomena? I must, I fear, leave this in the form of an interrogation. But the posing of the difficulty may perchance stimulate some of the younger generation to apply themselves to seeking a solution, by casting aside all preconceived ideas which have for the last 40 years accumulated round the subject.

Even with our present methods, another way of escape from our accuracy difficulty seems open, or at least not definitely closed. In measuring electrical energy we do not, indeed dare not, allow our instruments to absorb the energy that is measured, in the way that some forms of mechanical absorption dynamometers do. The flying electrons are caught in our instruments, made to give an account of themselves, and then allowed to pass on to their proper business of lighting our lamps or turning our motors, etc.

A Disproportionate Ratio.

Of course, they do not get through that ordeal quite scot-free; they have to do a little work. Not much, it is true—they have to turn a disc against a little magnetic friction, and turn the wheels of a counting train. The actual mechanical work is absurdly small; so is the levy demanded for this purpose from the electron flow—that is, small in comparison with the amount actually measured. But the disproportion between these two small amounts, *i.e.*, between the electrical input to, and the mechanical output from, the meter is simply amazing; it is something of the order of 50 000 to 1. This fact has never ceased to strike me with astonishment.

Why cannot a meter, considered as a motor, converting electrical energy into mechanical energy, be more efficient than that? Of course, it is admittedly a very small motor and, as we know, small motors are in general less efficient than large motors.

Engineering appliances, like motors, transformers, engines, etc., have a limit of size—not well defined, it is true—below which it is hopeless to expect any approach to ideal 100% efficiency. But it is a dismal thought that a meter can never be expected to have, as a motor, a better ratio of input to output than 50 000 to 1. It may be asked, "Why trouble?" Well, presumably a meter having higher mechanical working forces than at present would much better perform its functions as a meter, and our accuracy difficulties would tend to disappear in consequence. A curious consideration, however, emerges here. In presence of the eternal urge towards cheapness, manufacturers dare not make their meters much more efficient, in the sense I have just used the word, for the reason that higher efficiency means higher driving torque for the same watt loss; and higher torque necessitates stronger permanent magnets to damp down the disc movement. So that even a modest four-fold increase of efficiency would involve a positively prohibitive cost for the necessary permanent magnets. This is, indeed, not a fanciful notion. Manufacturers cannot afford to make ordinary meters, at prevailing prices, with torques much higher than they are now. May I suggest this as the reason why meters are not made far more accurately than they actually are.

I conceive the real function of supply meters to be to provide equitable and determinate means, rather than any arbitrary means (leading to approximations only) of fixing the relative amounts of individual consumers' contributions. But it is to be observed that, under the guise of two-part tariffs, arbitrary means are becoming more and more prevalent as part at least of the modern systems of charging.

What Manufacturers Want.

I consider that a broad distinction should be drawn between small meters for which low prices and low losses are admittedly important features, and large meters for which these features sink into relative insignificance. The manufacturer should surely be allowed a little more margin, economic and technical, to enable him to supply a better, more accurate, meter, for really important supplies. Especially important is this consideration when we remember that so many large meters have demand indicator attachments, upon the readings of which the transfer of large amounts of money depends.

The mention of demand indicators leads me to remark how curious it is that the exigencies of the conditions governing electrical generation and supply, combined with the efforts of the tariff builders, have imposed upon engineers the necessity of providing for the automatic measurement of a quantity based upon so artificial a conception as that of average maximum demand. It is a conception which involves a necessity unparalleled in any system of measurement, other than electrical, of which I am aware. It seems to be the exclusive privilege of electrical engineers to have to determine that particular value of unvarying rate of flow of energy, through a meter, which in a given time interval would have produced, had it been flowing, exactly the same number of integrated units as was really produced by the actual experienced load, however fluctuating.

Many problems, mainly of a mechanical nature, have presented themselves for solution in connection with maximum-demand measurement, and most of them are now satisfactorily solved. One problem, however, still remains unsolved, if we are content to allow the exception of thermal types of demand indicator. I refer to the fact that time switches, or equivalent apparatus, pick out successive time intervals for resetting demand-indicator mechanisms at arbitrarily allotted epochs, which may split the peak of the load curve instead of completely straddling it, in which eventuality the ideal maximum load period is not exactly accounted for. We still await a tripping apparatus endowed with prescience, capable of holding its hand as it were, and being ready to start a resetting period just when it can foresee the immediate incidence of a period which is going to embrace the true maximum load.

As though the artificiality of the maximum-demand conception were not enough, we have, superimposed upon it, the even more transcendental idea of kVA, and the problem of its measurement. On this particular subject I desire at the moment to do little more than pay a tribute to the work of those whose labours have crystallised out into some really beautiful examples of inventive skill, designed for kVA measurement. We may, I think, legitimately feel proud of the capacity of meter engineers for tackling and solving any problems, be they never so perplexing, and for exhibiting inventive genius second to none.

[Table.]

Progressive Reduction in Sizes and Weights of Induction Meters.

Approximate date.	1890	1896	1905	1913	1929
Space occupied, cu. in.	900	300	165	135	75
Total weight, lb.	80	15·5	8	4·4	2·75
Weight of voltage element, lb. ..	14	3·7	1·2	0·7	0·44
Weight of current element, lb. ..	11·5	1·5	1·2	0·4	0·28
Weight of disc, oz.	2·1	4·7	1·1	0·9	0·8

Reverting to general aspects of the electricity supply meter business, the impressions derived from it by uninitiated

* From the inaugural address to the I.E.E. Meter and Instrument Section.

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observers might be quite deceptive. On the technical side, development may seem to flow in a very placid stream. Meters are now, it may seem, much as they ever were. Truly, there have apparently been no spectacular or revolutionary advances, as there have been in other branches (e.g. wireless). Yet there has been not only steady and definite progress on the technical side, but enormous expansion in the way of new designs of meters for special purposes. As regards general development, one had only to glance back at the records of some 25 to 30 years to see, from the narrowest point of view, what phenomenal progress has been achieved. So we see the great advances that have been accomplished in economy of material and space (a condensed summary of which is given in the above table, in elegance of construction, and, hidden beneath and underlying all, great progress in subtleties of design. All meter engineers should rejoice that they live in an age when their problems are so much more interesting, even thrilling, than they used to be. Among others, still outstanding, there are the metering of super-tension supplies of 100 000 V and over, avoiding the tremendous difficulties of potential transformers for such voltages; and the impending problem of metering high-tension d.c. supplies.

PROTECTING METALS BY SHERARDISING.

Details of Process for Impregnating Metals with Zinc—Applications and Limitations—Practical and Commercial Considerations.

By A. P. PETRIE.

SHERARDISING, the process of applying zinc to the surface of articles made of iron or steel in order to prevent rust, is named after the discoverer of the process, Mr. Sherard Cowper-Coles. Other names have been given to the process by various firms, but the main principle remains that in every case the work to be treated is heated in zinc dust.

It may be news to many to know that it was discovered about 28 years ago, and that although it has been exploited by various companies who have undertaken the work as a commission trade, and it is also used by many large firms for the treatment of their own productions, Sherardising as such is very little known to the metal using trades.

One reason why the name "Sherardising" is so unfamiliar is that so very few articles which are so treated are advertised and sold as Sherardised. Either they are stated to be "rustless," "rust-proofed," or "treated by a special process to prevent rust," or else the fact is not mentioned at all. The process is quite distinct from most other methods of treating the surface of metal articles with a dissimilar metal in one important detail. This is that the zinc protection formed is an alloy of zinc with the surface of the article being treated.

The other methods, such as hot galvanising, electro-zincing, metal spraying, nickel or chromium plating, etc., of applying metal to the surface, result in coating the article with a skin of zinc, nickel, chromium, etc., as the case may be. This skin may vary in thickness and may be very closely adhering, but it is still a skin or layer of metal on the surface.

When Sherardising is properly carried out, the base metal is impregnated with zinc, which forms with it an alloy of progressive strength. From the deepest point of penetration, the zinc content increases rapidly as we near the surface, until we find, practically at the original surface of the base metal, an alloy consisting of 92% zinc and 8% iron (we exclude non-ferrous bases for the moment). It is upon this alloy that Sherardising almost entirely depends for its efficiency. Beyond this point, there is formed a layer of almost pure zinc approximately 0·0005 in. thick.

Depth of Penetration.

By increasing the time during which the articles being treated remain at the Sherardising temperature in the zinc dust, an increased penetration of zinc over and above the depth of about 0·002 in. usually obtained, takes place, but as a very much greater increase proportionately in the external layer of zinc is unavoidably coupled with this increase of time, it is a disadvantage to attempt it commercially, since the chief claim to commercial use of the process is the small dimensional increase combined with high efficiency as a rust-proofing process. Nevertheless, it is necessary to build up a layer of zinc of at least 0·002 in. external to the base metal surface in all cases where it is specified that the work shall pass the copper sulphate immersion or "Preece" test. It is necessary because in the test bright copper would be deposited, and therefore herald failure, on the stable alloy containing 8% of iron.

There is nothing to be gained, beyond slight extra resistance to mechanical abrasion, and much to be lost, by this increased external coating demanded by those who insist that this test be applied. It often occurs, therefore, that when nuts and bolts are specified to pass this test after Sherardising there is difficulty in replacing the nuts on the bolts, and the Sherardising is blamed. Yet no better protection from corrosion is obtained by the addition of the extra zinc. It is also interesting to note at this point that galvanised bolts are accepted as having passed the test even though there is no zinc at all on the threads, which are obviously never tested. (N.B.—The threads on galvanised bolts are nearly always cut *after* the galvanising process is completed, otherwise the threads would be filled up with spelter, and the nuts would not go on at all.)

Zinc dust, in which the work is heated, has one very peculiar property. This property is its catalytic action on water in splitting it into its two component gases. It is unfortunate that this property seems to remain with the solid zinc deposited by Sherardising, and is generally considered, by those who have studied the point, to be the cause of the failure of Sherardising as a protection when the work is immersed for quite short periods in "still water."

Limitations of the Process.

Some considerable disappointment could have been avoided in the past if users of the process had understood this limitation. Sherardised surfaces which have withstood the corrosive atmospheres of the south Lancashire district for five years, have shown signs of rust when immersed in a bowl of water for about a fortnight.

The theory held by most of those closely connected with the process is that the Sherardised zinc splits the water into hydrogen and oxygen as does zinc dust. The hydrogen bubbles, being light, rise to the surface and burst. The oxygen combines with the zinc to form zinc oxide. The zinc oxide floats away in suspension in the water, and leaves fresh zinc exposed to the same action. Thus the cycle goes on and minute pinholes are formed in the surface, until the base metal is reached at a point where iron oxide begins to form. This theory is supported by the appearance of the surface, which becomes dotted with very minute spots of rust. In running water, this does not happen, nor when exposed to ordinary atmospheric conditions, and it is thought that in such cases any oxygen bubbles which may be formed are immediately washed away before they can have any appreciable action on the zinc.

Whilst considering the limitations of Sherardising it may be interesting to many to know that although Sherardised iron or steel is rapidly freed of its zinc protection when immersed in hydrochloric or sulphuric acids, such is not the case with Sherardised brass. Even a heavy coating of zinc on the surface of Sherardised brass is not affected appreciably by such acids.

Copper alloys required to resist acid solutions are composed of copper and tin, and zinc is rigidly excluded. In a zinc-copper alloy it is the zinc which is primarily attacked by the acid, leaving the metal spongy. It would, therefore, seem natural to assume that the greater the proportion of zinc in such an alloy, the more rapidly destructive would be the attack of the acid. Yet, as proved by a long and thorough series of tests carried out some two years ago, the loss of weight in Sherardised brass lying in an acid bath is slightly less than the loss of weight in the same brass unsherardised in a bath of equal strength and at the same temperature.

For the purpose of the test and prior to it, the Sherardised test pieces were immersed for a period of two minutes in strong hydrochloric acid in order completely to remove the

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external zinc which was not alloyed with the brass. This first bath caused furious effervescence for a short period, after which no action remained visible, showing that no free zinc remained upon the zinc brass alloy. The difference in the losses of Sherardised and unsherardised brass is so slight as to be of no practical importance, and one does not recommend the Sherardised brass as a resistant to be used in continual contact with acid, but where brass is exposed to an occasional contact with acid or acid fumes, Sherardising offers very distinct advantages. Unprotected brass under such conditions rapidly becomes coated with verdigris, which seems to act both as a conductor and a retainer of acid, hastening the decomposition of the brass. On Sherardised brass verdigris is unknown. There is no means by which the acid may be retained indefinitely in contact with the metal, which is thus preserved, besides retaining a clean appearance.

We now come to the practical and commercial considerations. Just as with other processes, so with Sherardising, it is necessary to prepare the work by thorough cleaning, although, unlike electrolytic processes, Sherardising is not detrimentally affected by the presence of a little grease or oil of most types, provided that the metal surface is free from rust and scale. The work is packed in containers with the zinc dust and heated in electric furnaces, and the temperature, which does not exceed 750 deg. F., is measured by pyrometers whose stems project into the centres of the containers. Although in theory there is no limit to the size of these containers, practically, it is not found to be advisable to exceed 24 in. diametrically, chiefly owing to the low heat conductivity of zinc dust and the consequent excessive heat liable to be generated at the periphery of the containers before the required temperature is reached at the centre. The limit of size longitudinally is only governed by purely mechanical considerations, and present day demands have resulted in the construction of containers 15 ft. 6 in. long for the treatment of tubes for the electrical and other trades.

The porosity of the metal has no relation to the degree of penetration, and better Sherardising is in fact obtained on a high-grade carbon steel than on a low-grade cast iron, simply because there is less impurity present. The greatest enemy of the Sherardiser is inrolled scale, Sherardising will not bridge impurities, as will galvanising, and it is essential in all cases that the surface presented to the zinc dust shall be only of metal. Remembering also that Sherardising is an alloy depending for its success upon both the constituents of that alloy, it becomes obvious that the better the metal of the article treated, the higher resistance will Sherardising offer to corrosion, and the better will be the appearance of the Sherardised surface.

The cost of Sherardising is really a cost per cubic foot of space available in the containers, and if a container of, say, 5 cu. ft. is filled with 5 cwt. of screws it will cost practically the same as if filled with, say, 1 cwt. of light gauge stampings. Therefore the price "per cwt" will be five times as much for the stampings as for the screws. In actual practice, however, it is often possible to fill up the space between the stampings with a few screws and so reduce all round costs, although this advantage is often nullified by the extra labour involved in sorting afterwards. Another point about the charges made for Sherardising is that as far as prices per cwt. go, they are nearly always in inverse proportion to hot galvanisers' charges. Small screws, nuts, washers, etc., and small tubes can be Sherardised at prices well below those charged for hot galvanising, but for large articles, particularly those made of sheet metal, the Sherardising cost is too great to be a commercial consideration.

Some Attractive Finishes.

The natural Sherardised surface is a matt grey, but one or two methods of improving the appearance are available. A finish very suitable for small tools or for antique iron work, is obtained by scratch brushing after Sherardising. A circular brush on a slow-speed polishing spindle is used, the bristles of the brush being either steel or brass wire. The brass wire bristles give a pleasing brassy tint to the work. This process, by giving a semi-polish to the otherwise matt surface renders the work less liable to accumulate dirty finger-marks or stains. The most attractive finish of all is generally considered to be the highly polished one obtained by polishing the work well before Sherardising and then mopping it again after Sherardising.

Although the dull finish is an objection very frequently raised against Sherardising, polishing is not to be recommended. The reason is that on a polishing mop revolving at about 2 500 r.p.m., it is very easy to wear away the whole of the protective surface, particularly on the corners, edges, or raised portions of an article. If the surface is actually polished away on these parts it does not become evident until rusting occurs, since polished steel is almost identical in appearance with polished zinc. In this connection many people may have noticed that nickel-plated steel articles generally begin to rust in the first instance on the corners or edges.

Brass articles, however, can be safely polished after being Sherardised. They cannot naturally rust if over polished, but apart from that the zinc amalgamation with the brass extends to a much greater depth into the softer metal. The finish obtained on brass is difficult to distinguish from chromium plate.

BOOK REVIEW.

Das Rechnen mit Symmetrischen Komponenten.

By Von Ing. Dr. Techn. Gunther Oberdorfer. (Leipzig: B. G. Teubner.) Pp. 74. 5 marks.

This is another German monograph on Fortescue's theory of unbalanced three-phase systems. It is based on the possibility of analysing such a system into three components —forward and reverse three-phase systems and a single-phase system. This was published first in America in 1918, and has since attracted a good deal of notice. It appears to be almost the standard method of short circuit calculation in recent American text-books and has received attention in France, Germany and Sweden, but not in this country, the only reference the writer can remember being a short article by Mr. Stubbings in "World Power."

The method is certainly very neat though rather artificial. The main thing is—does it justify inclusion in an average electrical engineer's technical equipment? The case against it is that unbalanced loading is usually very unstable and varies from moment to moment, and it is not often that conditions can be determined with sufficient accuracy for the calculation to be worth while. Short circuit problems are still very nebulous, and the rupturing capacity of a breaker is more often a figure in a manufacturer's list than a scientific fact. Indeed, it is a figure that is in general incapable either of proof or disproof.

To turn to this particular publication. It is in German, which is unfortunate, but the treatment is straightforward and the notation is simple and in line with ordinary standards, which is more than can be said of other work in this direction. The diagrams are clear and the printing good. The author discusses in considerable detail the application of the method to the various problems of three-phase networks such as may result from unbalanced loads and faults, and the student should find the description quite sufficient.

As to the degree of utility of the system, the reviewer prefers for the moment to keep an open mind. It is neat and mathematically attractive, but the student has so much to learn to-day that unnecessary mental luggage must be rigorously avoided. W. F. C.

BOOKS RECEIVED.

"Ungarisches Wirtschafts-Jahrbuch," 1929. (Berlin: Carl Heymanns.) Pp. 370. 15 marks.

"High Voltage Cables." By L. Emanueli. (London: Chapman and Hall.) Pp. vii+107. 8s. 6d. net.

"An Outline of Advertising." By E. O. Hughes. (London: Chapman and Hall.) xii+162. 7s. 6d. net.

"Heaviside's Operational Calculus." By E. J. Berg. (McGraw-Hill Publishing Co.) Pp xiii+214. 15s. net.

"Electric Street Lighting." By C. J. Stahl. (London: Chapman and Hall.) Pp. xi+228. 17s. 6d. net.

"High Voltage Cables." By P. Dunsheath. (London: Sir Isaac Pitman and Sons.) Pp. xii+161. 10s. 6d. net.

"Elements of Radio Communication." By John H. Morecroft. (London: Chapman and Hall.) Pp. x+269.) 15s. net.

"Direct Currents." By Carl E. Magnusson. First Edition. (London: McGraw-Hill Publishing Co.) Pp. xi+495s. 22. 6d. net.

"Worked Examples in Electrical Technology." By F. Peasgood and H. J. Boyland. (London: Humphrey Milford.) Pp. xiv+219. 15s. net.

"Theory and Practice of Alternating Currents." By A. T. Dover. 2nd ed. (London: Sir Isaac Pitman and Sons.) Pp. xv+539. 18s. net.

"Science Abstracts." Secs. A and B. Vol. 32, Part II, No. 383. November 25th. Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s. Annual subscription, 30s., or 50s. for both sections.

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THE ANALYSIS AND MEASUREMENT OF THE NOISE EMITTED BY MACHINERY.*

Electrical Methods Preferred—The Apparatus Used—Test Conditions—Dealing with Extraneous Noises—A Tentative Loudness Scale.

By B. A. G. CHURCHER, M.I.E.E., and A. J. KING, A.M.I.E.E.

THIS research was originally concerned primarily with noise emitted by motors, but the methods of inquiry are applicable to many other forms of engineering apparatus, e.g., transformers, integrating meters, large generators and converting plant, gear, etc.

It is necessary to be able to assess the noise emitted by a machine for two main purposes, (*a*) to ascertain whether the noise is in excess of a desirable or permissible standard, and (*b*) to determine the cause of the noise with a view to modifying or reducing it. It has been suggested that the ear is the ultimate judge; but the ear, whilst a very sensitive and discriminating detector of sounds, cannot furnish quantitative data, and further it can only record a personal impression. Precise measurements should be based on a definite standard rather than on opinions of individuals. Yet due regard must be paid to the susceptibility of the average ear to sounds of different kinds.

Action of Three Elements.

The occurrence of sound involves the action of three elements, the sound generator, which is essentially a vibrating body, the transmitting medium and the sound detector. In the original paper the authors discuss the problem mathematically and derive an equation for the rate at which energy flows outwards through unit cross section at a given distance from the centre of the source. A pressure of 1 dyne per cm^2 corresponds to a fairly loud sound, and a very sensitive apparatus is needed to detect sounds of low intensity. The power varies as the square of the pressure. In practice, moreover, we have to deal with highly complex sound waves.

In analysing sound for engineering purposes we require an apparatus that will measure sound pressure in absolute units over a range of at least 100 to 2 000 cycles per sec. and will deal with intensities varying from very feeble to very loud sounds. It is desirable to be able to measure transient sounds, and some form of graphical record is thus desirable. For steady sounds, however, oscillograms should be avoided owing to the complexity of sound waves yielded by most machinery. In the original paper methods of sound-measurement adopted in the past are briefly discussed. Telephone receivers have been applied to rough measurements, the reference point being usually the threshold intensity of the observer's ear. Examples of absolute methods are the Rayleigh disc and the radiation pressure method. Whilst these methods are not directly applicable to measurements on engineering apparatus they are of great value in the laboratory.

Electrical methods have much greater possibilities than purely mechanical ones, owing to the greater precision and completeness of results and the large range of intensity and frequency that can be covered. The authors therefore concentrated on apparatus of this type.

The apparatus consists essentially of a microphone which generates an e.m.f. having a known relation to the incident sound pressure, an amplifier of known characteristics, which amplifies the microphone e.m.f., and some means of measuring the complex electrical wave-form of the amplifier output. An oscillogram of the amplified voltage from the microphone may be taken, and may be analysed. Alternatively one may measure the frequency and amplitude of each of the components in turn by means of an electrical frequency tester.

In the original paper the authors describe in turn the various forms of apparatus designed on these lines, and explain in some detail the method of calibration of the microphone, a typical calibration curve of which is presented.

In the next section of the paper test-conditions for general sound measurements are discussed. The sound intensity as measured near any source is dependent on the presence of other bodies in the sound field which give rise to general reflection or absorption. In practice two cases arise, i.e., when the test-conditions are under control, and when they are not. The nearest approximation to the ideal condition of infinite space is a large open area free from buildings, measurements being made at sufficient height above the ground to obviate appreciable reflection therefrom. In the early stage of this work the flat roof of a laboratory was used. Fairly satisfactory freedom from reflection was obtained, but the effect of wind, rain and extraneous noises proved prohibitive. It was therefore decided to construct a special building for acoustical work.

In designing this building consideration was paid to three main requirements, *i.e.*, the reduction of extraneous noise to a tolerable value, (2) the provision of a testing space reasonably free from reflection, and (3) the provision of accommodation for the fundamental standards of sound measurement. The detector element is placed in a sound-proof room, all other apparatus being excluded. The measuring and auxiliary apparatus, together with the observer, are located in adjacent rooms. In the original paper sketches showing the nature of the building are included.

Where, as in the case of large machines, records have to be obtained in a factory building, power station, sub-station, etc., the difficulties are considerable. Although the walls of such buildings are highly reflecting, the interference trouble may not be prohibitive if the building is large and the machine is not too near the wall, or a switchboard or another large machine. Where reflection is suspected a pressure/distance curve should be taken.

Extraneous noises, sometimes loud and confused, constitute a great difficulty. Fortunately large machines usually make a large noise as compared with small ones, so that the notes under observation stand out clearly against the general background of noise. If the machine under test can be shut down for a short time and the extraneous noise remains reasonably constant, the supposed irrelevance of certain notes can be checked. Attempts to make sound measurements on, say, a normal 10 H.P. motor on a factory test-bed, where several other machines are running and where the background of noise is large, are quite futile. It is not that the results may be inaccurate; they will probably be unintelligible.

Other factors of importance are the influence of temporary test foundations on the magnitude and distribution of sound, the contribution to the aggregate sound of auxiliary apparatus such as driving motors or loading brakes, and the influence of want of dynamic balance or alignment in a temporary set-up.

Actual Test Results.

In the final section of the paper examples of actual test results are presented. Thus, in the case of a small motor the frequencies of the chief notes in the total noise are identified; the amplitude of these vibrations determined, and the source of the various component sounds inferred. Similar data are given for a 1 000 kW geared turbo-generator set and for a commercial horn-type loud speaker. In assessing the intensity of noise of a given frequency the difference in the logarithms of the intensities of two notes of similar frequency furnish a scale indicating difference in loudness of these two notes. In choosing suitable units for this new scale, telephone engineers have been guided by their previous standard, the "800-cycle standard mile." Instead, therefore, of taking just the logarithm to the base 10 of the sound energy, a unit 1/10th as large has been adopted, and this corresponds roughly to the old standard.

Experience in testing a large number of machines of all sizes and types has given some confidence in this tentative loudness scale. A preliminary aural estimate of the most offending component of a noise is always confirmed by a high loudness figure where the results of an analysis are available. But even if this loudness scale is accepted for the moment, the problem of assessing the total loudness of a number of components of different frequencies still remains. A solution of this problem has been proposed by J. C. Steinberg, but the authors have not yet had an opportunity of judging how far his methods can be applied.

In conclusion it is suggested that the methods described in this paper may prove applicable to numerous other problems. A new apparatus of a more portable and self-contained nature is being designed which may prove of service in analysing street noises.

* Abstract of a paper read before the Institution of Electrical Engineers.

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TERMINAL APPARATUS FOR TRANSOCEANIC SUBMARINE CABLE TELEPHONY.*

Technical Details of Transmitting and Receiving Amplifiers Devised to Compensate for Attenuation of Long Submarine Telephone Cables.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

(*Concluded from page* 705.)

THE amplifier can be tested for the generation of harmonics in three ways: (1) Applying a sine wave to the input and taking an oscillograph record of the output. The input can be increased to a value where the output departs from a sine wave. This gives the input limit. (2) Passing the output to a frequency bridge and comparing it with the effect of the input so far as out-of-balance harmonics are concerned. (3) Observing the variation in anode feed current to each valve when the signal is applied to the input. For quantitative work a harmonic analyser can be used.

The theory of the screened grid valve and audio-frequency resonant transformer is substantially similar to that given by the author for radio-frequency transformers.† It was shown that the maximum amplification obtainable is $\frac{m}{2}\left(\frac{R}{\rho}\right)^{\frac{1}{2}}$, where m = voltage magnification factor of valve, ρ = internal a.c. resistance of valve, and R = effective dynamic resistance of the secondary winding of the transformer (including loss in leads, subsequent valve holder, etc.). By suitable design it is possible to obtain an audio frequency amplification per stage exceeding 1 000. The conditions for maximum amplification, however, are not always compatible with the requisite correction curve, and, as stated previously, this degree of amplification would overload one or more of the valves.

A resistance-capacity stage follows the correction units, so that the intensity of the output can be controlled. The power valve comes afterwards, and it is coupled to the outgoing line by a suitable step-down transformer whose characteristic is shown in Fig. 9.

It is desirable to supply the amplifier from a common battery system, and this is accomplished by connecting separate battery filters (chokes and condensers) in all the screened grid and anode circuits. To secure the proper working voltage on the screening grids, a potential divider system is employed.

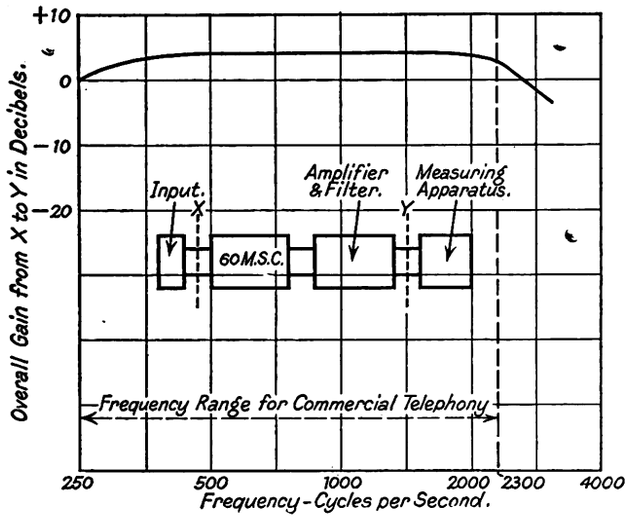

Fig. 11. Calibration curve of amplifier set to gain 60 M.S.C.

By aid of the amplifier of Fig. 6 it is easy to speak over a total of 90 m.s.c. (see Fig. 10). The additional 20 miles following the amplifier is to render the condition identical with that of a distant subscriber. The intensity is controlled by the potentiometer P, and the reserve amplification is adequate—apart from the additional correction necessary—to conduct satisfactory speech over distances of 110 m.s.c., i.e., 80 m.s.c. before the amplifier and 30 m.s.c. after it.

In listening direct to the amplifier‡ set to gain more than 70 m.s.c., it is usual to insert a cut-off filter to reduce the noise level due to extraneous interference, valve hiss, etc. A performance curve of the amplifier associated with a 2 700 ~ cut-off filter is shown in Fig. 11. For a gain of x miles the total talking distance is $x + 20$, since it is assumed that the level falls to — 20 m.s.c. at the subscriber. It will be seen from Fig. 11 that the curve is substantially flat over the commercial speech range, viz., 250 ~ to 2 300 ~.

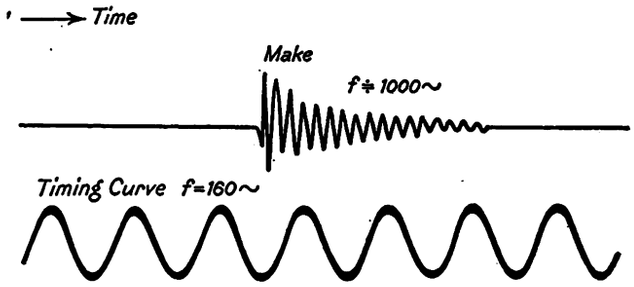

Fig. 12.

Although a gain of 90 m.s.c. has been obtained with a six stage amplifier there was a certain amount of noise caused by irregular electron emission from the valve filaments. The measured voltage amplification at 2 200 ~ was of the order of four million.

The various correction units and the battery filter circuits are housed in screening boxes of magnetic material. By means of a plug and jack system, any number of correction units, from one upwards, can be used, i.e., the amplifier can be adapted to suit any length of cable.

The degree of correction can be varied in the following ways:—(1) Altering the number of primary or secondary turns; (2) altering the capacity across the secondary winding; (3) putting a resistance or other suitable impedance across the primary, the secondary or across a tertiary winding; (4) altering the thickness of the core stampings; (5) altering the material of the core.

To eliminate the influence of the input impedance of the triode V_4 of Fig. 6 on the preceding transformer, the latter has a tertiary winding T across which a suitable condenser is connected. Both primary and secondary windings have supersonic resonance frequencies. If a standard resonant transformer [f = 4 000 ~] were used, the effect of the triode would be to lower the frequency to, say, 2 000 ~ thereby altering the correction.

The Transmitting Amplifier.

The transmitting amplifier is constructed on similar lines to the above. After the desired degree of accentuation of the upper frequencies, the voltage is fed to a pair of transmitting triodes arranged back to back. Thence the output is passed via a step-down transformer to the telephone cable. The power triodes are worked at any suitable voltage, e.g., 5 000, and the average *input* to the cable is of the order of 8 watts ($0{\cdot}2^2 \times 200$).

On economical grounds it is evident that the same cable must be used for the go and return conversations. Conditions are such that it is essential to incorporate a relay which operates when the speaker's voice is raised above a certain level, e.g., it must not be actuated by the action of breathing. One function of the voice relay is to disconnect subscriber A's transmitter, at the same time connecting his receiver to the cable when subscriber B is talking. The second function of the relay is to disconnect the cable from A's receiver and connect it to his power transmitter when he talks to B. By aid of a retardation device, the cable is connected to the transmitter before the voice current can pass thereto.

If a cable transmits frequencies of 2 300 ~ satisfactorily, it will transmit frequencies of 150 ~ with consummate ease. Thus, it can be regarded as a super-telegraph cable upon which

[* Manuscript received on June 20, 1929.—Ed.]

† "Experimental Wireless," September, 1926, and October, 1927.

‡ Without the succeeding 20 m.s.c.

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speeds of 500 words per min. or more are possible without serious distortion. At this speed a seven-channel scheme, with each channel running at 70 words per min., will enable direct printing to be conducted. It must be remembered, of course, that although the speed of any one channel is low, the distributor at each end of the cable must work at the combined speed of all the channels.

Apart from the line or cable, speech is subject to considerable distortion, due to the superposition of the natural oscillations of the microphone and the telephone receiver. The latter consists mainly of transients, some of which are really severe, as when saying the letter "p." In this case the air pressure rises precipitately as in an explosion. The corresponding effect upon the acoustic output from a telephone ear-piece is illustrated in Fig. 12. Owing to lack of damping (the ear-piece was not held to the ear) the oscillation of the telephone diaphragm is more prolonged than would be the case in practice. Nevertheless it is clear that on those portions of speech embodying severe transients, an oscillation of about 1 000 ~ is superposed which causes marked distortion and aural discomfort. The same effect—often more pronounced—is found at the microphone, and in practice the listener has the disadvantage of the two.

It is possible to lay bare the defects of the ordinary microphone and receiver by comparing the results with those from a Reisz microphone (which has no appreciable resonances) and a telephone receiver of the moving coil variety. The comparison is just as striking as that between the broadcast reproduction of 1922 and 1929. When these superior instruments are used in conjunction with the amplifiers described herein, the same striking effect is evinced, which proves that the system is capable of producing high quality commercial speech.

I wish to acknowledge my indebtedness to Mr. Willoughby S. Smith, managing director of the Telegraph Construction and Maintenance Co, for permission to publish the matter contained herein; also to Mr. G. A. V. Sowter, B.Sc., for his co-operation and valuable assistance in the design and testing of the apparatus.

BUDGETARY CONTROL AND SALES ANALYSIS.

A Recognised Method of Controlling and Developing Business.

ADDRESSING the members of the Business Research and Management Association, Mr. A. G. H. Dent stated that budgetary control had developed from scientific management, and was a recognised method of controlling and developing business efficiently by forecasting and deduction from all available facts and probable tendencies.

Forming part of the master budget, the sales budget should be made out by combining analysis of past results, analysis of prospects in all markets, study of orders on hand and carry over position, study of general business factors, which were closely related to business volume, analysis of current economic and industrial conditions, and study of salesmen's reports, and conforming to policies to be carried out. When these various factors had been studied and sales estimates produced and split up by territories and lines of merchandise, the estimates had to be scrutinised and adjusted from the viewpoint of production capacity, the company's finances, existing inventory, desired closing inventory, conditions in the labour market, and the raw material market situation.

It was necessary to steer between the two danger positions of excess production, causing loss through large amounts of capital being tied up, and insufficient production, which meant losses through inability to meet customers' demands.

Eliminating Seasonal Variations.

The technique of methods of analysis in analysing past results and in forecasting sales had grown during the last few years. It was possible to eliminate from business data of several years the seasonal variations, and the trend line of growth, leaving the cyclic movements which were related to the movements of the general business cycle. Some businesses had been successful in relating home trade volume of sales to a general economic conditions curve by forecasting processes while other producers manufacturing goods had constructed index curves and "barometers" for the industries which consumed their goods, and estimated future demand in this manner.

When the sales budget had been fixed the production plan was based upon these sales figures, and the physical volume of output, the programme of purchases of raw materials and supplies, the man-hours worked in the shops, the machines to be used, shipments, billings, expenses and receipts were all deduced from the sales figures. These estimates were the framework of the business year, and while subject to changes, provided a definite scheme of working.

The Thomas A. Edison Co., the Crabtree Co. of Walsall, the Walworth Manufacturing Co., Hans Renolds of Birmingham, the Graybar Electric Co., and Rowntrees of York were typical examples of British and American companies with budgetary control systems.

In the U.S.A., the Graybar Electric Co. merchandising some 60 000 different electrical products, regularly estimated demand and growth of its many lines analysing important internal and external factors and operating data. This company used the general business conditions curve prepared by the American Telephone and Telegraph Co. as an index of national prosperity. In Great Britain the Crabtree Co. had been very successful in forecasting future business movements from a trend line of growth, using the areas above and below this line as a basis of forecasting. This company now averaged out below 1% error on its budgetary estimates.

A Five-year Budget.

Budgetary plans were sometimes made out for a period of three or five years, the first year being detailed, and the others general in character. The American Telephone and Telegraph Co. operated a five year budget plan in this manner.

The budget period could be adjusted to the type of business, three-monthly, half-yearly or yearly. Retail houses having two marked seasons would use a six months' budget.

Economical manufacturing in advance during slack periods was possible when occasional analysis showed regular peak and trough periods of business. This made feasible steady employment and continuous machine operations.

When production for definite periods was deduced from sales estimates, it was necessary to add a percentage to cover possible heavy demands. This was a factor of safety determined by experience.

Commitments based on manufacturing schedules were generally made for shorter periods than the actual budget period. For instance, the Edison industries in the U.S.A. operated a 12 months' manufacturing budget, but orders for materials were carried out on a three months' or smaller period basis. This company not only derived purchases and stocks from original budget estimates, but also forecasted cash receipts in advance for monthly, 60 day and 90 day periods with reasonable accuracy.

Forecasting sales and associated figures was admittedly a difficult task, but it became a more accurate job when statistical study of important figures, such as production, shipments, stocks, orders, sales billings, gross profits, receipts, expenses, and receivables were consistently made, and the relationships between these figures ascertained and understood. Results actually obtained in some engineering firms were surprisingly accurate, and meant steady business, and economies which were immense compared with the cost of carrying out the work.

In keeping stock of sales and orders, it was necessary to analyse results against budget quotas by units, such as lines of merchandise, territories, agents, and salesmen. Overall figures hid important tendencies. In most instances monthly realisations were desirable, coupled with some index as to the general seasonal fluctuations of business. Forecasting future billings and receipts depended upon accurate detailed analysis. A very useful chart for this purpose was the Z chart, which showed a valuable figure, the moving total of sales or receipts, etc., at the end of each month. Other data on the chart were monthly and cumulative figures compared with budget estimates.

Detailed analysis showed which classes of goods were making a profit, and where. Unprofitable lines could be located and investigations made on eliminating them. New lines of opposite seasonal selling characteristics to those marketed could be introduced to balance up a very seasonal business. Rapidly increasing demand could be watched and stock position on a particular line maintained to keep pace with unusual growth. A variety of similar types could be studied with a view to standardisation, analysing the consumption by line and by class of customer, the profit per unit, and growth of sale. Results showing superfluous types led to consultation with customers with a view to acceptance of substitutes.

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DEVELOPING THE ELECTRICITY SUPPLY INDUSTRY.*

Some Suggestions from the Contractors' Point of View—Abolish Meter Rents—Irritating Restriction ons Use of Motors—Building up the Domestic Load.

By HARRY MOSS, A.M.I.E.E.

A PROBLEM which will have to be given serious consideration shortly, is that of service charges. Personally, I think these are wrong, especially in the case of properties alongside distributors. When houses, shops, etc., are built right up to the pavement edge within 2 or 3 ft. of supply cables, or even stand back a yard or two from the pavement, a supply should be laid in free and willingly, but in the case of private properties some distance from the mains, 40, 50 or 100 yd., a different problem presents itself, and it would be only reasonable to expect the consumer to pay a proportion for crossing a lot of private land to give him a supply, unless a certain guaranteed sum per annum for a period of years was mutually arranged between the two parties.

We must bear in mind that, at the present day, the better class property, householder or shopkeeper on the route of supply is already taking a supply, and therefore what remains is a class that requires inducement, and who have not got pounds to put down for the privilege of a public service which ought to be theirs for the asking. There are miles of distributing mains laid that might bring in a much larger revenue by reaching a higher saturation point with new consumers who might be induced to come on to the supply if service charges were abolished.

Another thorn in the consumer's side is the question of meter rents. A charge for the rent of a meter of say, 5s. to measure 50s. worth of current per half year, and in some cases only 20s. worth, is as absurd as a coal hawker charging 5s. for the use of his weighing machine or scales when he sells you a ton of coal, or a butcher charging you 1d. per pound for use of his scales to weigh your meat; and both these tradesmen are compelled by law to keep their scales or measuring instruments in accurate working order. Moreover, the coal hawker and butcher will provide the means of transport for delivering their goods to you, without any charge.

Apart from tariffs there is another aspect of very great importance to the user, and that is the restrictions and regulations governing his motor equipment. The enforcement by some authorities of the use of the slip ring motor except in very small sizes, where squirrel-cage is allowed, is detrimental to electrification in some works, whilst the rules and regulations which make starting gear almost as expensive as the motor itself are a very definite brake on progress.

The large power stations now in use are a vastly different proposition from the small ones of a few years ago, and irksome restrictions regarding starting current of motors, the present limitations of squirrel-cage machines, and the elaborate requirements in connection with the starting gear, are things that ought to be swept away to-day.

Objections to Standing Charges.

There must be hundreds, if not thousands, of small power consumers or would-be consumers who object to a standing charge of so much per kVA connected, and I feel that all these standing charges should be swept aside, and replaced by a charge for current used, and current only.

It is very evident that if the day load for power is going to be increased to improve the load factor, the lowest flat rates for power, irrespective of maximum demand, must be given to the power consumer.

During the past few years there appears to have been a growing tendency among certain supply engineers to expend much time and effort on the sale of such small current consuming devices as vacuum cleaners and washers.

Is this done simply for the picturesque effect, because as current users they don't make any appreciable difference to the units sold? I often think, from the central station point of view, their efforts in this connection are wasted, and it can only be because they want to boost their sales departments that so much attention has been paid to the above apparatus, which to my way of thinking, ought to pass through the hands of the retailers to the users.

Have supply engineers thought that they will sell far more current by getting consumers to replace a 60 W lamp by a 100 W in a living room or kitchen, than by any cleaner or washer they may sell? The domestic iron is worth far more to the supply engineer as a current consumer than is a vacuum cleaner or washer.

An intensive effort among all present consumers and the maximum support to the E.D.A. Outlets Campaign, to instal more plug points, and especially heating plugs, is likely to have far greater results in units sold at the year end than all the cleaners and washers can possibly have.

A vacuum cleaner, in many houses, will only be used approximately ten minutes per day, or, say, one hour per week, and will make a demand on the central station for about one-sixth or one-fifth of a unit per week. A washer, working two hours per week, will consume approximately two-fifths or ½ unit per week. Now, whilst these two articles are very excellent pieces of electrical apparatus in the home, they are, as current consumers, practically worthless to the supply authority, and not worth a moment's consideration.

Increasing Sales of Energy.

Less effort spent on the foregoing, and more effort on the question of water heaters, long-hour current-consuming devices, and educating their customers to improve their existing lighting, especially in those rooms where lights are burning the longest, and also a concentrated campaign among their consumers to instal and use electric radiators, which will use more current in a day than a vacuum cleaner will in months, will pay them better than anything else in the domestic line.

If you take a town with say, 3 000 consumers, and can persuade each of these to replace two 60 W lamps with two 100 W, these burning, say, 1 000 hours per annum, your sales will immediately go up by ¼ million units.

Further, if you can get 3 000 consumers to use radiators, using only two units per day more than they are doing, you immediately increase your sales by over two million units.

Some years ago I urged, at a meeting of the I.E.E., the necessity of easily replaceable elements in heating apparatus, and it is pleasing to note that at the present time some manufacturers are embodying the idea in their designs. It is an absurd thing for a customer to have to have an electrician sent miles across town, spending valuable time and also travelling expenses, simply to slip a new bar into a radiator. Elements must be designed and made so that they may be as easily replaced as a lamp, and by this means the cost of maintenance of electrical installations, which means so much to a consumer, can be kept within reasonable bounds.

Whilst B.E.S.A. standards in connection with plugs, etc., are now common with our manufacturers, we are still floundering about with scores of different sizes of pins, plugs and sockets on heating apparatus, which is all wrong and a hindrance to development.

Whilst one manufacturer has only his own size of plugs to consider, the contractor or retailer has those of every make, and delay in carrying out repairs is frequent, owing to the impossibility of stocking every known make of spare part.

If we can get standardisation among our own manufacturers we can afford then to leave the foreigner with his own patterns in the background.

Whilst on this question of standardisation let me put in a very urgent plea for universal 3-pin earthing arrangements. If apparatus is thus fitted it does not matter whether the earthed pin is used or not in insulated situations, but it would be there if required.

A further point is service to the public, and I think I can rightly say that the organised contractors such as E.C.A. members and members of the National Register, can do, and will give greater and more efficient public service than the hundred-and-one so-called electrical engineers and contractors to be found in the back streets and yards of our towns to-day. Closer co-operation between the recognised and acknowledged contractors, supply authorities and manufacturers will lead to the exclusion of the jerry man and kerbstoner.

* From a paper read before the E.D.A. (North Midland Area) at Bradford on December 3rd.

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SHOWROOM ORGANISATION.*

Its Importance in Developing Uses of Electricity.

By A. C. BOSTEL, A.M.I.E.E.

A PROPERLY equipped electrical showroom plays such an important part in the development of the uses of electricity in the home, the shop and the factory, that I offer no apology in asking you to review with me its organisation, equipment and management.

It must be admitted that a large number of electrical showrooms are poorly equipped, and it is surprising to find in many showrooms a large amount of shoddy apparatus offered for sale, and the assistants who are supposed to sell these goods quite at a loss to give definite information of the cost of running them.

Let us consider the general position and lay-out of our showroom. The site should be carefully chosen, and preferably in the main thoroughfare. The window space should not be large, and about 100 sq. ft. per window gives plenty of room for attracting attention, and it is important not to crowd this window space with a large variety of subjects—the fewer the better. The overcrowding of window space with such things as distribution boards, switches, ceiling roses and other paraphernalia of the wiremen's art cannot stimulate interest in electrical appliances, nor create any attraction; but place a washing machine in the window with a girl working it, or an electric cooker with a joint in the oven, or even a kettle boiling on the hotplate, and watch the number of people who will be attracted.

The inside lighting of the window space should be arranged so that different colour schemes can be given to the display, and if a small revolving switch can switch on at intervals a series of three colours, the effect is surprising.

Too much thought cannot be given to the window display, and a study of the general lay-out of many of the retail shops in London will give many valuable hints, as some of the displays are works of art in presentation to the public of goods in beautiful surroundings.

Consumers should be encouraged to pay all accounts at the showrooms, and the pay counter should be so arranged that the consumer must pass the main display, or at a glance be impressed by the surroundings. In the event of the customer having to wait, encouragement must be given to examine the surrounding apparatus, and for this purpose the interior should be divided into sections as far as possible, each section devoted to a particular subject. For example, one section to table cookery, another to electric ironing, others to vacuum cleaners, coffee percolators, industrial apparatus, cooking stoves, water heaters, washing machines, etc.

Encouraging Inquiries.

Each section should be neatly set out with a short description of each piece of apparatus, with its price and running cost. Some people are shy to ask questions, and if they are able to gain some knowledge of the goods without the assistance of the salesman they are much more encouraged to make inquiries. I am very much against a too zealous salesman who pushes in front of every possible visitor and asks questions. The visitor should do that. This principle is recognised in most of our large stores; the public feel that they can comfortably examine the display without the annoyance of the importunate salesman.

By all means have your salesman handy, and he should be the judge, if he knows his job, of the moment when the visitor requires information.

The apparatus should be so displayed as to be easily handled; wired tables in the centre of the showroom and neat benches placed against the walls are admirable.

It is a mistake to place the goods, except lighting fittings, above the average eye level. Suitable tables and benches placed about the showroom at a height of about 3 ft. from the floor level would be quite high enough.

It should be remembered that in showroom display lay-outs, the accepted idea is to produce an environment which is subjugated to the apparatus or goods which are offered for sale, and in this respect an electric fire is shown to greater advantage if it is placed in a dummy fireplace with a mantelshelf than if it stood up against the wall or middle of the room with no appealing background. The same remarks apply to the display of a vacuum cleaner; place it on the floor or against the table and few people will notice it, but, on the other hand, place the cleaner on a carpet which has been covered with a white powder over which the cleaner has been drawn leaving that part of the carpet clean, and attention is given at once, and conveys to the customer the story surrounding the use of the cleaner. Such illustrations can be multiplied by the number of appliances, and they certainly catch the imagination, which is an inducement towards the inclination to buy. These settings do not want to be spectacular, just simple appealing frameworks to the picture of the display.

Do not show a large number of different makes of any piece of apparatus, for it confuses both the buyers' and sellers' minds as to what to buy or recommend; different makes take up time. Carefully investigate the various makers' goods and prices, decide which you consider the best, and sell the best of two or three different makes. By this means very little obsolescent stock will be left behind.

Group Displays Attract.

Group displays attract much more attention than the display of one article. If an electric iron is placed on a table or bench by itself it is rarely seen, but place a dozen or so in symmetrical form on the bench, and the eye is at once caught. The same remarks apply to fires or any piece of apparatus. Hence the necessity of arranging the whole showroom display in sections.

Lighting fittings should also be set out in groups; dining room fittings together, bedroom fittings together, and so on. Not only does the display look more attractive, but it also saves a considerable amount of the consumers' and salesmen's time. Fashions rapidly change in lighting fittings, so do not keep fittings that are out of date. It is far better to sell them off cheaply than to hang on to them; at the same time I do not encourage the display of fittings which are ahead of the times unless the showroom is in an appropriate neighbourhood.

* From a paper read at the November Sales Conference of the E.D.A. (South Wales and Monmouthshire Area).

THE BATTI-WALLAHS.

Mr. Watlington Explains how Electrification will Relieve Unemployment.

ABOUT 150 members of the Batti-Wallahs' Society and their friends were present at the Society's luncheon at the Hotel Cecil, London, on December 5th. Mr. H. L. Howard (the President) was in the chair, and the principal guest was Mr. Victor Watlington, managing director of the English Electric Co.

Mr. Watlington, in an address following the luncheon, pointed out how profoundly our position as an exporting nation had been influenced by the fact that we lived on an island in which no producer of goods was more than 100 miles from the seaboard. In some countries distances of 2 000 miles and over had to be traversed by goods destined for export. The enormous advantage which this facility bestowed upon us materially aided the development of a world-wide export business. It was not always realised that we had made our way by exporting what the overseas customers wanted. In recent times the United States and some other nations seemed to have specialised in selling the customer what the seller wanted him to have. Perhaps that feature accounted in some degree for the recent development of American export trade.

Whether or not we subscribed to Free Trade principles we could not get away from the fact that unless we imported something from a man, we could not sell him something in return. The real issue was that goods must be paid for by goods, and so we must have a big export trade.

In the early years of our industrial activity we had deliberately destroyed the agricultural industries for the benefit of manufacturers, and decided to buy our food on the score that this was cheaper than producing it. The result of this was that about 80% of our population lived in the towns and barely 20% in the country; and not all of these were engaged in agriculture. In the past we had always been able to find some place where the people were prepared to produce food for us and accept in return our coal, iron, cotton goods, etc; to-day these conditions did not generally exist. The advantage in the past was that those with whom we exchanged were satisfied with less than the people here. The theory of low wages and cheap food had had a good trial, and to-day one might wonder whether the advantages had been as great as had been anticipated. Possibly the time had arrived for consideration of the desirability of redistributing our population. It was a dangerous matter to talk about tariffs and free trade, but

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most people would agree in wanting tariffs for their own industry and free trade for all the others.

The British electrical industry, Mr. Watlington continued, was in a very enviable position, because it was expanding, while the former staple industries were contracting. Being comparatively new, it was comparatively free from the rule-of-thumb methods of earlier industries. Furthermore, most of the people in the industry had been trained in a scientific manner, and to that extent probably had more logical and open minds than those engaged in the coal, metallurgical and similar industries.

Our exports of electrical machinery and apparatus only totalled about £7 500 000 in 1913. In 1928 the total was £18 300 000. The British Dominions furnished a big market for this apparatus, and in 1928 they took £11 000 000, or 61%.

A not so satisfactory feature in 1928 was that, for the first time, Germany's electrical exports were greater in value than our own, and also greater than the U.S.A. exports. There was no need for immediate alarm on this account, as a proportion of the German figure was represented by Reparations deliveries. In the future, these Reparations exports might constitute a real danger. For the first half of this year the British electrical exports totalled £9 000 000, against Germany's £13 000 000.

Study of the situation would show that the British Dominions represented our biggest market. There was a common tendency to-day to demand preferential treatment in trading with our Dominions. His own view was that the best preference one could have in any market, Dominion or otherwise, was the ability to supply what was wanted at the right price.

Cause for Optimism.

We needed to take a slightly more optimistic view of our position and achievements, instead of going out and telling the world what a terrible state we are in. Unemployment was a very old problem, and even so long ago as 1450 there were the equivalent of labour exchanges in some of our towns. To-day, out of a total of 11½ million registered workpeople roughly 10% were officially unemployed, these being mainly in the shipbuilding, iron and steel and coal trades. It was wrong to imagine that we had a standing army of people permanently out of work, for about half of those registered as unemployed would be working some of the time.

Exploring the prospect of reabsorbing these workers, Mr. Watlington said it was obviously absurd to try to get them employment in one industry. The only way was to improve and modernise the equipment of all our industries, a development in which the electrical industry could afford material assistance. If we could expedite the electrification of this country we would do away with a great deal of unemployment. Besides providing work inside the industry, electrical development would give employment to people normally engaged in other activities. For instance, excavating work for cable laying was very suitable for miners, and in the manufacture of cable ducts a considerable quantity of coal was used. In the electrical industry itself there was little unemployment, the figure being only about .4%. On the other hand, we had a surplus productive capacity in the neigbourhood of 40%, so that there was room for considerable further employment if only the industry obtained the necessary work.

Referring to rationalisation, which, he said, had been described by a dozen eminent men in a dozen different ways, Mr. Watlington said that to him it implied rationing, or balancing the demand and the outpit. Rationalisation had been very successful in Germany, where the coal industry decided to close the uneconomic pits and allocate the possible demand amongst those still producing. From a position of bankruptcy two years ago, Germany had recovered in a marvellous manner. What Germany had done we could do here, and it was up to the electrical industry, unfettered by tradition, to show the way in intelligent and helpful co-operation.

GLASGOW TECHNICAL COLLEGE.

The annual report of the 133rd session of the Royal Technical College, Glasgow, records distinctions gained by members of the College during the session. The number of day student class enrolments during the session was 3 580, compared with 3 316 in the 1927-8 session, and evening student class enrolments 5 951, against 6 456, the decrease in evening students being mainly attributable to the transfer to Glasgow Education Authority of craft classes, and the institution by surrounding education authorities of higher classes corresponding to those in the College.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Smethwick Fire Disaster.

[To The Editor.]

Sir,—The attention of the Council of the Institution of Electrical Engineers has been drawn to newspaper reports of the proceedings at the inquest, which concluded on September 25th last, upon eleven persons who lost their lives by reason of a fire at premises in Rolfe Street, Smethwick, on September 2nd.

Some of the evidence purported to show that the fire was due to a defective electrical installation in a neighbouring building, and in this connection one of the witnesses condemned the use of lead-covered rubber-insulated cables for the wiring of public buildings.

This statement has caused great uneasiness in the minds of consulting engineers, architects, electrical contractors and others, inasmuch as the use of lead-covered rubber-insulated cables is permitted by, and the proper methods of installation of such cables are set out in, the " Regulations for the Electrical Equipment of Buildings " issued by the Institution.

These regulations are recognised by consulting engineers, electrical contractors, electricity supply authorities and the Fire Offices, as representing the best standard practice, and the Fire Offices in particular commend their use.

The Council reaffirm, therefore, that they are of the opinion that lead-sheathed cables are both suitable and safe for electrical installations, if installed and maintained in accordance with the I.E.E. Wiring Regulations.

From the evidence given, as reported in the newspapers, there is every indication that the electrical installation which, it is suggested, caused the fire at Smethwick, did not comply with these Regulations.—I am, etc.,

P. F. Rowell,
Secretary, The Institution of Electrical Engineers.

Savoy Place, W.C.2.
December 9th.

"Electricity is Cheap."

[To The Editor.]

Sir,—I have to thank Mr. A. B. Cousins for his letter under the above heading in your last issue, giving details of the results obtained by using a Jackson Junior electric cooker. His figures, I think, prove that electric cooking with energy purchased at 2d. or less per kWh is a paying proposition. I also agree that other advantages which he mentions, such as cleanliness, and absence of fumes and intense heat in the kitchen, should be taken into account. Unfortunately, there are still districts in which electricity cannot yet be obtained at the rate Mr. Cousins mentions, and it is only with regard to electric cooking in such places that I remain,

Dubious.

December 10th.

Street Lighting Experiments.

[To the Editor.]

Sir,—The proposal that the main streets of our principal towns should be lighted to such an extent that it will become unnecessary for vehicles to use their own lights at night is not so impracticable as it may at first sight appear.

Already the City of London proper—the area under the control of the City Corporation—is so lighted that the use of the lamps on cars and 'buses is a mere formality rendered necessary only in compliance with the law on lighting-up. The City of London streets, lit by gas or electric lamps suspended over the centre of the roadway, are bright and shadowless by night, while the lighting is entirely devoid of glare. The headlights of a car, therefore, are no more necessary in the City at midnight than on a clear day at noon.

The general introduction of an equally effective system of illumination is mainly a question of local initiative. Progressive public bodies may see what can be done not only in the City of London, but also in less wealthy districts such as Lewisham, where the Borough Council is at present engaged on a most interesting series of experiments. The tests will be on an elaborate scale, with gas and electricity each allotted one mile of main road for their trial installations.

With the abolition of the speed limit for cars, the question of

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getting rid of dazzling headlights becomes urgent. A fast-travelling car with its lights on will become a real danger in urban thoroughfares. The safe alternative is to get as near as possible to a daylight effect in street lighting, so that strong headlights may become unnecessary—and even illegal—in our principal towns.—I am, etc., W. J. LIBERTY,

Hon. Secretary, Association of Public Lighting Engineers.

London, S.W.1. December 5th.

"Standardised Page Sizes."

[To The Editor.]

SIR,—We have noted with pleasure the publication of the I.S.B.A. letter on the subject of standardisation of advertisement page size. We accordingly write to express our approval of the standards proposed. Whilst we should have preferred only one size—namely, 10 in. by 7 in., we appreciate the difficulties that this would mean to certain publishers, and, therefore, agree with the proposals that where a larger or smaller size is essential, this should be in the same proportion. The two additional sizes suggested should, we think, meet the requirements for such cases.

This company feel very strongly that the adoption of standards in advertising space is a reform long overdue. The money spent on designs and blocks of varying sizes is waste which can and should be avoided.

The publishers in the long run stand to gain by the proposals, as by their adoption advertisers would be enabled to cut out the waste expenditure from their allocation, and thereby take additional advertising space.—I am, etc.,

J. TAFFS.

For the English Electric Co.

London, W.C.2. November 29th.

Treatment of Sulphur Fumes.

[To The Editor.]

SIR,—Inspection of the interim report on the treatment of sulphur fumes, which was practically reprinted in THE ELECTRICIAN of November 29th, reveals to me as a power-station chemist, certain misleading features which, I think, for the guidance of engineers, call for the following criticism:

In the report stress is laid upon the small quantity of water found adequate for spraying—from 7 to 12 tons per ton of fuel—and figures are given showing the slight effect on the water used, the L.P. Co.'s chemists and advisers appearing to consider neutralisation of the effluent a non-essential refinment; the Government chemist, however, at the conclusion, states that he considers it necessary, and even then that there is still a question of harm to the river water from possible So_3.

Now, firstly, the Government chemist has evidently taken the fuel as evolving about 1·5% of sulphur, 250 tons of water of 20 parts per 100 000 alkalinity (as calcium carbonate) being stated as necessary for neutralisation of effluent from spraying gases from 1 ton of fuel. For,

20 parts calcium carbonate neutralise 16 parts So_3.

250 tons water = 560 000 lb.

560 000 lb. water, neutralising 16 lb. So_3 per 100 000 lb., will neutralise $16 \times 5{\cdot}6 = 87{\cdot}6$ lb. So_3.

2 240 lb. fuel, evolving 1·5% sulphur, gives therefore $\frac{2\,240 \times 1{\cdot}5}{100} = 33{\cdot}6$ lb. of sulphur, which is transformed to 84 lb. of So_3, which is very near the above figure for So_3 neutralised by 250 tons water. Now, taking 12 tons of water sprayed per ton of fuel, the effluent must contain about 84 lb. So_3 in 26 880 lb. water, or 313 lb. So_3 in 100 000 lb. water, whereas the effluent given on p. 8 of the report, stated to be from the use of 12 tons sprayed water per ton of fuel, is given as having acquired less than 44 parts So_3 per 100 000 —a very much weaker solution of acid.

Therefore, either far more water than 12 tons per ton was sprayed ($\frac{313}{44}$ = about 7 times as much, or 84 tons), or the sulphur extraction was hopelessly incomplete (only one-seventh of the total).

Moreover, the fuel usually burnt contained amounts of sulhpur such as 3·7%, 4·4%, etc., by the L.P. Co.'s own figures. Assuming, at a low estimate, that 3% of sulphur was evolved, then the effluent must contain twice as much So_3 as the above—namely, about 626 parts per 100 000, instead as about 44 as given. This makes the various figures in the report still further from actuality.—I am, etc.,

P. NARRACOTT.

London. December 9th.

CHROMIUM PLATING.

Preliminary Details of a New Direct Depositing Process.

CHROMIUM is deposited under many processes, but in nearly all of them the article to be chromium plated is nickel-plated first. The latest method, however, has just been brought to this country by Dr. Nast, and under it, chrome is thrown direct on to the surface of the base metal.

The advantages which Dr. Nast claims are:—

(*a*) That where chrome is thrown direct on to the base metal, it amalgamates with it and will neither peel nor chip; whereas chrome on the top of nickel is liable to both defects, because the nickel underneath the chrome is liable to chip or peel.

(*b*) That the direct method is cheaper, because it saves the lengthy process of nickel-plating first. (An article needs a forty minutes' immersion to nickel plate as against about ten minutes in a chrome bath, meaning that apart from the cost of the extra process itself, about four nickel baths are required to every chromium bath, if the work is not going to be held up through congestion in the nickelling department.)

The Northern Chromium Plating Co. are exploiting the new process at their Skinnerburn works in Newcastle, where an extensive plant is now in operation.

Under the new process an article is dismantled and de-nickelled, and is ground and buffed, until the base metal has a perfect polish. It is then wired for hanging in the chromium bath in such a way that all parts of the surface will get a fair share of the deposit.

Next, it is degreased in a special bath. This is necessary through an invention of Dr. Nast's which has a direct bearing on this method of plating, particularly in connection with the low cost. When chrome is being released from the acid in the chrome baths hydrogen bubbles, thinly coated with minute quantities of chrome, rise to the surface. These bubbles are lifted into the air by the hydrogen and form a serious menace to the health of the workers unless drawn away. An elaborate and costly system of exhaust and filterage is usual, but Dr. Nast has prepared an oil, which he floats on the surface of the acid. This oil decoats the hydrogen bubbles of chromium as they pass through to the surface, to be liberated as harmless hydrogen.

The article to be plated has to pass through this layer of oil on its way to the acid. Hence the necessity for it to be thoroughly degreased so that when it is passed through the oil (after it has been wetted) no oil adheres to the surface.

The article comes out of the chromium bath with a fine surface, which requires very little polishing.

It is claimed that the new direct process throws as well on to steel as to brass, copper and the many other popular alloys used for radiators, etc.

But, as is well known, all chromium plating is porous, and if the article plated is left for long periods in damp places, rust is liable to form in the base metal, with the result that the chromium above may crack. This difficulty is got over by treating the steel with a between coating giving it rustless properties.

The aluminium process is a very elaborate one, as the intractability of aluminium and its refusal to amalgamate with other metals has long been a problem. The Northern Chromium Co., however, claim a perfectly satisfactory method of plating this metal.

It is desirable to burn on the chromium plating of some articles so that it becomes extremely hard, and consequently has additional heat-resisting properties. The maximum degree of hardness claimed to be obtainable is 95 per cent. of the hardness of a diamond. The final hardness depends upon the amperage per sq. ft. used in the chrome bath. Normally, one does not desire the extreme hardness; for one thing the finished article is much more difficult to polish satisfactorily, and consequently the expense is proportionately greater.

ACCRINGTON ELECTRICITY SUPPLY.

The Electrical Engineer of Accrington has been instructed to estimate the cost of extending supply to Huncoat, and to ascertain whether it is possible to get a grant from the Unemployment Grants Committee towards the scheme. The chairman of the Electricity Committee reports that up to the present the electricity department's output has overtaken that of last year, and the cost per unit has been less than a year ago.

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RADIO MANUFACTURERS' ASSOCIATION.

Annual Dinner and Meeting—Continued Increase in Membership—The Marconi Royalty Position—The Year's Work.

THERE was a large attendance at the annual dinner of the Radio Manufacturers' Association, held at the Savoy Hotel, London, on December 4th, Sir William Bull in the chair.

The toast of the R.M.A. was proposed by Mr. F. Kellaway, who said that no man would venture to make a prophecy with regard to the future of wireless, but in his opinion we were only at the beginning of what wireless was destined to do for mankind.

Their industry had made a greater change in the social life of the world than any other invention since printing. Broadcasting had done for the spoken word what printing had for the written word. Our public men, particularly politicians, had had the common sense to take advantage of the technique of broadcasting.

He referred to certain people who had brought discredit on the industry, and said that he hoped, before anyone subscribed any money for the proposals put before the public, they would look at the names of the men who were promoting them. It was high time that someone able to speak with authority should call attention to the scandalous abuse which was taking place in the last few years in connection with public flotations.

It was time that men with great names, and holding prominent positions, were a little more careful in allowing their names to be connected with exploitations of inventions which had never been properly examined.

After a brief response by Mr. J. T. Mould, chairman of the R.M.A., Capt. J. W. Barber proposed the toast of "Our Guests."

Lt.-Col. J. T. C. Moore-Brabazon, in reply, said he agreed with Mr. Kellaway in his warning against the "dud" company, but he would remind him that British investors put their money into the Marconi Co. long before it was a financial success. It would be a bad day for this country if investors did not put any money into companies before they were commercial successes.

The toast of "The Press" was given by Mr. R. M. Ellis and responded to by Mr. A. Beverley Baxter.

Mr. L. McMichael proposed "The Chairman," and after Mr. Mould's acknowledgment, the company adjourned for dancing and a cabaret entertainment.

The New Council.

The annual general meeting of the Association was held at the Hotel Cecil, London, on December 5th, when Sir William Bull was re-elected President and the ballot for 18 members to serve on the Executive Council was made, the following firms or their representatives being elected :—The Bowyer-Lowe Co., Ltd., the Brownie Wireless Co. of Great Britain, Ltd., Burndept Wireless (1928), Ltd., the Chloride Electrical Storage Co., Ltd., the Climax Radio Electric, Ltd., the Columbia Graphophone Co., Ltd., the Dubilier Condenser Co. (1925), Ltd., Ferranti, Ltd., the General Electric Co., Ltd., Graham Amplion, Ltd., Hart Collins, Ltd., the Igranic Electric Co., Ltd., Kolster-Brandes, Ltd., the Marconiphone Co., Ltd., L. McMichael, Ltd., the Mullard Radio Valve Co., Ltd., Pye Radio, Ltd., and Radio Instruments, Ltd.

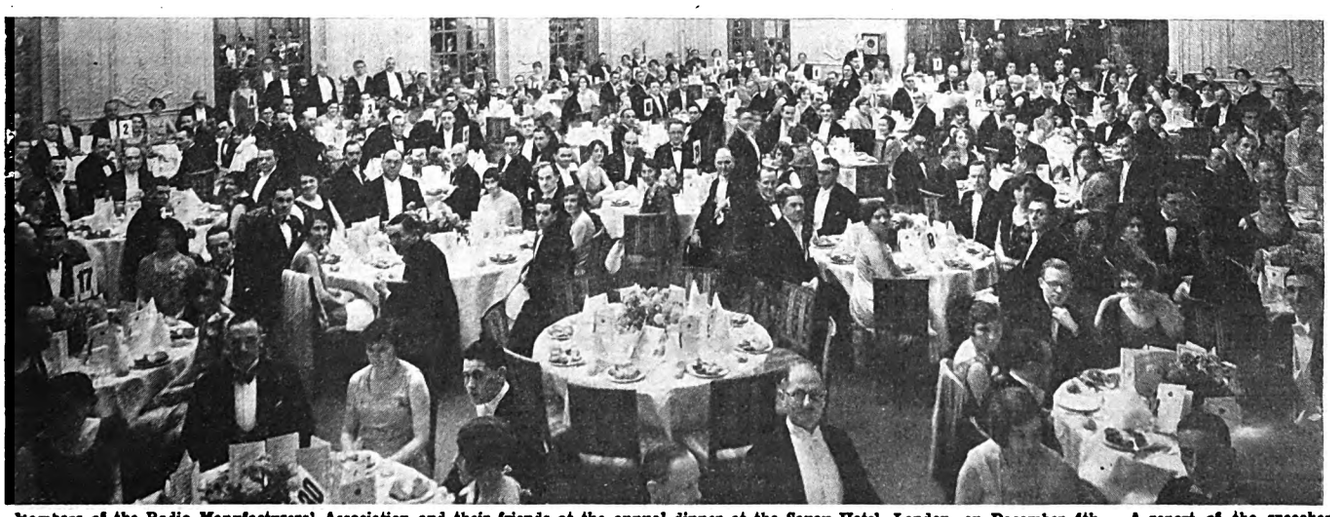
The annual report presented at the meeting stated that as was the case last year, outstanding among the matters dealt with during the year was the question of Marconi royalties.

A Difficult Problem.

At the time of the last annual general meeting, manufacturers as a whole, in accordance with the recommendation of the R.M.A., were working, for purposes of Royalty payments, on the terms of the award of the Comptroller-General of Patents on the "Brownie" application, namely, a royalty of 10 per cent. of the manufacturers' wholesale selling price —with a minimum charge of 5s. on the first valveholder and 2s. 6d. on each additional valveholder. It was then hoped that the appeal which had been lodged by the Marconi Co. against the Comptroller-General's decision would be heard at an early date and the whole position speedily stabilised. It was not until June, however, that the Marconi appeal came before Mr. Justice Luxmoore in the Chancery Division, when after a hearing judgment was given on June 18th allowing the appeal. In the serious position thus created, the R.M.A. Royalties Committee took immediate action. A preliminary and unofficial meeting between the Chairman of the Council and Mr. F. G. Kellaway, managing director of the Marconi Co., on June 20th, paved the way for the reception by Mr. Kellaway of a deputation from the R.M.A., the object of the deputation being to arrive at an amicable settlement—satisfactory alike to the licensor company and the trade—of the difficulties created by Mr. Justice Luxmoore's judgment.

Mr. Kellaway met the deputation in a spirit of accommodation, but discussion of the position speedily showed that no progress could be made towards the fixing of a mutually satisfactory royalty scale until certain information relative to royalty returns was before the negotiating parties. It was agreed, therefore, that a joint investigation of certain matters be immediately carried out, Mr. Kellaway consenting to stay for one month proceedings under any legal action already instituted for the recovery of the difference between 12s. 6d. per valveholder (to which the Marconi Co. were entitled under Mr. Justice Luxmoore's judgment) and the amount payable on the Brownie basis, and to defer, for a like period, the demand for payment of such difference. Further, in regard to arrears of royalty fees due from licensees as a result of the decision, Mr. Kellaway agreed, in the event of the negotiations reaching a satisfactory conclusion, to recommend to his board that the scale of royalty as thereby fixed should be operative as from August 28th, 1928, the date of the award given by the Comptroller-General of Patents. Upon the conclusion of this joint investigation, which occupied just over a fortnight, negotiations with Mr. Kellaway were at once resumed and, as a result, a basis of agreement was come to at a meeting held on July 19th, at which the R.M.A., the Marconi Co. and the Gramophone Co. were present.

At the meeting at which this basis of agreement was arrived at, it was also arranged that the R.M.A. would call a



Members of the Radio Manufacturers' Association and their friends at the annual dinner at the Savoy Hotel, London, on December 4th. A report of the speeches and of the annual general meeting, held next day, are given above.

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general meeting of radio manufacturers and would there recommend to members the acceptance of the terms for a new licence.

This general meeting was accordingly held on July 24th, in the Grand Hall of the Hotel Cecil, and was attended by some 150 manufacturers and by representatives of the Press. At such meeting, whilst the terms of the agreement met with general satisfaction, exception was taken to certain items, notably the granting to the Marconi Co. (and the Gramophone Co.) of the free use of licensees' patents, and the probable inclusion of loud speaker patents in the agreement. Following the holding of this meeting the preparation of a new licence on the conditions agreed upon has been the subject of negotiation between the Marconi Co. and the R.M.A., and this has taken more time than was at first anticipated, so that the date of August 24th, originally named as the date by which applications for the new licence should be received by the Marconi Co., has had to be modified. The interim period was, however, well spent, as the continued negotiations resulted in the conclusion of a licence more favourable to manufacturers than that first offered by the Marconi Co.

The National Radio Exhibition.

The National Radio Exhibition, organised by the Association, and held in the New Hall, Olympia, from September 23rd to October 3rd, was open for ten days instead of the usual seven days. During the run of the show, the total paid attendance was 140 627 as against 123 531 during the seven days in 1928, 99 315 in 1927, and 116 570 in 1926, the exhibition being open on this last-named occasion for 13 days. Additional space this year permitted of the erection of 286 stands as against 264 in 1928, and 229 in 1927. It was a triumph for the Exhibitions Committee that they were able to arrange for the Prime Minister, the Rt. Hon. J. Ramsay MacDonald, to "introduce" the Exhibition in a talk from "Chequers" on September 21st, prior to the opening on the 23rd. Of the 185 exhibitors 113 were members of the Association, whereas last year the members numbered 83 out of a toal of 181. The net surplus on the Exhibition amounted to over £6 305.

As last year, the R.M.A., through its Exhibitions Committee, co-operated with Provincial Exhibitions, Ltd., and the Manchester "Evening Chronicle," in the organisation of the Manchester Radio Exhibition, held in the City Hall, Manchester, from October 16th to 26th, the net surplus of which, so far as the Association was concerned, amounted to £200 approximately.

In view of representations made by members at the time of the Ideal Home Exhibition held at Olympia last Spring, the Council has rented from the Organisers of the Exhibition a space occupying practically the whole of the side of the Gallery of the Main Hall to the right of the Main Entrance, sufficient to provide some 7 000 square feet stand area. At the time of preparing this Report detailed proposals for the lay-out of this wireless section of the exhibition are being worked out by the Exhibitions Organiser and the Exhibitions Committee.

The difficulty of securing a suitable tenancy for the organisation of a radio exhibition in Glasgow has, so far, remained insuperable, but there is now some reason to hope that during 1931 this project, long contemplated by the Association, will materialise.

Co-operation with B.R.V.M.A.

Events during the past year (such as the adoption by the B.R.V.M.A. of the Continental standards for a.c. valve caps without first ascertaining the views of set-makers on the proposals) led to the conclusion that, in order to achieve real effective co-operation between the two Associations, joint liaison meetings must be held at known and regular intervals. This being realised by the B.R.V.M.A., a properly constituted B.R.V.M.A. and R.M.A. Liaison Committee has now been set up consisting of five R.M.A. and four B.R.V.M.A. representatives, such Committee meeting regularly once a month, unless it is found that there is no agenda to discuss. By this means it is hoped that the two Associations will in future work in closer harmony than has been the case in the past.

Throughout the year the Association has continued its membership of the Radio Trade Committee on Broadcasting, where matters of importance to the radio industry have received consideration, and has continued to act in conjunction with the B.E.S.A. in standardising matters affecting the radio industry.

Evidence of the increasing esteem in which the R.M.A. is held among outside bodies is afforded by the fact that an invitation was extended to the Association to assist in the making of arrangements for the celebration of the Faraday Centenary by the Royal Institution in 1931. The Royal Institution asked the Institution of Electrical Engineers, in consultation with other interested bodies, to consider in what way the technical applications of Faraday's discovery of electro-magnetic induction could best be celebrated, and the I.E.E. invited the R.M.A. to appoint a representative to attend a Conference on this subject. The Council appointed its Chairman, Mr. J. T. Mould, to attend the Conference on its behalf and, at this Conference, Mr. Mould was elected to serve on a Committee appointed to proceed further with the arrangements for the Centenary Celebration.

At a meeting, attended by representatives of the B.R.V.M.A., the R.W.F., the W.R.A., the wireless Press, and the R.M.A., the question of the establishment of a Radio Trades Benevolent Fund was discussed and the general feeling was that, in a matter of this kind, it was essential that resources should be as large as possible, that the number of similar institutions was already too large, and that the radio industry should be covered by the Electrical Trades Benevolent Institution.

It was stated in the last annual report that the R.M.A. had lodged with the Board of Trade an application for an Order under the Merchandise Marks Act, 1926, for the marking of imported radio apparatus with the country of origin (on importation, or alternatively, on sale or exposure for sale in this country). The inquiry for the hearing of this application was finally fixed for September 30th and following days. In view of this date clashing with the National Radio Exhibition at Olympia it was feared that the delegated R.M.A. witnesses would be unable to spend the requisite time away from their stands at the show. Application was made, therefore, for another date, but the day of the hearing having already been published by the Board of Trade, the latter were disinclined to agree. For that reason it was decided to withdraw the application for the time being on the understanding that it might be renewed at a later date. A further consideration influencing such decision was the question, raised since the making of the application, as to how far the provisions of the Merchandise Marks Act make it obligatory on manufacturers when including any foreign apparatus in their sets to announce such fact in their advertisements and catalogues.

Progress in Brief.

Membership of the Association continues to increase and whereas at the date of the issue of the last annual report the membership roll contained the names of 101 firms, the present total is 152. A brief summary of the other work of the Association during the year under review is as follows:—(1) Through the medium of the Radio Trade Committee on Broadcasting, the B.B.C., the B.R.V.M.A. and the R.M.A. have drawn up a scheme of co-operation to assist educational organisations in obtaining and maintaining radio apparatus for the reception of educational programmes. Such scheme is now awaiting the sanction of the National Councils for Educational Broadcasting; (2) The drafting of a pamphlet on power supply to broadcast receivers has engaged the attention of the R.T.C.B., and such pamphlet is now nearing completion; (3) Action taken by the R.T.C.B. resulted in the satisfactory modification of a proposal by the Post Office to print on the back of wireless licences an instruction that all mains apparatus must conform with the Wiring Rules of the I.E.E.; (4) As a result of action taken by the R.M.A. Technical Committee, a proposed revision of the I.E.E. Regulations for radio apparatus connected to supply mains has been postponed; (5) The association has co-operated with the I.E.E. in the drawing up of a schedule of wireless waves of standard frequencies to be transmitted from the National Physical Laboratory; (6) Steps have been taken to determine the legal position of electricity supply authorities in regard to the replacement of radio equipment connected to their mains when changing over from d.c. to a.c. supply; (7) Modification of the wavelength changes of B.B.C. stations proposed under the Prague plan was secured by the association.

During the course of the meeting it was suggested that the Association should make some arrangement with the B.B.C. for advertising, well in advance, any special items in future programmes. Mr. Mould pointed out that this was already receiving the attention of the Council.

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NEWS IN BRIEF.

Societies' Arrangements—Activities of Electrical Association for Women—York School Lighting—Physical and Opitical Societies' Exhibition.

BLACKBURN Corporation has decided to pay £75 4s. as compensation for damage done to crops on farms adjoining the Whitebirk electricity works.

About 2 000 telephone lines in the London area were damaged by the gales last week, and more than 200 trunk circuits were affected. Cork and other towns in Southern Ireland were completely cut off.

At a meeting of the Institution of Engineering Inspection at the Royal Society of Arts to-day (December 13th), Capt. B. H. Peter, general manager of the Westinghouse Brake and Saxby Signal Co., Ltd., will read a paper on "The Trend of Development in Railway Signalling."

Plymouth Works Committee has accepted the offer of the Transport Department for a battery for an electrically propelled vehicle, at £220.

A successful dance and whist drive was held by the Bristol and District Branch of the Electrical Association for Women at Fortt's Restaurant, Bristol, at which there was an attendance of 120 members and friends.

Leeds Baths Committee has asked the Baths Superintendent to make inquiries with respect to the installation of an electric motor to drive the filtration plant at Hunslet Baths, in substitution for the existing steam pump.

It has been reported to York Education Committee that of the 18 non-provided schools in the city, electric lighting has been installed in 13, and the Committee has decided to urge the managers of the five remaining schools to change over from gas to electricity as soon as possible.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN, *dated December 13th :—*

Messrs. Siemens were lighting "by means of three of their 6 000 candle machines, the shops of some enterprising Woolwich tradesmen."

It was recalled that Jean Paul Marat, one of the most prominent characters of the first French Revolution, wrote several important books on electricity.

Mr. Gladstone addressed a meeting in the Corn Exchange, Edinburgh, and his speech was telephonically relayed to an audience in a neighbouring hall.

* * *

TWENTY-FIVE years ago it was stated in THE ELECTRICIAN, *dated December 16th, 1904:—*

The newly-electrified Metropolitan Railway was opened.

That Mr. Justus Eck appealed for contributions to "a benevolent fund now in process of being organised for the electrical industry."

A succession of short-circuits, fires and explosions in the Bradford network deprived domestic consumers of a supply for a whole day.

The next meeting of the Institution of Electrical Engineers North Midland Students' Section will be held at the Technical College, Huddersfield, on December 17th at 7 p.m., when a paper on "Power Transformers" will be read by Mr. I. H. Hedley.

The Electrical Power Engineers' Association (Manchester Technical Group) has arranged for a lecture on December 18th, by Mr. H. L. Guy, on "Developments in Power Station Condensing Plant," at the Geographical Hall, St. Mary's Parsonage, Deansgate, Manchester.

The series of evening lectures by Mr. H. Bourne, of the Hendon Electric Supply Co., under the auspices of the Electrical Association for Women, are proving very popular amongst women demonstrators and domestic science teachers.

The Board of Trade Standing Committee under the Merchandise Marks Act will hold inquiries at the Board of Trade Offices, London, on dates to be announced later, as to whether imported dynamos, starting motors, magnetic cut outs, dash board (instrument board) fittings, high-tension distributors ignition coils, magnetos, batteries and ignition plugs, should bear a mark of origin.

Sir William Bragg, in the course of his Huxley biennial lecture at Charing Cross Hospital Medical School, London, recently, dealt with the analysis of the structure of materials by means of X-rays. It was a new method, he said, and opened up a new direction of inquiry into the relations between the properties of matter, organic and inorganic, and the atoms and molecules of which it was composed.

H.M. Stationery Office has issued statutory Orders No. 1 015, containing regulations made by the Electricity Commissioners relating to the method to be adopted for ascertaining the cost of production of electricity at selected generating stations; and No. 1 016, containing regulations, also prescribed by the Commissioners, with regard to the adjustment of the price for a supply of electricity according to power factor. The price of each of these Orders is 1d.

A chimney stack at the works of the Llanelly and District Electric Lighting and Traction Co. fell on Sunday evening as a result of the gale. The damage done caused a stoppage of the supply of energy, but it was resumed the same evening.

A meeting of the Overhead Lines' Association will be held at the Institution of Electrical Engineers on December 18th, at 5.30 p.m., when a discussion will be opened by Major Theodore Rich on "Some Continental and British Methods Compared."

Henley's Dramatic Club will present "The Skin Game" at the Cripplegate Theatre, Golden Lane, London, E.6, on December 16th, at 8 p.m. The charges for seats (all numbered and reserved) are from 3s. 6d. to 1s. 2d., and tickets can be obtained from Mr. W. G. Turner, at the company's offices, 11, Holborn Viaduct, London, E.C.1.

The Borough Electrical Engineer of Wimbledon has made arrangements for a showroom and demonstration room at 32, Hill Road, for two months, for daily demonstrations of electrical apparatus.

On the suggestion of the chairman, Eastbourne Electricity Committee has decided that the cost of the work of improving the lighting arrangements of the church schools in the borough shall be spread over a period of from three to four years.

Mr. E. E. Sharp recently lectured, at a meeting of the Electrical Association for Women, on some of his electrical experiences in Australia and New Zealand. He gave information regarding domestic electrical equipment in those countries, and the efforts of certain supply undertakings to provide, by means of electricity, a supply of hot water as nearly as possible comparable to the thermal springs in parts of New Zealand.

The Association of Provincial Electricity Undertakings has appointed Sir John Keane as arbitrator in accordance with the agreement made with the I.F.S. Electricity Supply Board regarding arbitration in cases of dispute in connection with the purchase price of undertakings by the Board. The Board has also to nominate an arbitrator.

With reference to recent statements which have appeared in the Press regarding the discovery, by Mr. T. A. Edison, of a process of making synthetic rubber from a weed called "golden rod," Mr. Edison denies the statement that golden rod rubber can be made at a cost of about 8d. a pound. The most he can promise to date is the production of synthetic rubber at a high price in case of war.

The 20th annual exhibition of the Physical and Optical Societies is to be held on January 7th, 8th, and 9th, at the Imperial College of Science, London. Over 80 firms intend exhibiting in the Trade Section, and in addition a group of research and experimental exhibits will be shown by Fellows of the societies and others, and a number of research laboratories and other institutions. Some interesting historical exhibits will also be included.

A paper by Mr. F. Forrest, chief assistant engineer of Birmingham electric supply department, was read to the Birmingham and Midlands branch of the Electrical Association for Women recently. Mr. Forrest, who visited America last year, stated in his paper that amongst the causes of the greater consumption of electricity in America were the more extreme climatic conditions in that country, low tariffs framed to stimulate long-hour use, low cost of lamps and other apparatus, and strong selling organisation. An ordinary 40 W lamp which cost 2s. 4d. in this country could be purchased anywhere in the States for 11d.

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PERSONAL.

THE Marconi International Marine Communication Co., Ltd., announces that Mr. James O'Beirn has been appointed a director of that company.

Mr. H. W. Millatt, showroom manager of Chester electricity department, has been appointed sales manager of the Bedford undertaking, at a salary of £400 per annum.

Estate of the gross value of £47 587, with net personalty £47 307, was left by the late Mr. John Charles, Dwaffyd, Bridlington, Jones, formerly electrician-in-chief to the Eastern Telegraph Co., at Singapore.

Mr. H. Mozley, manager of Burnley electric tramways and omnibuses department, is retiring next March, after 29 years' service. He is to receive an illuminated address recording appreciation of his long and faithful duties.

Sir William McLintock has, the Minister of Transport states, been engaged to advise the Government in the London traffic problem. It will be remembered that Sir William took a prominent part in the cable and wireless merger.

The recommendation that Mr. S. M. Hill be appointed station superintendent at Portishead has been approved. Our reference last week to Bath Electricity Committee in connection with the appointment should, of course, have read Bristol.

L.C.C. Highways Committee recommends the appointment of Mr. John Hampden Parker, borough electrical engineer and transport manager of West Hartlepool, as electrical engineer in the tramways department at a commencing salary of £1 700 a year, rising to £1 900. See page 751.

Mr. Henry Young, late assistant secretary of the Royal Institution, has been presented with a silver rose bowl and cheque on his retirement after 50 years' service in the Institution. The presentation was made on December 2nd by Sir James Crichton-Browne on behalf of the members.

Barnes U.D.C. has received the resignation of Mr. G. C. Law, assistant electrical engineer, who has been appointed deputy electrical engineer and manager by Hammersmith (London) Borough Council. The Council decided that the thanks of the Council for Mr. Law's past services be recorded on vellum and sealed.

Following the resignation of Mr. H. W. Laing, tramways manager at Lytham St. Annes after 23 years' service, several departmental heads are passing into retirement shortly. These include Mr. J. Partington, rolling stock superintendent, with 27 years' service, and Mr. P. Partington, tramways electrical engineer, with 26 years' service.

Mr. William Beavis, manager of the Newhaven and Seaford Electricity Co.'s works at Newhaven, received a telephone call at his residence at Seaford early on Saturday and immediately left his home for the works in his car. He has not been seen since, and fragments of the car have been found in such a position as to lead to the conclusion that Mr. Beavis was blown into the sea during the gale which was raging at the time.

The appointment of Mr. Frank Forrest as successor to Mr. R. A. Chattock, city electrical engineer of the Birmingham electric supply department for a period of twenty-six years, who will retire in January, has been approved by the Corporation. The Electric Supply Committee has approved a report placing on record appreciation of Mr. Chattock's work. Mr. E. J. Jennings has been secretary to the department for the past twelve years, and Mr. Chattock's impending retirement has been taken as a fitting opportunity of altering the title of his office to that of "Secretary and Commercial Manager," the city electrical engineer continuing to be responsible for the whole of the engineering side of the department, both generation and distribution. See page 751.

Obituary.

SIR ROBERT ASHTON LISTER, on December 6th, aged 84 years, founder and chairman of R. A. Lister and Co., Ltd.

MR. WILLIAM RICHARD BOWER, on November 20th. He was for over 30 years head of the physics and electrical engineering department at the Huddersfield Technical College. He retired at the end of 1926.

MR. CHARLES ALBERT BLASCHECK, on November 26th, aged 55 years. He had been chief engineer of the Canterbury Corporation electricity department since 1902. He came to Canterbury from Norwich, where he had been chief assistant electrical engineer, and prior to that he had been with the St. James's and Pall Mall Electric Light Co., London. See page 751.

IN PARLIAMENT.

House of Lords Committee Rejects Grampian Electricity Bill as a Whole.

DURING last week, in the course of further consideration by a House of Lords Committee of the Grampian Electricity Company's Bill, Mr. A. D. Phillips, formerly electrical engineer and manager of the Fife Electric Power Co., explained the factors which made it necessary to charge higher prices in a scattered area than in a thickly populated town.

Mr. Arthur Collins gave evidence in support of the proposal for relief of part of the undertaking from valuation for rating.

Mr. J. Keith, K.C., addressing the Commttee on behalf of the local authorities who objected to the concession in the matter of rating, said if the water scheme could produce electricity cheaper than a steam power scheme there was no justification for subsidising it.

Sir John Snell, chairman of the Electricity Commissioners, said he had been in consultation with Sir Andrew Duncan, chairman of the Central Electricity Board, and they welcomed the scheme.

Evidence in opposition to the scheme was given by representatives of Stirling County Council and Inverness Town Council.

The Committee decided that no part of the Bill should proceed, but stated that this decision did not prejudice in any way any application for a Special Order for the extension of the present area, which might be made to the Electricity Commissioners, and, of course, did not prejudice any decision the Commissioners might see fit to arrive at.

Tyneside Tramways and Tramroads.

The Tyneside Tramways and Tramroad Co.'s Bill, in which the Company seeks authority to abandon its tramways and substitute motor omnibuses, has again been before a Select Committee of the House of Commons.

Mr. J. H. Thorpe, for the Wallsend Corporation, whose area is on the route from Newcastle to Tynemouth and Shields, announced that an agreement had been reached on certain conditions. The Corporation, therefore, withdrew its opposition.

Mr. Craig Henderson, K.C., addressed the Committee on behalf of the Tynemouth and District Electric Traction Co., Ltd., in opposition. He said the draft agreement between Newcastle Corporation and the promoters was in violation of an agreement between the Tynemouth and the Tyneside companies, and was to the prejudice of the former company. He suggested that a local inquiry should be held into the whole question.

A clause for the protection of Northumberland County Council in respect of the maintenance of the Gosforth tramways having been agreed to, the opposition of the County Council was withdrawn.

Mr. Tyldesley Jones, K.C., for United Automobile Services, Ltd., opposed any protection for the promoters if they ran on any other than their existing east to west route.

The committee found the preamble proved, and decided that the agreement between the company and the Corporation be scheduled to the Bill. They decided to allow extensions of the company's system up to 8 miles in Northumberland, such extensions to be subject to the consent of local authorities and the Ministry of Transport.

Replies to Questions.

The average number of persons per telephone in Great Britain (excluding Northern Ireland) at September 30th last was 24, and in Northern Ireland 56.

The total number of paid words in press and news messages transmitted by the Post Office wireless telegraph station at Rugby during the 12 months ended November 23rd, 1929, was 2 663 250.

The Postmaster-General is aware of the deficit on the telegraph account of the Post Office. An increase in the Press tariff would require legislation, which he is not at present prepared to initiate.

The £750 000 programme of special telephone development will, it is estimated, employ about 2 200 men and women for 12 months. The Postmaster-General hopes to be able to announce a corresponding acceleration of programme for next year.

The Postmaster-General is always willing to make the best arrangements practicable for diverting to underground, or to

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another route, overhead telegraph and telephone wires in the vicinity of aerodromes, provided the owners of the aerodromes will bear the expense.

The number of new private telephones installed during the year ended September 30th, 1929, was 267 480 and deducting 144 071 given up, the net growth was 123 409. Residence telephones installed during the year was 90 032, the net growth being 50 428.

The Electricity Commissioners in a circular recently issued have urged all electricity undertakings to accelerate their expenditure on development so as to provide increased work in the next two years. The Central Electricity Board has also been requested to continue to press on with all possible speed with its constructional work.

It is the desire of the Minister of Transport that cheap and efficient services of electrical power and transport should be provided as far as possible in rural areas. Over 70 per cent. of the rural population is at present included within areas with an authorised supply of electricity, and applications in respect of a considerable proportion of the remaining area are pending.

No proposals have yet been submitted to the Government by the railway company for the construction of an electric railway from Liverpool Street, via Bethnal Green to Leytonstone and Waltham Cross and to Ilford and Hainault Forest. The Minister of Transport has already drawn the attention of the railway company to the necessity and desirability of these schemes.

In accordance with the provisions of the Telegraph Acts the consent of the local authority is sought before any overhead line is placed by the Post Office in any public road under its jurisdiction, and consultation, if necessary, follows. Due regard is paid to the question of amenities in framing applications for such consents and the lines are laid underground whenever this can be justified financially.

Northern Ireland Parliament.

In the Northern Ireland House of Commons last week, Mr. Milne Barbour, Minister of Commerce, said his attention had been called to resolutions by Londonderry and Tyrone Agricultural Committees and Tyrone County Council in favour of extended telephone services. He would point out that the terms upon which the Postmaster-General was prepared to provide telephone facilities in any particular district were the same as those obtaining in any corresponding district in England, Scotland or Wales. In these circumstances he did not feel that he should be justified in making representations to the Imperial Government for an extension of the scheme. Since April last 103 telephone call offices were being installed at rural post offices and rural railway stations situate within two miles of an existing telephone exchange.

Replying to Mr. Healy in the Northern House of Commons last week, Mr. Milne Barbour, Minister of Commerce, said a commencement had been made towards a scheme for the provision of an electricity supply on comprehensive lines in the Lagan Valley area by the construction of a high-tension main transmission line between Belfast and Lisburn. A beginning had also been made in the development of an electricity supply in North Down, where a high-tension transmission line was nearing completion, connecting Belfast with Holywood and Bangor. In the autumn Session of last year Parliament conferred powers on the Antrim Electricity Supply Co. to supply throughout the greater part of county Antrim and part of county Londonderry. That company was now proceeding with the first stage of the scheme by constructing a main transmission line from Larne to Ballymena and Randalstown. Any scheme of comprehensive development in Northern Ireland in the near future would involve the most use being made of the efficient generating station in Belfast.

THE SOCIAL SIDE.

A reunion dinner of ex-editors, advertising managers and staff of THE ELECTRICIAN was held on December 6th in the Knight's Room, Simpson's-in-the-Strand, London. Mr. W. G. A. Bond, resident director of the Shropshire Worcestershire and Staffordshire Electric Power Co., who was editor from 1895–1897, was in the chair. Reminiscences of the early days of the electrical industry, and of the journal which has been so closely associated with its development, were exchanged by Messrs. F. C. Raphael, W. E. Warrilow, F. H. Masters, and the Chairman, who incidentally recalled that THE ELECTRICIAN was the first periodical to be printed by the Monotype method.

BUSINESS ITEMS.

MOSSES AND MITCHELL, LTD., announce that, after having been established at 122–124, Golden Lane, London, E.C.1, for over 20 years, they have now removed to Chiswell Works, 60–64, Ironmonger Row, Old Street, E.C.1.

THE "Marconi" wireless telephone set of the new Dover lifeboat which, with its two 375 H.P. engines, is the fastest lifeboat in the world, and has been specially designed for the rescue of aeroplanes which have fallen into the sea.

All the aircraft taking part in the official opening of the Heston Air Park School, Brancknar, Middlesex, were fitted with radio equipment manufactured by ALFRED GRAHAM AND CO., LTD., Slough. The equipment selected for the light aeroplanes was Type G.A. 6, which consists of a receiving set of light weight and compact dimensions, and can be accommodated on the dashboard. The valves employed in the set are two Mullard P.M. 14, one P.M. 3A and one P.M.4.

The ELECTRIC FURNACE CO., LTD., of 17, Victoria Street, London, S.W., has formed and will be the sole proprietors of a subsidiary company, the ELECTRIC RESISTANCE FURNACE CO., LTD., to deal with electric resistance furnaces for industrial purposes. The new company will handle all installations of "Efco" resistance furnaces and stoves, and the benefits of patents and agreements for exchange of technical information and drawings with foreign countries, in so far as they apply to resistance furnaces, will be transferred from the Electric Furnace Co., Ltd. The latter will continue to supply electric melting furnaces of all kinds, such as the Héroult, Ajax-Wyatt and Ajax-Northrup furnaces, and contracts for complete metallurgical and electrical installations.

In connection with the "Exide Fortnight" limerick and window display competition which was held from October 7th to 19th, the first prize of £50 was awarded to Hattersley Bros., 346, Idle Road, Bradford. The winners of the second prize, of £25, were J. & C. Colbourne and Sons, of 179a, Dudley Road, Wolverhampton; and the winners of the third prize, of £10, Francis W. Harris and Co., Ltd., of High Street, Leek. Prizes of £5, £3 and £2 respectively were awarded to the window dressers of the first, second and third prize displays. Prizes of £5 each were awarded to twenty-five other competitors. These were Clifford and Co., Sidcup; D. J. Tredan, St. Helier, Jersey; the General Electrical Co., Ltd., Glasgow; Motor Mac's, Ltd., Bournemouth; James Scott and Co., Perth; V. Buckland, Derby; R. Darbyshire, Ltd., Blackpool; Jones Garage, Ltd., Lichfield; Morgan Bros., Swansea; Mann, Egerton and Co., Ltd., Norwich; Tamplin and Makovski, Ltd., Reigate; Castlehouse-Vasey and Co., Ltd., Scarborough; Leonard Bradbury, Droylsden, Manchester; Milne and Russell, Ltd., South Croydon; W. Rowntree and Sons, Ltd., Scarborough; Baglan Auto Electrical Co., Briton Ferry; W. H. Johnson and Sons, Ltd., King's Lynn; J. Blake and Co., Ltd., Liverpool; George Box, Ltd., Batley; the Chelston Electrical Works, Torquay; the Western Radio, Plymouth; Eric Thompson, Thirsk; Rossleigh, Ltd., Stirling; Moore of Brighton, Ltd., Weybridge; Smith and Bellhouse, Wolverhampton. See page 751.

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E.T.B.I. COMPETITION.

Full List of Prizes and Chief Prize Winners in Cable Competition.

WE have received from the organisers of the Cable Competition, held in connection with the Electrical Trades Benevolent Institution, the final list of prizes and the chief prize winners. The solution to the competition was published in THE ELECTRICIAN of October 11th and we give below the names of some of the successful competitors :—

Prize (1) Portable " Gecophone Screen-Grid 4 " wireless set presented by the General Electric Co., Ltd., and won by G. J. Steer, Esq., 2, Carlton Crescent, Luton, Beds ; (2) 1-3 stage wireless set complete with valves, presented by the British Thomson-Houston Co., Ltd., won by Mrs. N. Baker, 13, Hemberton Road, Stockwell, S.W.9 ; (3) " Cosyglo " electric coal fire, presented by Siemens Electric Lamps and Supplies, Ltd., Mr. N. W. Riley, 34, Daventry Road, Manchester ; (4) 1-2 stage wireless set complete with valves, presented by the British Thomson-Houston Co., Ltd., Miss M. Savage, 36, Burleigh Avenue, Wallington, Surrey ; (5) " Arora " electric fire, presented by the Arora Co., Miss Jones, 4, Kenton Avenue, Harrow, Middlesex ; (6) " Ensign " tropical No. 12 camera in hide case with f/4.5. Aldis-Butcher lens, presented by Houghton-Butcher (Great Britain), Ltd., Mr. D. K. B. McGregor, 40, Aldbury Avenue, Wembley, Middlesex ; (7) wooden floor standard and shade, presented by Messrs. Young and Wildsmith, Miss H. M. David, 18, Conway Road, Cardiff ; (8) " Ediswan " electric radiator, presented by the Edison Swan Electric Co., Ltd., Mr. W. H. Tranmer, 15, Warwick Road, Reading ; (9) " Bandy " 10 in. desk and bracket fan, presented by Berkeley and Young, Ltd., Mr. P. M. Plucknett, 41, Wood Vale, London, N.10 ; (10) " Mullard " " H " type loud speaker, presented by the Mullard Wireless Service Co., Ltd., Mr. H. J. Yarwood, 14, Wake Green Road, Moseley, Birmingham.

The pewter rose bowl presented by Mr. Justus Eck, for selling the winning ticket was won by Mr. L. E. F. Baenziger, " Aros," Sandpit Lane, St. Albans, Herts.

Other Prizes and Donors.

Others prizes included :—" Ensign " folding all-distance camera, by the Houghton-Butcher Manufacturing Co., Ltd. ; real " Noritake " table standard with 14 in. dia. double silk, hand-painted shade, by L. G. Hawkins and Co., Ltd. ; " Amplion " standard cabinet cone loud speaker (A.C. 25), by Graham Amplion, Ltd. ; electrical goods to value of £3 3s., by Cryselco, Ltd. ; " Universal " chromium-plated toaster, by L. G. Hawkins and Co., Ltd. ; " Venner " silver grill, by Venner Time Switches, Ltd. ; " Mullard " high-tension units, by the Mullard Wireless Service Co., Ltd. ; " Ferranti " valve tester, by Ferranti, Ltd. ; " Neon " sign for any name of 12 letters, by Messrs. Marryat and Place ; " Ediswan " electric iron, by the Edison Swan Electric Co., Ltd. ; " Premier " accident-proof electric kettle, by Premier Electric Heaters, Ltd. ; " Berry's " electric coffee percolator, by Berry's Electric (1928), Ltd. ; " Xcel " nickel-plated safety kettle, by Siemens Electric Lamps and Supplies, Ltd. ; " Inventum " 1½ gallons electric cistern, by Drake and Gorham Wholesale, Ltd. ; " Philips " loud speakers, by Philips Lamps, Ltd. ; electric radiator, by Mr. J. Fotheringham. ; " Artic " electro-velocity radiator, by Arctic Fuse and Electrical Manufacturing Co., Ltd. ; " Benjamin " products to the value of £3 3s., by the Benjamin Electric, Ltd. ; " B.T.H. C.2 " horn type loud speaker, by the British Thomson-Houston Co., Ltd., Cardiff ; " Goltone " radio products to the value of £3 3s., by Ward and Goldstone, Ltd. ; " Godwinex " h.t. eliminator, by J. Dyson and Co., Ltd. ; " Premier " Smoothwell " electric iron, by Premier Electric Heaters, Ltd. ; " Polar Claricone " loud speaker, by Wingrove and Rogers (Polar), Ltd. ; " Waterman's Ideal " fountain pens, by L. G. Sloan, Ltd. ; " Ediswan " electric toaster, by the Edison Swan Electric Co., Ltd. ; " Mullard " " C " type loud speakers, by the Mullard Wireless Service Co., Ltd. ; type 1-C2 loud speaker, by the British Thomson-Houston Co., Ltd. ; " Stuart " model dynamo, by Stuart Turner, Ltd. ; " Formo " radio components to the value of £2 2s., by the Formo (Arthur Preen) Co., Ltd. ; electric kettle, by the A.E.G. Electric Co., Ltd. ; mottled " Spot " fountain pen and rolled gold " Spot " pencil, by the Mentore Manufacturing Co., Ltd. ; " Day-Fan " cleaner, presented by S. G. Leach and Co., Ltd. ; 3 doz. " Duophone " new electrical process records by the Duophone and Unbreakable Record Co., Ltd. ; cone loud speaker by the British Thomson-Houston Co., Ltd. ; " Varley " radio components, by Varley (Oliver Pell Control, Ltd.) ; " Rothman " greywood cabinet of " Pall Mall " virginia cigarettes, by Rothman's, Ltd. ; " Swan " No. 4 self-filling fountain pen with rolled gold clip, by " Swan " pens (Mabie Todd and Co., Ltd.) ; " Kunzle " 1½ lb. box of " Art Dessert " chocolates, by Messrs. Kunzle ; radio voltmeter, by the A.E.G. Electric Co., Ltd. ; electric heating pad, by the A.E.G. Electric Co., Ltd. ; " Durham-Duplex " razors, by Durham-Duplex Razor Co., Ltd. ; " Trojan " electric iron, by John Shaw and Sons, Wolverhampton, Ltd. ; " Player's " casket of medium navy cut cigarettes, by John Player and Sons ; domestic electric iron, by J. Gledson and Co. ; sets of tungsram barium valves, by the Tungsram Electric Lamp Works (Great Britain), Ltd. ; " Graham Farish " coupler complete with resistances, by Graham Farish, Ltd. ; " Brownie " crystal receivers, by the Brownie Wireless Co., Ltd.

ELECTRICAL RIFLEMEN.

Annual Dinner and Prize Giving of Electricity Supply Rifle League.

MEMBERS of the Electricity Supply Rifle League met on November 30th at the Talbot Restaurant, London, E.C., for their annual dinner and presentation of prizes. Mr. R. S. Downe (Brompton and Kensington) presided, and the 79 diners included Messrs. A. R. Bacon (County) and H. P. Gaze (Central) past Presidents, and Messrs. J. R. J. Bowden (Hackney), E. Harlow (City Co.), S. G. Nodes (Central), G. C. Weston (K. and K.), vice-presidents. Owing to the unfortunate absence of Mr. Pethard (S.M.R.C.), the toast of the League was taken as read and the Hon. Secretary had a few remarks to make as to the activities of the League during the past season. Mr. Harlow (City Co.) in a racy speech proposed " The President " (Mr. R. S. Downe) and commented on the fact that although he was President of the League, the club run by his undertaking had not been able to fire a single shot because it had not got a range.

The following were the prize winners :—CHAMPIONSHIP, 1ST DIVISION.—Central A, Shield, and silver medals to Messrs. A. J. Beale, H. P. Gaze, E. E. Lee, J. W. Lyons, A. E. Northrop, W. Pearce, F. Smith, W. G. Wright and W. C. Young (captain). CHAMPIONSHIP, 2ND DIVISION.—St. James, Shield, and silver medals to Messrs. H. P. Liddell (captain), C. J. Johnson, C. P. Fox, H. J. Clark, F. O. Andrews, E. L. Rigby, R. D. F. Powell, and G. A. Wilshire. The S.M.R.C. SILVER MEDAL for the best average in League matches, was awarded to Mr. S. Thomas (Shoreditch) with 97·85. The winners in the Knock-Out Competition (teams of three) were Central, comprising Messrs. Watkins, White and Wright ; St. James, with Messrs. Fox, Rigby and Clark, were runners up.

Possibles were registered during the season by Messrs. S. Thomas (Shoreditch), S. Driver, J. Crouchman and W. H. Baines (City Co.). The highest score during the season was :—Division 1 : Central A and City A, 586 ; and Division 2 : St. James, 580. The best average was : Division 1 : Central A, 582·57 ; and Division 2 : St. James, 571·71.

Final Results.

Owing to range difficulties it was not possible to complete all the matches and the final table of results was as follows :—

DIVISION 1.

	Shot.	Won	Lost	Scores. For	Against	Points
City A	8	7	1	4 640	4 022	14
Central A	8	7	1	4 078	4 027	14
City B	8	4	4	4 602	4 040	8
Shoreditch A ..	8	2	6	4 022	4 047	4
County A	8	0	8	2 276	3 482	0

B. and K. did not compete.

DIVISION 2.

	Shot	Won	Lost	Drawn	Scores. For	Against	Points
St. James ..	14	12	1	1	8 004	7 655	25
Greenwich ..	14	11	3	0	7 912	7 140	22
City C ..	14	10	3	1	7 929	7 144	21
Central B ..	13	8	5	0	7 376	7 172	16
K. and K. ..	12	4	8	0	5 037	6 683	8
Hackney ..	14	4	10	0	7 189	5 634	8
Shoreditch B	12	2	10	0	5 969	6 102	4
Barking ..	11	0	11	0	4 250	6 136	0

In the tie shoot for the championship of Division 1, Central A were successful.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

DUNDEE CORPORATION.—Electric lighting work in connection with additions and alterations at Lilybank Day Nursery. Further particulars from the City Engineer.

FORFARSHIRE INFIRMARY.—Supply of two sunray lamps, suitable for the Grampian scheme energy of 240 V. Further particulars from Messrs. Machardy and Whyte, joint secretaries, Forfar.

WREXHAM RURAL DISTRICT COUNCIL.—Electric light wiring of 160 houses to be erected on various sites. Specifications, etc., from the engineer, Mr. J. H. Edwards, Imperial Buildings, Wrexham; deposit £10.

BELFAST EDUCATION COMMITTEE, December 13th.—Electric lighting installation at North Road P.E. School. Specification from the Education Architect, Victoria Street, Belfast; deposit £1 1s.

Tower Ladder Vehicles.

MANCHESTER CORPORATION, December 13th.—Supply of electrically-propelled tower ladder vehicles. Specification, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

EDINBURGH CORPORATION, December 14th.—Supply of 25 air-brake equipments, suitable for electric tramcars. Specification, etc., from the Transport Manager, 2, St. James's Square, Edinburgh.

GLAMORGAN COUNTY COUNCIL, December 16th.—Electric lighting installation at Hensol Castle, near Pontyclun. Specification from the Clerk of the County Council, County Hall, Cardiff, or at Hensol Castle.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., December 17th.—Rewiring for electric lighting at the Patent Office and the Public Record Office, London, W.C. Specification from the Contracts Branch, King Charles Street, S.W.1; deposit £1 1s. in each case.

MANCHESTER CORPORATION, December 17th.—Supply of copper bands for tramway rails. Specifications, etc., from the General Manager, Transport Department, 55, Piccadilly, Manchester.

GLASGOW EDUCATION AUTHORITY, December 18th.—Electric lighting and heating installations at South Carntyne Temporary School and Our Lady and St. Margaret's School Temporary Annexe. Specifications, etc., from the Education Offices (Property Department), 129, Bath Street, Glasgow; deposit £1 1s. per specification.

KIRKCALDY EDUCATION AUTHORITY, December 18th.—Electric and heating installations, in connection with extensions of St. Agatha's R.C. School, Methil, and Bell-Baxter School, Cupar. Schedules from Mr. E. Sandilands, Education Offices, Kirkcaldy; deposit £1 1s.

PORTSMOUTH GUARDIANS, December 18th.—Three months' supply of electric lamps and stores. Forms of tender, etc., from the clerk, Mr. W. E. Godfrey, 1, St. Michael's Road, Portsmouth.

WEST RIDING MENTAL HOSPITALS BOARD, December 18th.—Electric light wiring in connection with erection of a sanatorium at Wadsley Mental Hospital, near Sheffield. Specification, etc., from Mr. W. E. H. Burton, West Riding Mental Hospitals Board, Wakefield.

HULL CORPORATION, December 19th.—Supply of electricity meters (contract No. 148). Forms of tender, etc., from Mr. J. N. Waite, city electrical engineer, Electricity Works, Sculcoates Lane, Hull; deposit £2.

MILLOM URBAN DISTRICT COUNCIL, December 20th.—Haverigg extension scheme, comprising e.h.t. and l.t. cables, pillar box, etc. (section A); and e.h.t. and l.t. switchgear, transformers, etc. (section B). Specification, etc., from Mr. A. Lawrence, solicitor, clerk to the Council.

BARMING HEATH MENTAL HOSPITAL, December 21st.—Electrical installation for lighting, heating, etc. Specification, etc., from Mr. E. E. Hoadley, Corporation Electricity Works, Maidstone; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, December 21st.—Supply and erection of 132 000 V transformers in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.F.T.1) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

HALIFAX CORPORATION, December 21st.—Electrician's work in connection with erection of new Girls' High School at Craven Lodge. Names of intending contractors to be sent by December 21st to Mr. A. C. Tipple, borough engineer, Crossley Street, Halifax; deposit £2 2s.

WIRKSWORTH PARISH CHURCH, December 21st.—Electric light installation. Specification from Mr. T. H. Greatorex, The Birches, Cromford Road, Wirksworth; deposit £1 1s. Only members of the National Register of Electrical Installation Contractors are invited to tender.

LIVERPOOL CORPORATION, December 23rd.—Supply of 12 750 kVA, three-phase, 50 period, 6 600/400 V oil-cooled, step-down transformers. Tender form from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

METROPOLITAN ASYLUMS BOARD, January 2nd.—Replating 500 Ah battery at St. Luke's Hospital, Lowestoft. Specification, etc., from the office of the Board, Victoria Embankment, London, E.C.4.; deposit, £1.

METROPOLITAN ASYLUMS BOARD, January 2nd.—Alterations of electric lighting installation at South-Western Fever Hospital, London Road, Stockwell, London, S.W.9. Specifications, etc., from the office of the Board, Victoria Embankment, London, E.C.4; deposit, £1.

CENTRAL ELECTRICITY BOARD, January 6th.—Supply and erection of 132 kV overhead transmission lines (special crossings and high spans), in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.—P.L. 2) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

ISLINGTON (LONDON) GUARDIANS, January 9th.—Supply and erection of five full-automatic push-button electric lifts at the Infirmary, Highgate Hill, N.19. Specification, etc., from Mr. Albert King, Guardians' Offices, St. John's Road, Upper Holloway, N.19; deposit £2.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 17th.—One year's supply of cables, electricity meters, cable terminal and other boxes, switches, wires, lamps and sundries. Specification, etc., from the Town Clerk, Municipal Buildings, Upper Street, London, N.1.

CENTRAL ELECTRICITY BOARD, January 20th.—Supply and erection of 3·3 kV, 6·6 kV, and 11 kV switchgear, for connecting the Board's supply to undertakers' busbars. Specification (N.W.E.—G.S.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

METROPOLITAN WATER BOARD, January 21st.—Supply and erection of four steam turbines, with pumps, and two electric generators for Surbiton pumping station. Specification, etc., from the Chief Engineer (Room 173), 173, Rosebery Avenue, London, E.C.1; deposit £3 3s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

CHRISTIAN BROTHERS, TRALEE (CO. KERRY).—Wiring installation in new schools. Specification from Messrs. McEntee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £2 2s.

CHRISTCHURCH DRAINAGE BOARD, December 13th.—Supply and installation of four electrically-driven automatically-controlled pumping plants, each consisting of two horizontal centrifugal pumps with direct-coupled electric motor (contract No. 29/420); and two horizontal type, 3 H.P. a.c. motors direct-coupled with centrifugal sewage pumps (contract No. 29/421). (Reference A.X. 8 788.)

DUBLIN CORPORATION, December 14th.—Electric lighting and power installation at City Abattoir, North Circular Road, Dublin. Specification from the City Engineer, 28, Castle Street, Dublin, or Mr. F. McArdle, architect, 29, Rosemary Street, Belfast; deposit £3 3s.

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NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, December 16th.—Supply and erection of electrically-driven pumping plant, with ironwork, crane and gantries, for Junee water supply. (Reference A.X. 8 740.)

VICTORIAN ELECTRICITY COMMISSION, December 16th.—Oscillograph equipment. (Reference B.X. 5 692.)

MOROCCO POSTS AND TELEGRAPHS, December 17th.—Supply of two tons of 2 mm. copper wire and 75 tons of 2 mm. high conductivity copper wire.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Secondary batteries (schedule C. 505). (Reference B.X. 5 777.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Telephone fuses, heat coils and protectors (schedule C. 498). (Reference B.X. 5 784.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 17th.—Loading coil pots (schedule C. 499). (Reference B.X. 5 785.)

Accumulator Accessories.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY Co., December 20th.—Supply of (1) glass boxes for accumulators; (2) plates for accumulators, and (3) wood separators for accumulators. Specification, etc., from the secretary, Mr. S. G. S. Young, White Mansion, 91, Petty France, Westminster, S.W.1; on payment of £1 for No. 2 and 10s. each for Nos. 1 and 3 (not returnable).

IRISH FREE STATE PUBLIC WORKS DEPARTMENT, December 20th.—Electric lighting installation at Stationery Office, Beggar's Bush Barracks, Dublin. Specification, etc., from Mr. T. Cassedy, secretary, Office of Public Works, Dublin; deposit £1.

COPENHAGEN LIGHTING DEPARTMENT, December 21st.—Oil-cooled 10 000 kVA transformer, with pumps, motors and other accessories. (Reference B.X. 5 945.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 27th.—Telegraph material, including g.i. tubular arms, insulators, upper tubes for poles, etc. (tender No. 175). (Reference A.X. 8 734.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, December 28th.—Supply and erection at site of Mankabad Barracks of three Diesel engine driven electric generators, and sinking of two wells. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 4th.—Supply and erection at site of Meadi Barracks, Cairo, of two Diesel engines to drive existing generators. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

JOHANNESBURG MUNICIPALITY, January 4th.—Supply of automatic traffic signals (contract No. 305). (Reference B.X. 5 924.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 6th.—Supply and erection of plant for supply of filtered and unfiltered water, including pumps, electric motors, etc. (Reference A.X. 8 746.)

CAPE TOWN MUNICIPALITY, January 7th.—Supply of 3-core 11 000 V cable (specification No. 482/1929). (Reference B.X. 5 925.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of timing clocks (schedule No. C. 507). (Reference B.X. 5 762.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Telephone cable terminal boxes (schedule C. 540). (Reference B.X. 5 938.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of testing instruments (schedule C. 504). (Reference B.X. 5 786.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of contact pressure testers (schedule No. C. 516). (Reference B.X. 5 821.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 7th.—Supply of telephone hand sets (schedule C. 526) (Reference B.X. 5 823.)

BLOEMFONTEIN MUNICIPALITY, January 10th.—Supply of automatic electric traffic signals (contract No. 5). (Reference B.X. 5 887.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 13th.—Supply of four-point jacks (P. and T. 151/1897). (Reference B.X. 5 840.)

VICTORIAN ELECTRICITY COMMISSION, January 13th.—Supply of 2 200 V switchgear and accessories (specification No. 30/2). (Reference B.X. 5 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 14th.—Two air compressors (capacity not less than 800 cu. ft. of free air per min.), and two electric motors. (Reference A.X. 8 784.)

INDIA STORE DEPARTMENT, January 15th.—Supply of wood separators for train-lighting cells. Form of tender (5s.) from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

NEW ZEALAND POSTS AND TELEGRAPHS, January 16th.—Plug covers for telephone switchboard plugs. (Contract P. and T. 151/1 943.) (Reference B.X. 5 879.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 16th.—Supply of crude oil engine driven electric generating sets (tender No. 1 589). (Reference B.X. 5 926.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 21st.—Spare parts for automatic telephones. (Reference B.X. 5 917.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 21st.—Four electric motor driven ventilating fans. (Reference A.K. 8 857.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 28th.—Supply of 50 kV oil-immersed circuit breakers, with current transformers and relays (section 299). (Reference B.X. 5 878.)

POSTMASTER-GENERAL'S DEPARTMENT, January 28th.—Supply of telephone cycle signalling equipment. (Reference B.X. 5 906.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 28th.—Supply of induction coils and register plates. (schedule No. C. 533). (Reference B.X. 5 899.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 18th.—Telephone jacks and number plates (Schedule No. C. 541). (Reference B.X. 5 940.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Jumper rings and terminal strips (schedule C. 543). (Reference B.X. 5 941.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th,—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge power scheme, section 217. (Reference B.X.5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457). (Reference B.X. 5 793.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., April 12th.—Electrical and other equipment for the various departments of the company's iron and steel works to be erected at Pretoria. Further information from the Committee of Consulting Engineers of the South African Iron and Steel Industrial Corporation, Ltd., c/o the International Construction Co., Ltd., 56, Kingsway, London, W.C.2.

Tenders Accepted.

CAIRO UNIVERSITY.—Holophane, Ltd., electric lighting installation.

BATH CORPORATION.—Lambeth and Son, electrical work at the Hospital, £659.

HULL CORPORATION.—Siemens Bros. and Co., Ltd., supply of 440 yds. of l.t. cable, £143.

ASHBOURNE URBAN DISTRICT COUNCIL.—Meldrums, Ltd., refuse destructor, £1 000 3s.

TYNEMOUTH CORPORATION.—Macintosh Cable Co., Ltd., supply of cable, £371 17s. 11d.

CONSETT IRON CO., LTD.—R. W. Leek and Co., electric light installations in 635 houses.

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STAFFORDSHIRE EDUCATION COMMITTEE.—W. G. France, lighting of Wolverhampton School.

GRIMSBY CORPORATION.—Forest City Electric Co., Ltd., provision of street automatic light signals.

SCARBOROUGH CORPORATION.—British Insulated Cables, Ltd., supply of e.h.t. and l.t. cables, £18 531.

HORNSEY CORPORATION.—A. Reyrolle and Co., Ltd., alterations to switchboard, £855 8s. (Recommended).

WEST HAM GUARDIANS.—F. Hodson and Co., Ltd., installation of fire alarm system at Whipps Cross Hospital, £324.

SALFORD CORPORATION.—General Electric Co., Ltd., equipment for private automatic branch telephone exchange, £668. (Recommended.)

BRISTOL CORPORATION.—J. H. Winter and Co., electrical work at secondary school, to be erected at Cotham, £560. (Recommended.)

LEWISHAM (LONDON) BOROUGH COUNCIL.—A. J. Hewens and Sons, electrical installation at depot garage, £74 12s. 6d. (Recommended.)

PERTH EDUCATION AUTHORITY.—A Bell, electric light installation in connection with erection of academy, £1 258. (Recommended).

GRIMSBY CORPORATION.—Metropolitan Electric Cable and Construction Co., Ltd., supply of low pressure, paper-insulated, lead-covered cables.

SOUTHWARK (LONDON) BOROUGH COUNCIL.—Derby Cables, Ltd., supply of cable, £3 067; W. Lucy and Co., Ltd., supply of feeder pillars, £53 15s. each. (Both recommended.)

EASTBOURNE CORPORATION.—General Electric Co., Ltd., supply of two transformer kiosks, including gear and estimated cable connections, £1 049; Pirelli-General Cable Works, Ltd., supply of h.t. cable, £5 612.

GENERAL POST OFFICE.—Manufacture, drawing in and jointing of cables: Salisbury-Basingstoke, Pirelli-General Cable Works, Ltd.; telephone exchange equipment: Sydenham, Automatic Telephone Manufacturing Co., Ltd.

HULL CORPORATION.—T. Bolton and Sons, Ltd., supply of 3 tons of bronze wire, for telephones department, £326 2s. 9d; Equipment and Engineering Co., Ltd., supply of insulators, £128 12s. 6d., for telephones department, £128 12s. 6d. (Both recommended.)

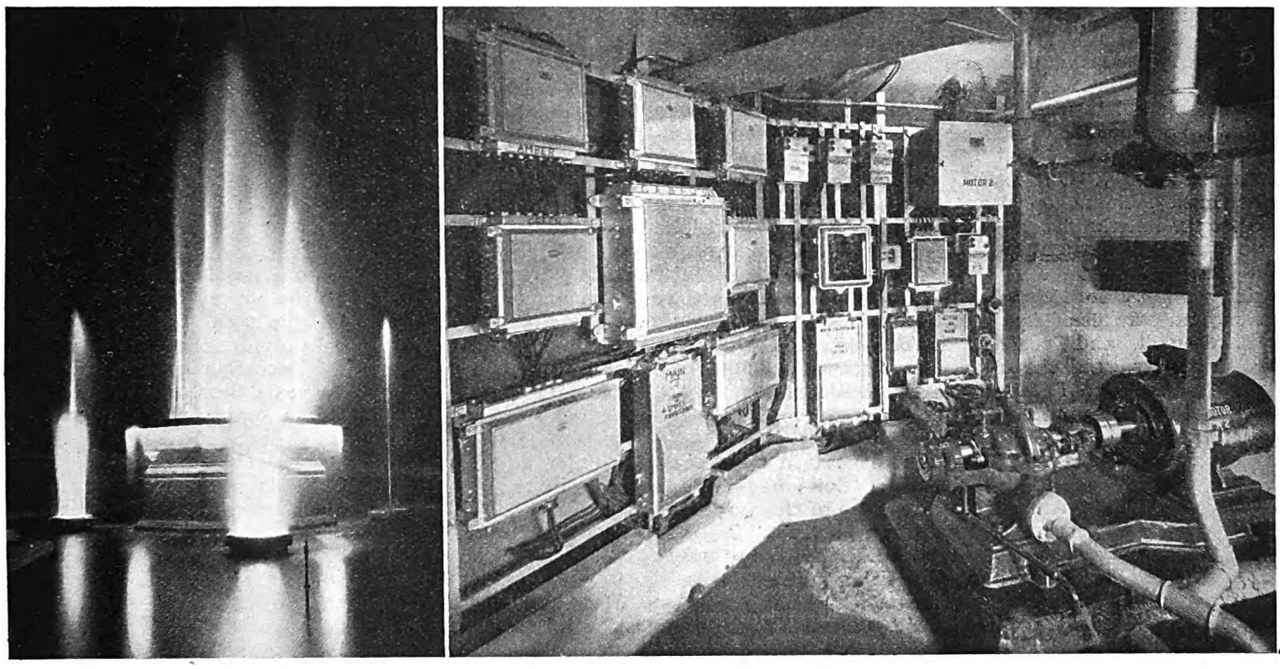
BIRKENHEAD CORPORATION.—Electrical supplies, etc., for technical college: Standard Telephones and Cables, Ltd., telephones and instruments, £11 2s.; Siemens Bros. and Co., Ltd., wall telephones, £3 3s.; Advance Lamp Co., Ltd., electrical supplies, £26 13s.

BARKING URBAN DISTRICT COUNCIL.—Derby Cables, Ltd., supply of 3 200 yds. of 4 core cable, £351; Hackbridge Electric Transformer Co., £186, supply of 400 kVA transformer at works of Messrs. Gross, Sherwood and Heald, £186. (Both recommended).

BIRTLEY PARISH COUNCIL.—F. Reid Ferens and Co., public electric lighting equipment, £2 005. (Contract was provisionally let to Watson and Norrie, Ltd., but this firm desired an additional sum of £180 over the contract price of £2 010, as the work would have to be carried out in the winter period, but Council rescinded resolution awarding contract to them.)

METROPOLITAN ASYLUMS BOARD.—Ericsson Telephones, Ltd., installation of central battery telephone system at South-Western Hospital, £437. (Recommended.) Also tendered: L. G. Tate and Co., Ltd., £492; T. Clarke and Co., Ltd., £493; Alpha Manufacturing and Electrical Co., Ltd., £523; General Installation Co., Ltd., £525; Phillips and Sons (Chiswick), Ltd., £890.

MANCHESTER CORPORATION.—Equipment and Engineering Co., Ltd., electric tram rail welding equipment; Titan Trackwork Co., Ltd., tramway special trackwork; R. Seddon and Sons, electrical installation at North Manchester High School for Boys; Brookes and Co. (1925), Ltd., electrical installation at Birchfields Road Municipal School; R. and J. Dempster, Ltd., electric light for waterless gasholder, Bradford Road.



BOURNEMOUTH'S ILLUMINATED ELECTRIC FOUNTAIN.

CONSIDERABLE public interest has been aroused by the illuminated electric fountain which has recently been installed in front of the new Pavilion at Bournemouth, and these pictures show the fountain in operation and the control room beneath the centre basin. There are six colour changes in the water jets in 8 minutes while 12 different lighting effects are produced every minute, giving a total of 72 different combined colours and water effects. Thirty special watertight floodlight projectors are used in the upper basin of the large centre fountain, each with a 1 000 W projector lamp. Each of the 4 small fountains contains one floodlight projector fitted with a coloured glass cover. The upper basin is, in addition, fitted with a bronze lip which houses a number of natural green glass vacuum lamps. The water jets and projectors are controlled by a motor-driven multi-way automatic control drum, the water jets being operated by 5 magnetic valves which continually alter the height of the sprays and jets. The water power for the 4 smaller fountains is obtained by means of a centrifugal pump driven by a 7½ H.P. squirrel cage B.T.H. motor, and for the large centre fountain by means of another centrifugal pump driven by a 10 H.P. motor. The control room is situated beneath the centre basin and is reached through a small door in the side of the centre fountain, though the dual controls fitted to the apparatus enable the fountain to be operated from another control room in the Pavilion. The fountain was supplied by the Edison Swan Electric Co., Ltd., the contactors, and J.A. 1 type switches were supplied and manufactured by the British Thomson-Houston Co., Ltd. and the erection of the electrical installation was carried out by Messrs. Aish and Co., of Bournemouth. The concrete constructions were built by the Bournemouth Corporation Park and Gardens Department under the supervision of Mr. W. Felstead and in accordance with drawings provided by the Edison Swan Electric Co., Ltd.

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ELECTRICITY SUPPLY.

Inauguration of Fairlie Supply—Cost of Hams Hall Station—Bulk Supply for Hornsey—Power Co.'s Offer for Wakefield Undertaking—County of London Co.'s Maximum Price—Plymouth Corporation's Extensions.

MANCHESTER Electricity Committee seeks sanction to borrow £50 000 for distributing stations and £100 000 for feeder mains.

A supply of electricity, taken in bulk from Preston Corporation, was inaugurated in the townships of Kirkham and Wesham on November 28th.

The Mayoress of Tiverton (Mrs. Physick) formally started a new Ruston Hornsby Diesel engine driven generating set at the Corporation electricity works on November 30th.

Sanction is to be sought by Heston and Isleworth Electricity Committee to borrow £30 989 and £2 550 for l.t. mains and replacement of consumers' apparatus, respectively.

The offer of Heath and Co., owners of Tavistock electricity works, to light the village of Whitchurch by means of 24 lamps from dusk to midnight at a cost of £80 has been accepted.

Bolton Electricity Committee has decided to instal additional water cooling plant of the sprayer type, capable of dealing with 750 000 gallons per hour, at the Back-o'-th'-Bank generating station.

Macclesfield T.C. has appointed a committee to consider and report as to the purchase of the undertaking of the electricity Co. of Macclesfield, Ltd., and other matters which may arise in connection with the electricity supply within the borough.

Kensington (London) Works Committee has agreed to give permission to the Brompton and Kensington Electricity Supply Co. to alter vaults at 192 and 194, Finborough Road, so as to utilise them as a transformer station in connection with the supply to the Kensington, Fulham and Chelsea General Hospital.

The first stage of the Grampian hydro-electric scheme was concluded on November 29th, when Mr. George Balfour, M.P., fired the last shot in the tunnel between Loch Ericht and Loch Rannoch. Great progress has been made with the undertaking during the past year, and about 40% of the tunnel has already been lined with concrete.

The British Columbia Provincial Government proposes to spend $110 000 000 during the next ten years on hydro-electric development. The British Columbia Power Corporation and the West Kootenay Power and Light Co. will produce most of the new power supply, and on the completion of the programme the electric power production in the province will be equal to 1 500 792 H.P. In 1914 it was 64 474 H.P.

The Earl of Glasgow officiated at the inauguration of the electricity supply to Fairlie last week, in the presence of members and officials of Ayrshire Electricity Board, Ayrshire County Council, and local public bodies. Ex-Provost A. Millar, Saltcoats, said the current was now available from Largs in the north to Turnberry in the south, and the board was contemplating extending the cable to Girvan in the immediate future.

The Minister of Transport announces that in connection with the application of Wandsworth (London) Borough Council and certain consumers for a revision of the maximum price which the County of London Electric Supply Co. may charge for electricity supplied by them under the Wandsworth Electric Lighting Order, 1892, into which an inquiry was held by two of the Electricity Commissioners, he has made an Order reducing the maximum charge to 5d. per kWh as from December quarter readings, and reducing the minimum quarterly charge to 6s. 3d. in each of the winter quarters and 4s. 2d. in each of the summer quarters.

Col. T. C. Ekin held an inquiry last week, on behalf of the Electricity Commissioners, into the application of the Tilbury U.D.C. for a loan of £44 362 for electricity purposes. The inspector stated that he found that the sum really required by the council was £46 706 10s. 5d., and if so the council would have to pass a resolution amending the amount. The inspector criticised the loss on the undertaking and the absence of a charge for meters, and remarked that in the present state of affairs every unit sold brought in a net loss of 3d. It was arranged that the council should supply certain supplementary information, and pass an amended resolution as to the amount of the loan.

Reporting upon the new Hams Hall power station, Birmingham Electricity Committee says the actual cost of the works and commitments to-date amount to £1 526 500, or £190 100 in excess of the original estimate. The estimate covered accommodation for plant of a capacity of 60 000 kW. The buildings, as finally designed, were erected to accommodate 90 000 kW of plant, and already the committee is faced with the necessity of installing the extra 30 000 kW at an early date. With regard to the cooling towers, when detailed designs and calculations were more closely investigated, it was decided to make larger provision for the future. Another item responsible for the increased cost was a reservoir in connection with the water supply.

The City Engineer of Hull has received from the City Electrical Engineer a quotation for street lighting on the North Hull Estate and Derringham Bank Estate. The figure quoted for the 36 lamps to be erected on the North Hull estate extension and 84 lamps on Derringham Bank Estate is £4 per lamp per annum, including installation, etc. These terms are for an all-night lighting and for 100 W lamps, which will give 80 c.p. The offer has been accepted.—The Electricity Committee has approved a proposal to erect an overhead line from Sutton to Skirlaugh, in connection with the project to give a supply to the Hornsea area. The cost of such line and ancillary apparatus, inclusive of provision for a supply to Swine and Skirlaugh, is estimated at £15 186. The work is to be carried out by the electricity department's present contractors, Watsham's, Ltd., at schedule rates.

Plymouth Electricity Committee has received sanction to borrow £65 000 for new mains and services.—The Town Clerk and the Borough Electrical Engineer of Plymouth, with the Clerk and Electrical Engineer to Plympton R.D.C., have interviewed the Electricity Commissioners concerning Orders to supply in the urban districts of Ivybridge and Kingsbridge. The Commissioners intimated that they would be prepared, if necessary, to grant the Corporation the necessary powers to go through the Plympton area for the conveyance of a bulk supply beyond that area.—Plymouth Electricity Committee has decided to provide additional equipment at Prince Rock station, including a turbo-alternator and foundations, £42 500; boilers, chimney, etc., £39 333; feed and circulating pumps, etc., £4 200; circulating water screens and chamber, £3 080; steam and other piping, £4 400; switchgear, £8 713; cables, £900; and conveyor, £1 200.

Hornsey Electricity Committee reports that it has received a further communication from the London and Home Counties Joint Electricity Authority, offering terms for a permanent arrangement with regard to the supply by the Authority of electricity in bulk to meet the total requirements of the borough. The new proposal provides that (*a*) the agreement shall continue in force until December 31st, 1950; (*b*) that after the expiration of seven years the Council shall have the option at any time of taking a supply at the "grid" price instead of the price named in the agreement; (*c*) in consideration of an increase in the price already agreed the Joint Electricity Authority will repay in addition to the actual cost of generation at the Council's station the annual existing loan charges payable by the Council in respect of generation. The Committee recommends that this proposal be accepted.—The Electricity Committee is to lay a new feeder to Priory Road sub-station at a cost of £3 065.

With reference to the offer made by the Yorkshire Electric Power Co. to purchase Wakefield Corporation's electricity undertaking for £250 000, "plus a substantial sum," the General Purposes Committee reported last week the receipt of a further communication from the company. The council recommended that the Council's previous decision to refuse the offer be adhered to. Councillor A. A. Bonner referred to the loss sustained by the town recently (as the result of the collapse of the Hatry group), and said that if the corporation had an offer from the power company which would allow a large amount being left over after they had paid off the debt on the electricity undertaking he considered that they ought to think of this, with a view to assisting the town in its present position. An amendment to refer back the Committee's recommendation was not carried, the voting for and against it being equal. At a special meeting on the same day the council approved the promotion of a Bill in Parliament to authorise borrowing powers for making good the loss incurred in connection with the issue of the Wakefield 4½% loan.

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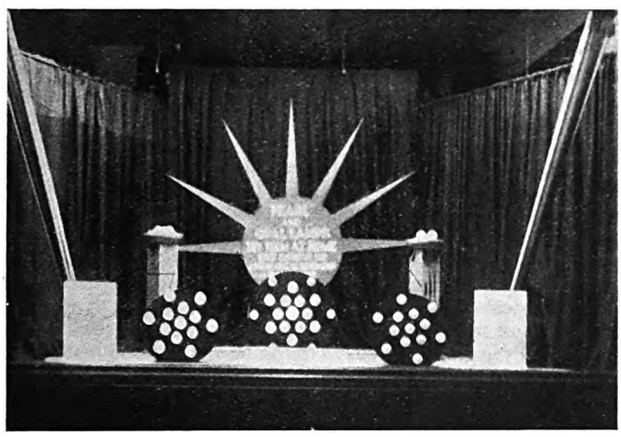
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

Mr. J. H. Parker, borough electrical engineer, West Hartlepool, who has been recommended for appointment as electrical engineer to the L.C.C. Tramways Department. See page 744.

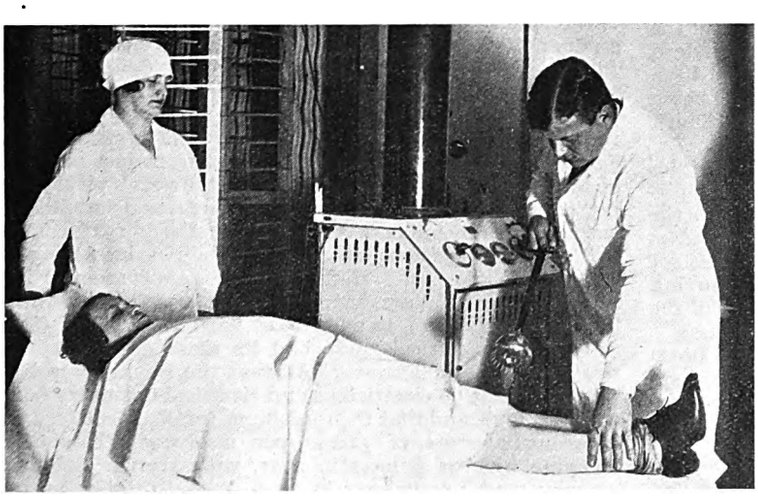
Mr. E. J. Jennings, who will in January assume the title of Secretary and Commercial Manager of the Birmingham Electric Supply Department. See page 744.

Mr. C. A. Blascheck, whose death on November 26th is referred to on page 744, was chief engineer of the Canterbury Municipal electricity undertaking for 27 years.



A novel arrangement for a window displaying pearl and opal lamps, designed by the sales staff of Keighley electricity Department. The window was intended to emphasise the improved appearance of decorations illuminated by lamps of these types.

The prize-winning window of Hattersley Bros., of Bradford, staged in connection with "Exide Fortnight." In the foreground are cavalry at the mercy of the batteries left and right. A full list of prize winners is given on page 745.



This apparatus, the invention of an Austrian doctor, is reported to be of considerable interest in the treatment of cancer. It is, we understand, a high frequency machine of high voltage and is used in conjunction with radium. It is now being used by the inventor in a special institute with a view to substantiating all the hopes that the arrangement seems to offer.

The lighthouse on the top of St. Bartholomew's Hospital, London, which has been erected in connection with a £1 000 000 reconstruction fund. Other details of the light are given on page 752.

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THE NATIONAL REGISTER.

Further Seventeen Names Added to Registration List.

AT a meeting of the Executive Committee of the National Register of Electrical Installation Contractors on December 6th, applications for registration from twenty-five electrical installation contractors were considered, the Committee accepting seventeen and declining seven. At the same meeting one application was withdrawn.

The names and addresses of those contractors whose applications were successful are given below :—

Firth, James, Shaw Street, Bradford, Manchester.
Gaskell and Garraway, Ltd., Bridge Street, Taunton.
Wilkinson's Wireless and Electrical Co., 40, Clifton Street, Lytham, Lancs.
Penrose and Son, 62, Mutley Plain, Plymouth.
Swift, T. W., Robert Street, Selby, Yorks.
Maclean, Kenneth, 2, Cheltenham Road, Chorlton-cum-Hardy, Manchester.
Burton, Walter H., 13, Alexandra Road, Chesterfield.
King, H. H., and Co., 2, Stamford Road, Longsight, Manchester.
Podmore, William H., Merridale Road, Chapel Ash, Wolverhampton.
Hammond, Charles Wm., 25, Westbourne Road, Peverell, Plymouth.
Lowrey, Amos S., 5, North Street, Newcastle-on-Tyne.
Fear, Ernest J., Lyefield Road West, Charlton Kings, Cheltenham.
Hill, William Frank, 18, Parkholme Road, Dalston, London, E.8.
Wyeside Welding and Battery Service Co., 51/52, Whitecross Street, Hereford.
Thomas Lewis and Sons, Ltd., 54, North Parade, Aberystwyth.
Darby, George A., 28, Frederick Street, Birmingham.
Watson and Sons, Birmingham Street, Oldbury.

"BART'S" LIGHTHOUSE.

Electrical Aid to £1 000 000 Hospital Appeal—Estimated c.p. of 750 000.

VISITORS to London will no doubt have seen the beams thrown by the lighthouse on the top of St. Batholomew's Hospital, which was switched on by the Prince of Wales last week. The device is an actual lighthouse made by Collier and Co., Ltd., who have kindly lent it to the hospital for the purposes of a special appeal for £1 000 000 for the reconstruction fund. The light is fixed at the top of the new surgical and operation theatre block which is approaching completion, and its height is about 120 ft. above ground level. The lighthouse had to be fixed without holding-down bolts, as the roof was already asphalted, and it reflects great credit on the Clerk of the Works that the temporary fixings have withstood the violent gales. The lamp is a Philips 5 000 W 200 V of standard type, and is fixed cap upwards. The lenses are rotated by a one-eighth H.P. shunt motor, a series resistance of 100 Ω being inserted in the armature circuit at starting, to prevent a kick on the worm gear.

The model, which was switched on by the Prince of Wales in the Great Hall of the hospital simultaneously with the lighthouse on the roof of the new building, was presented to the hospital by the consulting electrical engineer, Mr. F. Charles Raphael, and is an exact small-scale copy of the lighthouse, except for slight differences in the lenses. It was equipped with a 100 W lamp, which was rotated by a motor in the base of the model at approximately the same speed as the lighthouse.

No measurement of the actual candle-power of the beam from the large lighthouse has been made, but it may be approximately estimated at 750 000, assuming the normal concentration by the dioptric lenses employed. The beam has been seen as far off as Bedford. See page 751.

ASSOCIATION OF EX-SIEMENS' MEN.

A smoking concert to be given by the Association of ex-Siemens' men will be held at Gatti's Restaurant, London, on January 14th, 1930. Tickets are 3s. each, and guests will be welcome. Mr. J. Snow Huddleston, Dagenham Dock, Essex, is the hon. secretary, and will be pleased to give full particulars of the Association to any intending members.

BANKRUPTCY REPORT.

The Toll of Insolvency—Creditors' Dead Loss 88%.

THE uncomfortable knowledge is gained from the Board of Trade's annual bankruptcy report that creditors may consider themselves lucky if they get as much as half-a-crown in the £ in satisfaction of their claims. This is the chief factor which emerges from analysis of the report for the year 1928—which was not issued until the end of November, 1929, the public officials concerned being apparently quite content if they just succeed (which they have not invariably done) in getting out the figures for any given year before the end of the following year. Of the gross assets set out in the debtors' own statements of account lodged with the court, the amount actually realised in the estates wound up by the official receivers during 1928 reached 67%, which is slightly more than in the previous year. In the cases wound up by non-official trustees the proportion of estimated assets actually realised, which in the previous year had improved from 30 to 50% dropped back in 1928 to under 40%. Deeds of arrangement invariably show a better return ; but the 75% proportion of estimated assets which was subsequently realised in 1927, was not quite maintained in 1928. If all the bankruptcies and deeds of arrangement be taken together, we find that the average amount yielded by the insolvent estates wound up in 1928 reached no more than 57% (as against 60% in 1927) of the assets as estimated by the debtors themselves. But the dividends actually paid amounted in 1928 to only 11¾% (against 12¼% in 1927) of the ranking liabilities, so that the creditors concerned find themselves in the unfortunate position of having to write off as dead loss over 88% of the amounts owing to them. Perhaps credit would not have been given so readily had they known that in nearly a quarter of the annual applications for discharge it is reported by the official receivers, and not disproved, that the bankrupts brought on or contributed to their bankruptcy by rash and hazardous speculations, or by unjustifiable extravagance in living, or by gambling, or by culpable neglect of their business affairs ; that in more than half the cases, the bankrupts have omitted to keep such books of accounts as are usual and proper in the business carried on by them and as sufficiently disclose their business transactions within the three years immediately preceding their bankruptcy, and in more than 40% of the cases have continued to trade after knowing themselves to be insolvent. Of the 1 037 applications for discharge dealt with in 1928, it was reported in 207 cases, or one in five, that the bankrupt had contracted a debt provable in the bankruptcy without having at the time of contracting it any reasonable or probable ground of expectations of being able to pay it. Fraud or fraudulent breach of trust was reported in fifteen cases. In 67 cases previous bankruptcy or composition with creditors had occurred.

Total for Year.

The total bankruptcies and deeds of arrangements for the twelve months in England and Wales slightly exceeded in number those of the previous year, being 6 221 in 1928, compared with 6 170 in 1927 ; but the average deficit shown by the debtors' statement of affairs, declined from £1 446 in 1927 to £1 355 in 1928, the liabilities aggregating £12 258 690 in 1928, as against £12 734 104 in 1927. The proportion of liabilities to assets, however, increased from just under 30% in 1927 to just over 31% in 1928. Of the year's total failures, rather more than 5% of both insolvents and liabilities was accounted for by builders, 326 of whom failed in 1928, compared with 287 the previous year, with liabilities increasing from £514 653 to £694 461. Builders' merchants consequently also had a bad year, failures increasing from 15 in 1927, with total liabilities of £34 323, to 20 in 1928, with liabilities of £87 779.

That the electrical trade had its share of bad debts our readers will be well aware. All that the Bankruptcy Report tells us is that 96 electricians and electrical enginners failed in the year 1928, and that their liabilities totalled £196 983, which gives an average of £2 052 per insolvent. These figures compare with 92 failures in 1927, with average liabilities of £1 336 ; and 104 failures in 1926, with liabilities averaging £907. The report tells us nothing about the wireless trade, or of the electrical manufacturing industry ; the figures of these important industries in so far as they are not included among electrical engineers, being presumably buried among those relating to miscellaneous metal workers and miscellaneous metal wares dealers, and possibly also among china, glass and earthenware dealers.

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COMPANY NEWS.

Quiet Market in Electrical Securities—Cables and Wireless Still Weakening—County of London Co.'s New Issue—New Companies Registered.

BUSINESS in the stock markets has eased off considerably during the past week and fewer changes have occurred in the price quotations of electrical shares which are included in our usual tables.

Hydro Electric Securities have risen to 43, a gain of 5 points as compared with a week ago. Radio Corporation of America shares have also advanced smartly during the week, moving up from 37 to 44, an improvement of 7 points. International Holdings have improved from 5⅜ to 6⅛. The price of the American Telephone and Telegraph Co.'s capital stock has not only regained the 5 points yielded last week, but has put on a further 5 points, making 10 points in the week and bringing the market quotation up from 225 to 235. International Telephone and Telegraph stock is also appreciably higher than a week ago, having risen from 75 to 85 dollars. Marconi International Marine shares are half-a-crown up, from 46s. 3d. to 48s. 9d. The six per cent. preferred stock of the Anglo-American Telegraph Company is once again above par. A recovery is about due in Cables and Wireless issues, which have further weakened during the past week, the "A" ordinary stock having dropped a couple of points from 78½ to 76½ and the "B" ordinary stock having receded three points from 40½ to 37½.

The only movements of note among electrical transportation shares have been in Metropolitan Railway ordinary stock and in Rio de Janeiro Tramway 50-year Bonds, which have changed hands at 62½ and 82½ respectively.

In the manufacturing group, Associated Electrical Industries ordinary shares are 3s. lower, English Electric preference 1s. 3d. down at 7s. 6d., and British Thomson-Houston 6d. at 22s. 9d.

In the electricity supply section, County of London have fallen nearly 2s. on the new issue terms, and London Electric Supply ordinary shares are also easier. Whitehall Electric Investments debenture stock has improved one and a half points. Melbourne stock is 3 points up, but Victoria Falls shares are lower.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	20/6	22/6	19/9
6½	" " C. Cum. Pref. ..	20/6	20/6	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	58/9	58/9	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	50/7½	50/7½	56/-	32/6
5	" " " 5% Cum. Pref.	21/3	21/3	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	92½	95½	88½
(a)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	31/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	38/9	38/9	41/6	26/6
8	" " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	46/3	48/1½	68/6	25/9
6	" " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	48/1½	48/1½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	45/-	26/9
4	Fife Tram. Lt. & P Ord.	12/6	12/6	23/6	10/-
6	" " " 6% C.P. ..	15/-	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " 4½% 1st Mt.Deb.Stk.	89	89	92	80½
—	Hydro Electric Securities ..	43	38	87	20
—	International Holdings	6⅛	5⅜	35½	6⅛
(c)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref...	27/-*	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/-	27/6	31/3	24/6
1/9⅛	Lon. Elec. Sup. Ord. (£1) ..	26/6	27/-	37/6	23/-
5	London Power Co. 5% Deb. Stk.	97	97	104	95
10	Melbourne Electric Ord. Stk. ..	173	170	180	150
1/9⅛	Metro. Elec. Sup. Ord.	37/6	37/6	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	28/-	28/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-TyneElec.Sup.Ord.	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(e)	St. James & P.M. Ord. (£1) ..	26/-	26/-	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	25/6	25/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	94	94	98½	86½
7	Urban E.S. Ord.	35/-	35/-	46/6	18/-
5	Victoria Falls Power Ord. ..	57/6	58/9	69/-	46/3
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	81½	81½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	87½	87½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	117½	117½	152	117
7·67	" " " 6% Pf. Stk.	123½	123½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/6
5	" " " 5% Cum.Pf.	13/9	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	72	72	72	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb. ..	77	77	83	77½
5	City & S. London, Cons. Ord.	67	67	64	52
4	" " 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	73½	73½	73½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	93½	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	74	74	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	63½
3½	Met. Rly. Cons. Ord. Stk. ..	62½	62	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	72	72	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	112½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	82½	81½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	21/6	21/6	28/9	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	83½	83½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing.				
6	Associated Elec. Indus. Ord. ..	25/7½	28/9	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " 4% Mt. Deb.	75½	75½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	75/-	86/3	36/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	22/9*	23/3	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum.Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-*	20/-	22/9	21/-
4	" " 1st Mt. Deb. ..	66½	66½	75	68
20	Enfield Cable Works Ord. ..	97/6	97/6	82/-	60/-
7½	" " " 7½% Cum.Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	6/3	6/3	15/9	5/-
—	" " 6% C.P.	7/6	8/9	18/9	7/-
5½	" " 1st Mt. Deb. ..	88	88	103½	86
6	" " Conv. Deb. ..	71½	71½	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/-	19/-	92/3	18/1
10	" " 7% Partic. Pref. ..	29/-	29/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	15/9
10	General Elec. Ord.	47/6	47/6	46/6	26/6
6½	" " "A" C.P.	24/-*	24/-	26/-	22/-
7½	" " "B" C.P.	25/-*	25/-	27/9	22/9
7	" " 1st Mt. Deb. ..	103½	103½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	117/6	117/6	120/-	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord. ..	26/3	26/3	36/6	24/9
10	" " " Cum. Pref.	32/6	32/6	34/3	28/9
4½	" " " Deb. Stk. ..	91½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/3	21/3	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk. ..	235	225	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105	102
3½	Anglo-Am. Tele. Ord. Stk. ..	60½	60½	63½	56½
6	" " " 6% Prefd. Stk...	100½	99½	105½	91
1½	" " " Deferred Stk...	24½	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	76½	78½	—	—
—	"B" Ord. Stk.	37½	40½	—	—
—	5½% Cum. Pref. Stk. ..	96	96	—	—
3½	Eastern 3½% Pref. Stk.	61½	61½	70½	59
4	" 4% Deb.	75	75	81½	74
4	Eastern Extension 4% Deb. Stk.	75	75	80	74½
22	Great Northern Telegraph (£10)	29	29	43½	26
10	Indo-European (£25)	32½	32½	48½	30
—	International Teleph. & Teleg. ..	$85	$75	161½	48½
15	Marconi Int. Mar.	48/9	46/3	90/-	16/6
4½	New York Tele. 4½% Mt. Bds. ..	96½	96½	101	96
12	Oriental Telephone Ord.	38/9	38/9	65/-	42/-
—	Radio Corporation of America ..	44	37	115⅜	18½
4½	United R. Plate Tele. 4½% Deb.	87½	87½	89½	82
4	Western Tel. 4% Deb. Stk. ..	76	76	82	76

(a) 19⅞d. per share. (b) 1s. 9·3d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. *Ex dividend. (g) 2s. 2⅛d. per share.

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Directors' Reports, &c

BRITISH COLUMBIA POWER CORPORATION.—Div. of 50 cents p. sh. on " A " shs. is announced.

SHAWINIGAN WATER AND POWER CO.—Div. of $\$\frac{5}{8}$ per sh., agst. $\$\frac{1}{2}$ p. sh., for qtr. will be payable on Jan. 10.

BARCELONA TRACTION LIGHT AND POWER CO., LTD.—Qrtrly. div. of $1\frac{3}{4}\%$ on non-cum. participatg. pref. shs. will be payable on Dec. 31.

EVER READY CO. (GREAT BRITAIN), LTD.—Directors announce that sales for year to date are 23% in advance of those for corresponding period last year.

PETTERS, LTD.—Int. div. on $7\frac{1}{2}\%$ cum. pref. shs. in respect of half year ended Sept. 30, 1929, less tax, is announced. Transfer books will be closed until Dec. 18, inclusive.

CALLENDER'S CABLE AND CONSTRUCTION CO., LTD.—Deb. stk. and $6\frac{1}{2}\%$ and $7\frac{1}{2}\%$ " B " pref. sh. registers will be closed from Dec. 17 to 31, inclusive, for preparatn. of int. and div. warrts.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—The directors have decided to make an issue of £1 ord. shs. at 36s. each. The issue is to be offered to ord. shhldrs. in proportion of one new ord. sh. for every three held.

ASSOCIATED GAS AND ELECTRIC CO.—The time for exercising rights to buy allotment certificates has been extended from Dec. 16 to Jan. 15. Certain classes of the co.s security hldrs. have the right until Jan. 15 to subscribe for one $8 int.-bearing certificate for each 8 shs. of stk. held.

GENERAL ELECTRIC CO. OF NEW YORK.—A split up of the co.'s stock at the rate of four to one is announced. The new stock is to receive $1.60 annual div., agst. the present $6, including $4 regular and extras. Qtrly. div. of $1.50 was declared on Dec. 6. Shhldrs. are to be asked to approve increase in authorised stk. from 7 400 000 shs. to 29 600 000 of no par value.

CIA. HISPANO-AMERICANA DE ELECTRICIDAD.—Intm. divs. gold Ptas. 35 (agst. Ptas. 30) on " A," " B " and " C " shs. and gold Ptas. 7 on " D " and " E " shs. (agst. Ptas. 6 on " D " and Ptas. 3 on " E ") are announced. Equivalt. of gold ptas. in other currencies will be on parity of gold Ptas. 5.18 per dollar and rate of exchange for dollars ruling on day of paymt. for currency in which div. is to be made.

VENEZUELA TELEPHONE AND ELECTRICAL APPLIANCES CO., LTD.—Pft. for year ended June 30, 1929, £53 995; int. on debs., £8 847; int. on loans £3 411; income tax, £3 350, leavg. blce., £38 387. Intm. pref. div. paid Jan. 1, 1929, absorbed £4 383, leavg. £34 004, plus £47 833 standg. to credit of undivided pfts. acct. Fin. pref. sh. div., paid July 1, 1929, required £4 383. Ord. div. recommended 8%, less tax, for year, and it is proposed to write off exes. of issue of new " A " shs., amounting to £6 059, to provide £1 500 for 6% 1st mtge. debs. sinking fund and to place £30 000 to res., leaving £31 128 to carry fwd. Ord. sh. registers are closed until Dec. 17, inclusive.

STOCK EXCHANGE NOTICES.—The Stock Exchange Committee has granted official quotations to 250 000 £1, fully paid, ord. shs. of Atlas Light and Power Co. (now Atlas Electric and General Trust, Ltd.); 200 000 £1, fully-paid, 6% cum. pref. shs. of the Shropshire, Worcestershire and Staffordshire Electric Power Co.; £110 000 4% con. pref. stk. of the Aldershot Gas, Water and District Lighting Co.; 1 000 000 £1, fully-paid, ord. and 500 000 £1, fully-paid pref. shs. of the Bristol Tramways and Carriage Co., Ltd. The Committee has granted permission to deal in £4, 25-year collateral trust 5% deb. stk., and $962 25 year collateral trust gold bonds of the Postal Telegraph and Cable Corporation; 3 205 £1, fully-paid, ord. shs. of Underground Electric Railways Co. of London, Ltd.

Company Meeting.

S. SMITH AND SONS (MOTOR ACCESSORIES), LTD.—Mr. W. Henderson-Cleland, presiding at the meeting on December 5th, said the accounts indicated that the financial position of the company was sound. The available balance for distribution was £119,168. The results of the company's trading were satisfactory, and showed continued progress. The commercial vehicle side of the business was one to which the directors had devoted considerable attention, and they were able now to offer a complete range of accessories for these vehicles. The majority of commercial vehicle manufacturers now standardised the company's principal lines. The K.L.G. sparking plug had maintained its reputation throughout the year as the premier plug, while the M-L Magneto Syndicate, Ltd., had also had a satisfactory year. The main products of the company and its subsidiaries, speedometers, and clocks, were now fitted as standard to over 95% of the British-made motor cars and commercial vehicles. During the past few years they had been successful in introducing three new lines for which large contracts had already been secured, including an electric petrol gauge. The report and accounts were unanimously adopted.

New Companies.

ESSANDBEE, LTD.—Cap., £500. Mechanical and electrical engineers, etc. A director: S. Belaosky (chairman), 18/20, Hewart Street, London, E.C.2.

W. MAJOR AND CO. (MANCHESTER), LTD.—Cap., £1 750. Contractors, electricians, etc. A first director: W. Major, 45, Polefield Road, Blackley, Manchester.

MORTIMER, GALL AND CO., LTD.—Cap., £500. Electrical and general engineers and contractors, manufacturers of and dealers in electrical, radio or other goods, etc. Reg. Office: 26, Cheapside, London, E.C.2.

R. W. LEEDALE AND CO. (DONCASTER), LTD.—Cap., £1 000. Manufacturers of and dealers in electrical, wireless or mechanical appliances, scientific instruments, etc. Reg. Office: Britannia Buildings, Silver Street, Doncaster.

T. ELVINS AND SONS, LTD.—Cap., £20 000. To adopt agreement with G. Elvins, F. C. Elvins and H. J. Elvins, to carry on the business of contractors, engineers, electricians, etc. Solicitors: Docker, Hosgood and Co., 10, Newhall Street, Birmingham.

RADIUM ELECTRIC, LTD.—Cap., £5 000. To adopt an agreement with Erco Radium Kompresse, M. Munzer, and carry on business of manufacturers of and dealers in electrical and radio-active apparatus of all kinds, including a radio-active electrical apparatus comprising an electrically heated compress pad or bandage, etc. Reg. Office: 24, Grosvenor Gardens, London, S.W.1.

BRITISH TELEHOR, LTD.—Cap., £100. To manufacture or deal in any equipment used in connection with transmitting or receiving, producing, recording, or reproducing by electrical or any other means any matter, whether consisting of sounds, images, signals, impulses or otherwise, etc. Solicitors: Herbert Oppenheimer, Nathan and Vandyk, 1, Finsbury Square, London, E.C.2.

DUNOON AND DISTRICT ELECTRICITY SUPPLY CO., LTD.—Cap., £20 000. To take over and put into operation the Special Order in respect of Dunoon, co. of Argyll, known as Dunoon Electricity Special Order, 1929, and to carry on business of electric light and power supply company. Solicitors: J. D. Langton and Passmore, 71, Powis Street, Woolwich, London, S.E.18.

RUSTON-BUCYRUS, LTD.—Cap., £800 000. To acquire (a) that part of undertaking of Ruston and Hornsby, Ltd., devoted to the manufacture and sale of excavators, and (b) the business carried on by Bucyrus-Erie Co. in certain parts of the world, and to carry on the business of manufacturers of, dealers in and agents for the sale of machinery for excavating and handling materials, manufacturers of and dealers in electric and other shovels, dredges, derricks, dragline excavators, hoisting and conveying machinery, etc. Solicitors: Coward, Chance and Co., 30, Mincing Lane, London, E.C.3.

METAL AND CHEMICAL PRICES.

		Tuesday, Price.	December Inc.	10th. Dec.
Copper—				
Best Selected	per ton	£75 10 0	—	—
Electro Wirebars	,,	£84 0 0	—	—
H.C. Wires, basis	per lb.	11¾d.	—	—
Sheet	,,	11⅞d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2¼d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet ,,	,,	10¼d.	—	—
Wire ,,	,,	10½d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 15 0	—	—
Lead Pig—				
English	per ton	£22 15 0	—	—
Foreign or Colonial	,,	£21 7 6	—	—
Tin—				
Ingot	per ton	£177 15 0	£3 5s.	—
Wire, basis	per lb.	2s. 4¼d.	—	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	,,	£20 7 6	12s. 6d.	—
Mercury	per bottle	£23 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 Roll, ,, £10 10 0 *Copper Sulphate* .. Ton £25 to £25 10 0
Boric Acid (Crystals) ,, £20 0 0
Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2¾d.
Sodium Bichromate—Per lb., 3¾d.
Rubber—Para fine, 8¾d.; plantation, 1st latex, 8⅝d.
∴ The metal prices are supplied by British Insulated Cables, Ltd.

THE LEAD MARKET.

The lead market has been quiet this week and, according to James Forster and Co., no fresh feature presented itself.

The American market is a little steadier with the price maintained at 6.25 cents.

Closing prices on December 6th were £21 6s. 3d. for December, £21 7s. 6d. for January, and £21 8s. 9d. for February and March, 3s. 9d. to 1s. 3d. per ton lower on the week.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within* 21 *days.*]

APPLE, Mr. B., 87, Tottenham Court Road, W., wireless dealer. £16 17s. 2d. October 15th.

ARCHER, G. AND CO., 4-6, Phillip Street, Aston, electrical engineers. £13 12s. 5d. October 28th.

BRITISH ELECTRICAL MANUFACTURING CO., Alexander Works, Brent View Road, N.W., wireless factors. £14 14s. 11d. October 30th.

EVERETT, Charles G., 248, Plumstead High Street, Plumstead, electrical engineer. £15 1s. 5d. October 15th; and £17 6s. 9d. November 1st.

GRAINGE, R. W., 20, Nile Street, North Shields, wireless dealer. £29 0s. 2d. October 21st.

HARBORD, Mr. S., Solerton, Newtown, Fareham, wireless dealer. £15 9s. 7d. October 30th.

MADDOX, C. E., 70, Rowson Street, New Brighton, wireless dealer. £12 16s. 9d. November 5th.

MAGNETO AND DYNAMO REPAIRING AND ACCESSORIES CO., 54A, Wells Street, Oxford Street, W., electrical engineers. £20 9s. 7d. October 23rd.

MEANLEY, T. H., 158, Houghton Road, Thurnscoe, wireless dealer. £13 12s. October 14th.

PHOTO SERVICES, 90, Brynymor Road, Swansea, wireless dealers. £15 2s. 7d. October 16th.

RADIO SERVICES, 585A, Wilbraham Road, Chorlton-cum-Hardy, wireless dealers. £17 12s. 1d. October 16th.

RIVER RADIO, River Lane Works, Petersham, wireless dealers. £15 8s. 2d. October 16th.

SLAUGHTERN AND CO., 156, Ewell Road, Surbiton, radio and electrical engineers. £16 9s. 7d. October 30th.

Receivership.

FELLOW'S MANUFACTURING CO., LTD.—P. A. Bristow, C.A., of 68½, Upper Thames Street, E.C.4, was appointed receiver and manager on November 29, 1929, under powers contained in debentures dated September 27th, 1927.

Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *— followed by the date of the Summary, but such total may have been reduced.*]

HENDERSON (W. J.) AND CO., LTD., London, S.W., radio manufacturers.—Registered November 16th, £2 000 debenture, to A. F. Phelp, 54, Queen's Road, Brighton, wireless factor; general charge. *——. December 31st, 1928.

HERNE BAY AND DISTRICT ELECTRICITY SUPPLY CO., LTD.—Registered November 29th, series of £30 000 debentures, present issue £20 000; general charge. *Nil. October 1st, 1929.

LANGHAM RADIO, LTD., London, W.C.—Registered November 27th, debenture, to Lloyds Bank, Ltd., securing all moneys due or to become due to the Bank; general charge.

"M.P.A." WIRELESS, LTD., London, W.—Registered November 21st, £500 and £600 debentures part of £35,000 and bonus of 12½%; general charge.

SMETHURST AND CO. (LONDON), LTD., electricians.—Registered November 29th, deed of covenant securing £500, to Miss S. P. Findlater, c/o Barclays Bank, Ltd., 208, Regent Street, W.; charged on 72, Duke Street, Grosvenor Square, W. *Nil. December 31st, 1928.

UPFIELDS WIRELESS, LTD., Hastings.—Registered November 29th, £1 000 mortgage, to Hastings Permanent Building Society; charged on 5, Hughenden Place, Hastings. *Nil. March 26th, 1929.

Satisfactions.

CHARING CROSS ELECTRICITY SUPPLY CO., LTD. (late CHARING CROSS WEST END AND CITY ELECTRICITY SUPPLY CO., LTD.).—Satisfactions registered November 27th, £472,000, registered August 8th, 1901, to February 8th, 1906, and £250 000, registered April 28th, 1920.

KEIGHLEY ELECTRICAL ENGINEERING CO., LTD.—Satisfaction registered November 26th, £500, registered March 21st, 1928.

WILKINSON (THOMAS) (ARNSIDE), LTD., electrical engineers.—Satisfaction registered November 22nd, £10 250, registered April 18th, 1922.

London Gazette, etc.

Companies Winding-up Voluntarily.

BIFUEL CARBURETTORS, LTD. By special resolution December 5th. G. K. Mathers, chartered accountant, Fairfield Works, Bow, London, E.3, appointed as liquidator.

DIONOID BATTERY CO., LTD. By reason of its liabilities, November 28th. B. C. Davies, 6, East Parade, Sheffield, chartered accountant, appointed as liquidator.

Bankruptcy Information.

BROWN, John James, Handysides Arcade, Newcastle-upon-Tyne, wireless agent. Receiving order, December 5th. Creditor's petition.

WYNDHAM, James, trading as WYNDHAM'S WIRELESS AND GENERAL MANUFACTURING CO., 114, Tottenham Court Road, London, W.1, wireless and general manufacturer. Receiving order, December 5th. Creditor's petition. First meeting, December 19th, 11.30 a.m. and Public examination, January 21st, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Notices of Intended Dividends.

SMITH, Boulton, trading as H. WORTON, The Crescent, Spalding. electrical engineer. Last day for receiving proofs, December 19th. Trustee, C. E. Turton, 4 and 6, West Street, Boston, Lincs.

TURTON, John William, Market Place, Banbury, Oxford. electrical engineer. Last day for receiving proofs, December 23rd. Trustee, G. Mallam, 37, Cornmarket Street, Oxford, Official Receiver,

Order Made on Application for Discharge.

LAMBERT, Frederick Victor, 27, Parrock Street, Gravesend, Kent, electrical contractor, trading as LAMBERT AND CURLEY. Discharge suspended for two months, until January 13th, 1930.

Partnership Dissolved.

THE FALKSLEY CO. (James William LEWSLEY, Frederick Vincent HOWITT and May COPESTAKE), electrical engineers, Great Hall Street, Derby Road, Nottingham, by mutual consent as from November 23rd, 1929. Debts received and paid by F. V. Howitt and M. Copestake.

Bankruptcy Proceedings.

LANGLOIS, Herbert Augustus, trading with another as THE LONDON ELECTRICAL CO., 119, St. Mary Street, Cardiff, formerly 124, Queen Street, Cardiff, electrical engineer. The application for discharge herein was heard on December 3rd at the Law Courts, Cathays Park, Cardiff. The receiving order had been made in 1926. It was reported that the debtor commenced trading on his own account in 1921 as an electrician, and in 1926 he was joined by another, but the business only lasted seven months. The concern got into debt to the extent of £1 024. It was stated that the debtor consented to judgment for £150, £50 to be paid immediately and the balance within eighteen months. His Honour granted the discharge.

PEACE, Ernest Everitt, rear of 230, High Street, Erdington, Birmingham, trading as PEACE AND CO., manufacturing electrical engineer. The first meeting of creditors herein was held on December 4th at the Official Receiver's Office, 191, Corporation Street, Birmingham, when a statement of affairs was produced showing ranking liabilities of £1 090, and there was a deficiency of £929. The debtor attributed his failure to bad trade, loss on experimental work, and bad debts. It would seem that in 1923 the debtor entered into partnership with another, putting £200 into the business. It was not successful, and in 1926 a composition of 10s. in the £ was paid. It was stated that the money to pay the composition was advanced by a relative of the debtor's in consideration of the partner withdrawing from the business on receipt of £5. The debtor took over the assets in connection with the business, and carried it on under the name of Peace and Co., but he was not successful, and had only been able to continue by creating an overdraft at the bank and by borrowing. The matter was left in the hands of the Official Receiver as trustee.

Winding-up Orders.

FELLOW'S MANUFACTURING CO., LTD.—In the Chancery Division, on Monday, Mr. Justice Bennett ordered the compulsory winding up of Fellow's Manufacturing Co., Ltd. Mr. Christie, for the petitioners, said they were judgment creditors for £418 6s. 3d., and they were supported by creditors for roughly £2 000. Mr. Herman said he appeared for the landlords on a claim of £145, and another counsel said he appeared for Marconi's Wireless Co. and supported the petition. The company did not appear.

IDEAL WIRELESS CO., LTD.—Mr. Justice Bennett, in the Chancery Division on Monday, made an order for the compulsory winding up of Ideal Wireless Co., Ltd., on a petition of a judgment creditor for £300. The company did not appear.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

318 841 A. H. Marks and P. Russell (legal representatives of E. C. R. Marks, (deceased)). (Western Union Telegraph Co.). Telegraph systems. (6/3/28.)
288 630 Siemens-Schuckertwerke Akt.-Ges. Arrangement in asynchronous machines with commutator machines mounted in cascade. 14/4/27.)
319 024 C. Neff. Method of producing oscillations by means of two or more co-operating generators. (12/3/28.)
288 987 British Thomson-Houston Co., Ltd. Alternating-current commutator motors. (16/4/27.)
318 903 J. P. Naylor. Electric luminous signs and signalling-apparatus and their controllers. (4/5/28.)
296 774 Landis and Gyr Soc. Anon. Means for varying the temperature coefficients of induction-measuring instruments. (9/9/27.)
319 032 W. E. Beatty (Bell Telephone Laboratories, Inc.). Telegraph systems. (14/5/28.)
319 033 A. E. White (Fansteel Products Co., Inc.). Electrolytic condensers. (15/5/28.)
304 582 Aladdin Industries, Ltd. Lamp fixtures. (21/1/28.)
318 847 C. H. Verity. Synchronisation of machines for recording sounds and movements. (5/6/28.)
318 876 E. Reisz. Electrostatic loud-speakers and the like. (8/6/28.)
292 077 Electrical Research Products, Inc. Carrier frequency signalling systems. (11/6/27.)
319 037 H. N. Marvin. Means for tuning radio sets. (9/6/28.)
318 942 J. Neale. Means of mounting for light-sensitive bridges. (12/6/28.)
318 944 Standard Telephones and Cables, Ltd. (G. Deakin). Automatic and semi-automatic telephone exchange systems. (13/6/28.)
318 945 Standard Telephones and Cables, Ltd. (G. Deakin and L. Polinkowsky). Automatic and semi-automatic exchange systems. (13/6/28.)
318 946 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Signalling systems. (13/6/28.)
318 947 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Electric resistance units. (13/6/28.)
318 948 J. H. St. H. Mawdsley. Dynamo-electric generators for electric welding. (13/6/28.)
318 950 A. Wright. Electromagnetic devices. (13/6/28.)
292 597 Electrical Research Products, Inc. Synchronising systems for use in television systems. (23/6/27.)
318 953 Automatic Telephone Manufacturing Co., Ltd., and P. N. Roseby. Magnet cores. (13/6/28.)
292 130 Montecatini Soc. Generale Per L'Industria Mineraria ed Agricola. Electrolytic cells. (14/6/27.)
319 046 Standard Telephones and Cables, Ltd. (L. J. J. Schreiber). Switching-mechanism for automatic or semi-automatic telephone systems. (14/6/28.)
319 050 Electrolux, Ltd. (Platen-Munters Refrigerating System Aktiebolag). Evaporator units for refrigerating-apparatus. (15/6/28.)
319 051 C. F. Burton and H. Burton. Dials or the like for electrical condensers or other electrical instruments. (15/6/28.)
319 055 Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories, Inc.). Aerial systems. (15/6/28.)
319 058 J. B. Tucker. Electrical plug and socket connections. (16/6/28.)
319 061 Radio Instruments, Ltd., and W. L. Shaw. Iron-cored inductances. (16/6/28.)
292 600 C. Lorenz Akt.-Ges. Maintenance of constant frequency in high-frequency electric circuits. (24/6/27.)
319 072 British Thomson-Houston Co., Ltd., and R. D. Parry. Control of electric motor generator sets. (19/6/28.)
319 074 General Electric Co., Ltd., and R. J. Kaula. Electric terminals. (19/6/28.)
319 080 J. Durham. Amplifiers of sound-reproducing instruments. (25/6/28.)
319 085 C. E. Fry. Coin-freed mechanism, particularly applicable to prepayment devices for use with electric meters. (29/6/28.)
319 088 N. E. Goodrich. Massaging machine with electromagnetic engines. (3/7/28.)
319 095 R. Nettl. Electric lampholders. (16/7/28.)
319 100 P. D. Tyers. Portable wireless receiving apparatus. (19/7/28.)
319 115 L. Tschorner, L. Television apparatus. (15/8/28.)
299 865 Siemens-Schuckertwerke Akt.-Ges. Induction motors. (3/11/27.)
319 120 E. Quartier. Means for automatically controlling an electromagnetic device. (20/8/28.)
319 121 M. Trouton and Wireless Music, Ltd. Electromechanical vibrating devices for use, for example, in loud-speakers. (21/8/28.)
319 133 A. H. Seabrook and A. Avis. Poles, masts, and the like for supporting overhead electric wires and for similar purposes. (8/9/28.)
297 388 Telefonaktiebolaget L. M. Ericsson. Impulse senders of the finger-disc type. (20/9/27.)
319 141 A. E. Bowyer-Lowe. Wireless receiving-apparatus. (21/9/28.)
297 847 Marconi's Wireless Telegraph Co., Ltd. Thermionic valves. (29/9/27.)
319 147 R. Brandt. Method of and apparatus for the electrolytic revivification of ferrocyanide of potassium formed in the purification of gases by oxidation of hydrogen sulphide with ferricyanide of potassium. (4/10/28.)
298 241 Siemens and Halske Akt.-Ges. Electromagnetic relays with two armatures. (6/10/27.)
298 490 Rheinisch-Westfalisches Elektrizitatswerk Akt.-Ges. Protecting-device for current-distributing plants. (7/10/27.)
319 156 H. H. Thompson, A. E. Davies, and W. E. Box. Magnetic separators. (30/10/28.)
300 124 Telefunken Ges. für Drahtlose Telegraphie. Apparatus for amplifying and/or rectifying oscillations. (5/11/27.)

Applications for Patents.

August 31st.

26 565 R. H. Barbour and Electrical Apparatus Co., Ltd. Voltage control of transformers.
26 554 H. Bigg-Wither, W. Bruce-Brown and G. A. Pfister. Electrically-operated mechanism.
26 552 Ferranti, Ltd, E. D. T. Norris. Transformers.
26 530 H. F. Godfrey. Electric motor.
26 544 H. L. Kirks. Masts for wireless aerials.
26 543 M. Lazarus. Electric rectifying devices. (1/9/28, U.S.)
26 508 M. Wilderman. Electric batteries.

September 2nd.

26 658 W. Barsties. Devices for transmitting electrical indications, etc., to a distance.
26 666 Belling and Lee, Ltd., W. J. Byrne and E. M. Lee. Electrical connections.
26 633 J. Boot and Siemens and General Electric Railway Signal Co., Ltd. Electric signalling systems.
26 613 British Thomson-Houston Co., Ltd. and C. J. Morton. Ignition.
26 609 F. H. Constable and Radiovisor Parent, Ltd. Controlling temperature of light sensitive cells.
26 617 H. W. Cron and S. D. White. Electric junction boxes, etc.
26 667 Limit Engineering Co., Ltd. Supporting arms for electrical pick-ups.
26 621 G. Pedrazzo. Switch for controlling multiple power electrical machines. (4/9/28, Italy.)
26 632 F. A. Pike. Protective casings for electric cables, etc.
26 605 H. H. M. Shurlock. Telephone receivers.
26 670 Submarine Signal Co. Submarine acoustic apparatus. (27/10/28, U.S.)

September 3rd.

27 771 C. S. Agate and J. E. Rhys-Jones. Wireless receivers.
26 778 Associated Electrical Industries, Ltd. and J. H. Crossley. Electric heaters.
26 779 Associated Electrical Industries, Ltd. and T. B. Somerville. Automatic regulator systems for electric circuits.
26 754 British Insulated Cables, Ltd. Sealing devices for cables, etc.
26 755 British Insulated Cables, Ltd. and L. B. Wilson. Electric welding machines.
26 746 British Thomson-Houston Co., Ltd. Ignition apparatus.
26 693 A. B. Coleman. Connecting electric immersion heaters to tanks, etc.
26 717 H. I. Danzier. Electrical condensers.
26 795 H. Dietzins and Siemens-Schuckertwerke A.G. Electric individual drive for high speed revolving bodies.
26 790 H. E. Humphries and Siemens Bros. and Co., Ltd. Electric receiving and signalling apparatus.
26 695 J. Neale. Thermo-couples, etc.
26 806 S. Prisner. Kinematograph, television, etc., projection apparatus.
27 049 Soc. Italiana Pirelli. Electric cables.
26 752 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Shielded electric cable.
26 753 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.) Terminal circuit for telephone cables.

September 4th.

26 897, 26 898, 26 899 Associated Electrical Industries, Ltd. and D. B. Hoseason. Dynamo-electric machines.
26 900 Associated Electrical Industries, Ltd. and D. B. Hoseason. Electric motors.
26 913 Automatic Telephone Manufacturing Co., Ltd., C. E. Beale and R. Taylor. Telephone systems.
26 887 British Thomson-Houston Co., Ltd. Transformer cores. (4/9/28, U.S.)
26 888 British Thomson-Houston Co., Ltd. Encased electrical apparatus. (4/9/28, U.S.)
26 889 British Thomson-Houston Co., Ltd. Electron discharge devices. (4/9/28, U.S.)
26 890 British Thomson-Houston Co., Ltd. Photoelectric cells. (27/9/28, U.S.)
26 891 British Thomson-Houston Co., Ltd. Cores for air-blast transformers.
26 811 J. Cooper, Provincial Incandescent Fittings Co., Ltd. and J. Webber. Milliampere meters, etc.,
26 904 Electrical Research Products, Inc. Printing films with sound and picture records. (25/9/28, U.S.)
26 907 General Electric Co., Ltd. and W. Wilson. Electric relays.
26 920 W. O. Heyne and Plessey Co., Ltd. Variable condensers.
26 852 A. E. Howard. Electric lamp holder.
26 869 Lignes Telegraphiques et Telephoniques. Electric cables, etc. (14/9/28, France.)
26 822 R. Pearson. Electric cable connectors.
26 923 S. Prisner and E. Wender. Electro-acoustic instruments.
26 874 Raytheon, Inc. Electron discharge apparatus. (17/9/28, U.S.)
26 924 Reliance Electrical Wire Co. Winding wire.
26 848 A. Ristow. Method of calling wireless stations. (19/11/28, Germany.)

COMING EVENTS.

Friday, December 13th (To-day).

Institution of Engineering Inspection.—Royal Society of Arts, John Street, Adelphi, London. Paper by Capt. B. H. Peter on "The Trend of Development in Railway Signalling." 5.30 *p.m.*

Junior Institution of Engineers.—Royal Society of Arts, John Street, Adelphi, London. Inaugural meeting. Induction of Sir Ernest Moir as President. Address, "Some Engineering Difficulties and How They Were Overcome." 7.30 *p.m.*

Saturday, December 14th.

Association of Mining Electrical Engineers (South Wales Branch).—South Wales Institute of Engineers, Park Place. Lecture by Mr. W. T. Anderson on "Mining Cables." 6 *p.m.*

Association of Mining Electrical Engineers (Western Sub-Branch).—Paper by Dr. Stanley Phillips on "Electricity in Mines—First Aid."

Monday, December 16th.

Institution of Electrical Engineers.—Royal Technical College, Glasgow. Lecture by Dr. H. Norinder on "Surges and Over-Voltage Phenomena on Transmission Lines due to Lightning and Switching Disturbances." 7.30 *p.m.*

Tuesday, December 17th.

Institution of Electrical Engineers (Students' Section of the North-Western Centre).—Engineers' Club, Albert Square, Manchester. Paper by Mr. J. M. Gillespie on "Some Problems in Industrial Control Gear." 7.15 *p.m.*

Association of Supervising Electrical Engineers.—Junior Institution of Engineers, 39, Victoria Street, London. Lecture by Mr. S. S. A. Watkins on "Synchronisation of Films and Speech." 7.15 *p.m.*

Paisley Association of Electrical Engineers.—39, High Street, Paisley. Lecture on "A New Electrical Method of Determining the Pressure in Engine Cylinders." 7.30 *p.m.*

Wednesday, December 18th.

Electrical Contractors' Association (Sussex Branch).—Midland Bank Chambers, Brighton. Ordinary meeting.

Overhead Lines Association.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Discussion introduced by Major T. Rich on "Some Continental and British Methods Compared." 5.30 *p.m.*

Electrical Power Engineers' Association. (Manchester Group).—Geographical Hall, St. Mary's Parsonage, Deansgate. Lecture by Mr. H. L. Guy on "Developments in Power Station Condensing Plant." 7.15 *p.m.*

Institution of Electrical Engineers (Sheffield Sub-Centre).—Royal Victoria Hotel. Paper by Mr. J. F. Colquhoun on "Public Street Lighting." 7.30 *p.m.*

Thursday, December 19th.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Papers by Lt.-Col. S. E. Monkhouse and Mr. L. C. Grant on "The Heating of Buildings Electrically by Means of Thermal Storage," and Mr. T. G. N. Haldane on "The Heat Pump—An Economical Method of Producing Low-Grade Heat from Electricity." 6 *p.m.*

Institution of Electrical Engineers (Hampshire Sub-Centre).—Municipal College, Portsmouth. Paper by Mr. G. Shearing and Captain J. W. S. Doring on "Naval Wireless Telegraphy Communications." 7.30 *p.m.*

Friday, December 20th.

Electrical Development Association.—Roya Society of Arts, John Street Adelphi, London. "Display of Electrical Cinematograph Films." 7.30 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, Westminster. Informal meeting. Lecture by Mr. W. Challis on "Light Signalling on the Southern Railway." 7.30 *p.m.*

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THE ELECTRICIAN

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The Shanghai Power Company's Edinburgh Road Sub-Station, Shanghai.

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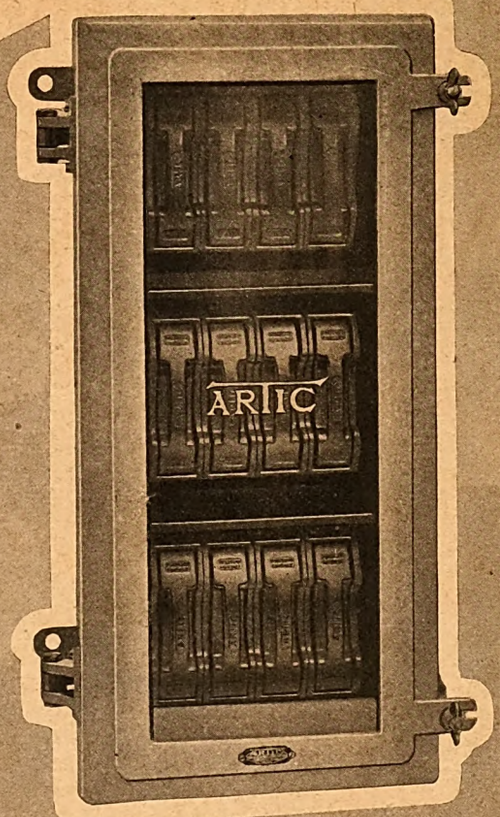

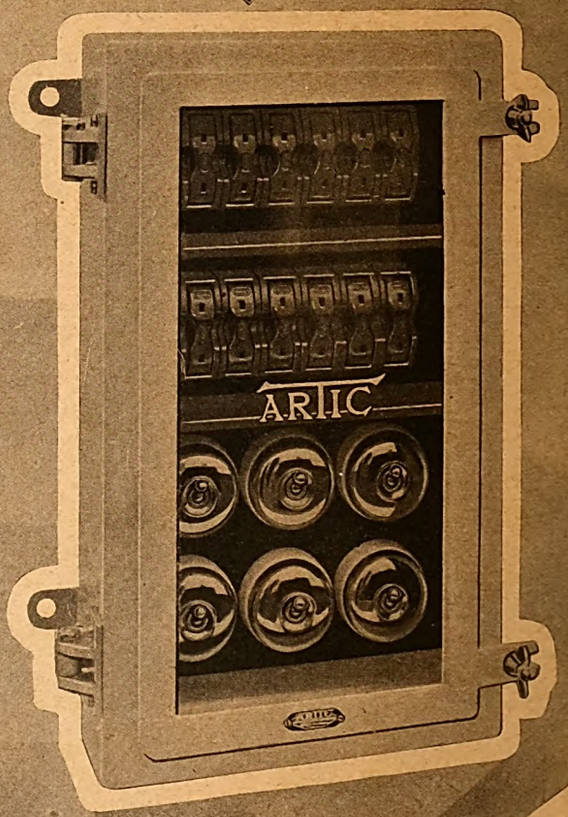

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CHRISTMAS HOLIDAYS.

The offices of "The Electrician" will be closed on Wednesday and Thursday, December 25th and 26th. Communications for the Special Annual Review Number, dated December 27th, should reach the Editor not later than Saturday, December 21st.

Current Topics.

Power Station Architecture.

IT is gratifying to note that the London Power Co. has retained the services of "a very eminent London architect" to design the building of the new Battersea power station. It may sound almost sacrilegious to say that most of the recently opened stations are architectural monstrosities, but unfortunately they are nothing more or less than that. Power stations assumed the general outline of to-day mainly because buildings so shaped will conveniently and economically house the necessary generating and boiler plant. So long as the power house remained a severely utilitarian job it had its redeeming features. Growth of a desire to make these structures more attractive has, unfortunately, gone unguided to the most precious limits of fussy applied ornamentation, which not only serves no good purpose but detracts from the essential dignity associated with any frankly engineering structure. Much of the blame for the present state of affairs must rest with the municipalities which entrust the borough surveyor with the architectural work of a power station. This is obviously wrong, and so long as the practice persists we cannot hope to have attractively designed power stations. Churches, cinemas and various other types of public building are now being erected in shapes owing little if anything to tradition, and all, or nearly all, to the purposes they fulfil in our modern civilisation. We can see the power station of the future, with its harmonious and pleasing lines, but we cannot tell how far into the future this prevision goes until some of our foremost architects have had an opportunity to design structures worthy to take their place among other public buildings of the twentieth century. As a start, we would suggest that the E.D.A. or some other interested body should inaugurate a competition, with suitable prizes for a design for a capital power station without restrictions on form or lay-out, except those naturally imposed by the plant which it will house.

Our First "Annual Review."

OUR next issue will contain the first comprehensive review of electrical industry affairs that has yet been published. One of the main features will be a review of technical progress in various branches of electrical and allied activity, written by specialists in their several spheres. Another interesting section will be a review of the progress made during the year by the numerous professional and trade associations connected with the industry. These two features alone will include some fifty separate signed contributions, and already it is certain that there will be an exceptionally big demand for copies of this authoritative review of the work of the industry during 1929.

E.D.A. Advertising.

WE have so often found it necessary to complain about the unsuitable positions formerly allotted in many of the daily papers to advertisements issued by the Electrical Development Association that we are particularly glad to notice the improvement in this respect in the placing of the "plug into comfort" series which is now appearing. One particularly happy choice of position was noticed in a London evening paper last Friday, where one of these announcements was included on a page which was otherwise solely devoted to builders' advertisements of houses for sale. The page is one that is carefully studied by those requiring house accommodation, and in such a context the advice "Ask your builder to fix an electric plug point in every room" may be expected to reach a section of the public that is directly interested in matters of this kind.

"Plug Conscious."

IT is pointed out in the latest E.D.A. Publicity Programme that the advertising activities now being undertaken in connection with the Electric Homes

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(Outlet) Campaign are designed to make the public plug conscious, or in other words to make them realise the need for installing more plug points in their houses. The idea which, by the way, was first exploited by the Electrical Association for Women, is now being driven home by means of regular advertising in 72 national journals and through distribution of copies of the booklet "The House you Want." The constant and widespread reiteration of the single idea behind this effort cannot fail to do good, and we would urge contractors to make the most of the opportunities so created to equip houses in such a way as to permit the proper use of all classes of domestic electrical equipment. Thus the Outlet Campaign will carry a special trade significance as the provider of outlets for electrical appliances which would normally remain unsold on account of the prospective user's inability to make use of them.

Electricity and Ventilation.

It has long been recognised that proper ventilation bears a direct relation to the success of any business enterprise. The public instinctively avoids a theatre where the ventilation is known to be extremely poor. Retail shops, and especially the big stores, where many people congregate and where outdoor clothes are seldom removed, should have the very best of ventilating systems, not only for the sake of the comfort of customers, but for the sake of the efficiency of employees. The same thing is true, perhaps, in an even more marked degree, in restaurants. In the factory or on the farm, in homes, offices, hotels, laundries and garages, in fact in every indoor situation, positive ventilation that provides fresh air without decreasing the comfort of the room is of the utmost importance, particularly in cold weather. Bearing these facts in mind, and knowing that the electric fan provides the most efficient ventilating service, it is surprising that most of us still regard the fan business as a seasonal matter. Sales effort based on an appeal to the customer's appreciation of the advantages in maintenance of mental and physical energy, better and more even factory production, should arouse interest in good air conditions and the apparatus which creates them.

Restaurant Cooking Possibilities.

It cannot be said that the development of the use of electricity in English hotels or restaurants for cooking has been rapid or widespread. Probably it is quite 25 years since English caterers began to use electricity for some of the smaller culinary functions, but to-day there are few first-class English hotels where the greater part of the cooking is not still done on a large central coal range. It is a characteristic of the greatest chefs of the world that, though they may be continually devising new recipes, yet, in the methods of cooking them, they like the ways of their grandfathers. And from their own point of view they may be right. The chefs of old who have made culinary history used coal for fuel; and cuisine de luxe has evolved on the central coal range. Yet, for many years, the best ocean liner galleys have been electrically equipped. The time is certainly ripe for making a real effort to get the hotel cooking business, and there is no reason why other kitchens where economy of space is a primary consideration, such as those on railway trains, small high-class teashops and cinema cafés, should not be included in the drive. In the large hotels there are possibilities of greatly increased cooking installations for grills, fish fryers, hotplates, and (especially in the pastry kitchens), where it is specially necessary that there should be cleanliness, a cool atmosphere and easily controlled heat."

Britain's Overseas Trade.

Exports of British merchandise were valued at £63 125 000 in November 1929, or £2 428 000 per working day, as against £2 392 000 in October. The total British exports for the first eleven months of 1929 amounted to £671 125 000, or about 1·2 per cent. more than in the corresponding period of 1928. Exports of raw materials were up by £8 993 000, and those of manufactured goods down by £2 621 000, but changes in the level of values, which improve the position from the quantity point of view, must be remembered. Total imports into this country were about 3 per cent. higher than for the same period of last year, at £1 013 472 000, and it is interesting to note that raw materials increased in value by 6·5 per cent. Since most of this material will be shipped as exports in the form of manufactured goods, the increase is significant.

The Electrical Figures.

So far as our own industry is concerned it will be appreciated from the details of the Board of Trade returns published on another page, that electrical exports, with an improvement of £177 457 on November of 1928, are still holding their own. For the eleven months of this year electrical exports again showed an increase when compared with the corresponding months of last year, the amount in this case being nearly £1 000 000. Imports last month showed a rather unfortunate increase of £237 889, but this is partly offset by exports for the month showing an excess over imports of £929 376. The main contributors to the higher import total were telegraph and telephone instruments, £72 476, and electric glow lamps, £37 290. We shall not know until next year what improvement has been made over last year's grand total, but for the time being it is satisfactory to note that electrical exports, so far, exceed imports by £10 334 440, with still another four weeks to run. At this time last year the favourable trade balance stood at over £11 000 000, but since the prices of both raw materials and manufactured goods have dropped since November 1928, the lower cash volume does not by any means represent a smaller volume of exports. On the contrary it may quite conceivably mean an increase.

All Fuming on the Battersea Front.

Objectors to the erection of the new Battersea power station are fuming again; they seem, in fact to have fumes on the brain. Not content with definite assurances from the power station authorities and from the Government that the station would not be permitted to cause a nuisance they went on objecting. Not even the White Paper containing reports of eminent chemists on the success of tests at Grove Road have stopped their fuming, and this week the matter has again been raised in Parliament. As the position of the objectors is amply safeguarded by the conditions laid upon the London Power Co. one can only assume that continuance of the protests is due to reasons other than those for which so much publicity has been obtained. The fume problem is obviously one that must, and will be solved, but agitations of the kind referred to hinder rather than help those who are working to that end.

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LOAD CONTROL.

Ingenious System for Reducing Risks of Failure to Supply—Telephonic Intercommunication—A "Mimic" System Diagram—Work of the Control Engineer—Maintaining Standard Frequency.

SOME idea of the ingenious nature of the arrangements made for reducing to a minimum risks of failure of its supply of energy were gleaned on the occasion of a recent inspection of the London Power Co.'s control room at Ergon House, Horseferry Road, Westminster.

The company's load, which is mainly lighting, varies from about 170 000 kW to 270 000 kW. There are four generating stations working—Willesden, Grove Road, Bow and Deptford West, and about fifteen switching and sub-stations. The system is interconnected in such a way that one generating station can take over part of another station's load in case of a sudden increase of demand or breakdown of any part of the plant, while each of the switching and sub-stations is connected with two generating stations, so that it can be switched over from one to the other when necessary.

The control room at Ergon House, where one or more control engineers are always on duty, is approximately 35 ft. square, and from this room the control of the whole of the system of the company is effected, largely through the medium of a suitably planned and efficient system of telephonic communication between the control centre, generating stations, switching stations and all the principal sub-stations connected to the system. In the centre of the control room is the control desk. The centre portion is called the control switchboard, and it is flanked on either side by control desks. The control desks are equipped with telephones through which any point of the system can be communicated with, and it is at these desks that the control engineers sit to perform their duties of controlling the system.

Station Data.

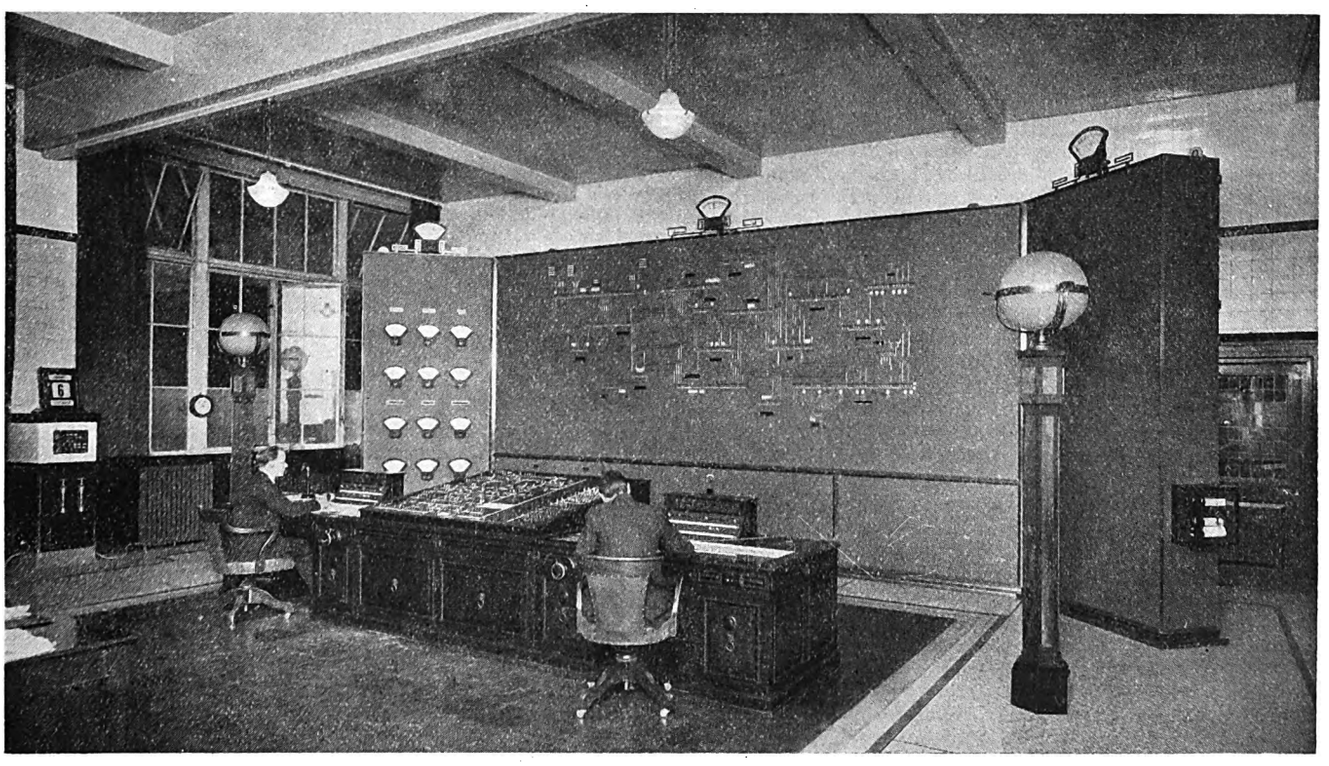
Facing the control desk is a steel structure which may be divided into three sections, viz.: a left wing, a centre panel, and a right wing. The left wing is the instrument panel, and is equipped with instruments indicating the following particulars from each generating station: (1) the operating steam pressure of the boilers; (2) the total instantaneous output of the station; (3) the voltage obtaining at the station; and (4) the frequency of the generators.

This information is transmitted automatically from each generating station to the instruments on the above-mentioned instrument panel in the control room by means of pilot wires laid between the generating stations and Ergon House, so that the indications showing on the master instruments in the generating stations are reproduced on the instruments in the control room. At the top of the left-hand wing or instrument panel is a voltmeter, indicating the voltage of the interconnected system. By means of a multiway switch the voltage obtaining at any one of the generating stations can be indicated on this instrument, and at the bottom of the left-hand wing is the frequency indicator of the system.

The System Diagram.

The centre panel is the system diagram panel, and it is upon this panel that the whole system is depicted diagrammatically. The panel itself is composed of $\frac{1}{4}$ in. thick steel plate. All feeders, and interconnecting cables between generating stations, switching stations and distributing stations, are depicted by monel metal strips. Thus a "mimic" diagram of the system is produced. It indicates in what manner the system is electrically coupled, and the in or out position of every switch on the system. The switches at every generating, switching or distributing station are represented on the diagram by small glazed holes called "light windows," and, by means of a special system of lighting, a green light or red light appears in the window, depending upon whether the switch at that point is switched out or in. No light appearing in the window indicates that the particular switch is out of commission. The illumination of the light windows representing switches on the system is controlled from the centre portion of the control desk by means of miniature switches operated by the control engineers as they modify the switching disposition of the system.

The control engineer, by means of the telephone, communicates with a responsible person at the point at which he requires an alteration to the switching conditions made. On completion of the operation he, by means of the miniature switches on the control switchboard, repeats the operation he directed to be carried out, thus reproducing on the "mimic" diagram the altered conditions of the switching at the point in question. Every light window representing a switch on the mimic diagram has a corresponding miniature switch on the control switchboard.



A view of the control desk with the instrument panel, system diagram panel and other devices used in the London Power Co.'s control room at Ergon House, details of which are given in the accompanying article.

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At the bottom and left-hand corner of the central or system diagram panel there is a "plant panel," and upon this panel there is provided a light window for every boiler and generator installed at each of the generating stations. The illumination of these windows is also controlled by the control engineers, and is based on information obtained from the several generating stations. They are thus enabled at any time to observe at a glance the following particulars obtaining at each generating station :—(1) Boilers steaming ; (2) boilers in reserve ; (3) boilers out of commission ; (4) generators on line ; (5) generators in reserve, and (6) generators out of commission. Every boiler and generator is numbered, and has its own corresponding light window. A red light in the window indicates that the boiler or generator, as the case may be, is, in the case of a boiler—steaming ; and in the case of a generator, on line. A green light indicates that the boiler or generator is held in reserve, and non-illumination indicates that the plant is out of commission.

Above the centre panel is an instrument on which the total instantaneous load on the whole 50-cycle system is indicated, and in the centre of the lower panel there is inserted a cyclometer, upon which is indicated the total output capacity of the generators connected to the system, so that by deducting therefrom the reading of the kilowatt indicator the amount of reserve output is immediately obtained.

Maintaining Standard Frequency.

On the right hand wall of the control room there is a case containing a swinging pendulum and three dials. This apparatus constitutes the device for maintaining standard frequency over the whole system. The lowest dial is a special pendulum-driven clock indicating Greenwich mean time, and is designated the master clock. The centre dial is a specially constructed clock driven by a small synchronous motor off the interconnected system of the company. This clock keeps correct time provided an average frequency of 50 cycles per sec. is maintained. The top dial is a combination of the lowest and centre dials, and consequently it indicates the deviation between "electrical time" and "Greenwich mean time," or, in other words, it provides an indication of the amount by which the summated frequency of the electrical system is gaining or losing in comparison with standard time.

Practically similar instruments are installed in the generating stations. These are controlled so far as Greenwich mean time is concerned by the master clock in the control room at Ergon House. Therefore, any departure from standard frequency is at once seen and corrected. Electrical time or the frequency of the system is shown on the top dial by the movement of the red hand, while Greenwich time on the same dial is shown by the movement of the black hand, so that if the frequency of the system is greater than it should be the red hand will be in advance of the black, and conversely, if the speed of the system is less than it should be the red hand will be moving behind the black hand.

In designing the control system, emphasis has been laid on the desirability of maintaining personal contact between the control engineers and the personnel at the various power houses, switching stations and sub-stations, with the resulting establishment of a desirable teamwork spirit.

Messrs. A. Reyrolle and Co., Ltd., supplied the main control board, Messrs. Evershed and Vignoles, Ltd., the Midworth repeaters and instruments, Standard Telephones and Cables, Ltd., the telephone outfit, and Messrs. Everett, Edgcumbe and Co. the time clocks.

Another point of interest regarding the system is the collection of data with regard to changes in climatic conditions. The control engineers have collected valuable information to guide them in directing the generating stations supplying the system, as to what load will be required of them from day to day, and from hour to hour. For each successive week a schedule is sent in advance to the stations, disclosing an estimate of the morning and evening loads expected under normal conditions, so that the necessary plant may be held in readiness. By observing the daily actual load demand at or about 8 a.m., and after studying the weather conditions, the control engineer, by means of the use of functional constants, or by reference to specially prepared curves, is able to establish an estimate of the morning peak load. With this estimate in front of him he allocates the anticipated total load to the various generating stations, and, therefore, at or about the hour named above, each station is informed what proportion it will be expected to meet at the morning peak, is instructed what plant to have on line, and the amount of power to be held in reserve.

The same procedure takes place at or about 2 p.m. in connection with the evening peak load. The estimated load and the actual load obtained are recorded on a chart twice daily, each chart being of sufficient size to accommodate the necessary data for one month. This chart is analysed daily, and new functional constants are set down for future reference.

BOOK REVIEWS.

Electric Traction: A Treatise on the Application of Electric Power to Electric Traction on Railways and Tramways. By A. T. Dover. Second Edition. (London : Sir Isaac Pitman and Sons.) Pp. xx+719. 25s. net.

Developments in electric railway traction since this excellent work was first published have rendered desirable a revision of much of the original matter. Generally the plan and arrangement of the first edition have been retained but the new edition contains a number of additional worked examples and a section on trolley buses and their equipment. For those who are not familiar with the book, it should be explained that it deals with the principles relating to the application of electric power to railways, tramways, giving representative examples of modern practice in both fields.

The subject matter is arranged under the following heads : Mechanics of train movement ; control ; auxiliary apparatus ; rolling stock ; detailed study of train movement ; track and overhead construction ; distributing systems and sub-stations. Not only the student, but the practising engineer, will find the work most useful. G. W. L.

Electric Street Lighting. By Charles J. Stahl. (London : Chapman and Hall.) Pp. xi + 228. 17s. 6d. net.

That this book is concerned with American conditions is obvious from the author's statement that no attention is given to gas, "since it is not in general use for street lighting purposes." In this country street lighting has been one of the few remaining strongholds of gas, though this unsuitable illuminant is gradually being eliminated, in spite of strenuous attempts to boost the use of gas by the high-pressure system. Although the subject is dealt with from the American point of view many of the problems involved are common to both countries, and though the U.S.A. can show some remarkable examples of ornamental and "white way" lighting, the general level of street illumination there is little, if any, higher than it is here. It is difficult to go far into the principles of lighting without touching on technicalities, but the author has to some extent succeeded in his attempt to avoid such intricacies in order to make clear to the uninitiated such information as will be useful in the design of street lighting installations, and in the selection and use of suitable equipments for various conditions. From this point of view the book should appeal to members of Lighting Committees and others interested in the subject as representatives of the public. On the other hand, designing engineers and others engaged in street lighting work should gain from it some general assistance in the solution of constructional, maintenance and operating problems capable of some degree of standardised treatment. Within the limitations of such a comparatively short book the author has covered the ground very well. S. W.

Elements of Electrical Engineering. By Arthur L. Cook. (London : Chapman and Hall.) Pp. x + 584. 20s. net.

Intended as a short course in the fundamentals of electrical engineering and their application in practice, this work, now in its second edition, is directed to non-electrical as well as to electrical students in colleges, though the former is expected to have such a knowledge of the principles of electricity and magnetism as would be given in a course of physics. The first edition appeared in 1924, but apart from general revision, a considerable amount of new matter has been added. The chapters on commutation, armature reaction and commutating poles and compensating windings have been re-written, and the subjects have been treated from the standpoint of modern d.c. dynamos. The treatment of parallel a.c. circuits has been changed and made more general. A new set of problems has been substituted for those of the first edition, but the character of the problems has not been changed. W. L. S.

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ROUND THE JOBS.

The Importance of the Electrical Sub-contract—Reflections on Some Stupid Conventions—Rising Mains for Flats—"To Earth or Not to Earth Interchangeable Apparatus."

By "CONTRACTOR."

AN American journalist, when engaging a young reporter, said: "What we want here is news and nothing but real news. If you see a dog biting a man on Broadway, that is not news, and we don't want it; but if you see a man biting a dog on Broadway, that is news, and we do want it." That story might be translated into terms of the electrical industry thus, I think: "If you hear anyone telling an electrician that it is his (the electrician's) fault, that is not news. But if you hear an electrician telling the other man that the latter is wrong, then that is news."

In the same way that, as a nation, we are a little bit prone to take the kicks without attempting to assert our superiority, so in the electrical industry—or, at any rate, in the contracting branch—we are a little bit prone to play the part of the office cat for the shortcomings of others. Of all the sub-contracts which go to the making of a modern building none is so important as the electrical sub-contract. That is not merely an arrogant statement from a prejudiced member of that side of the industry; it is a fact which a moment's thought will show to be correct.

Yet, in spite of this fact, the electrical sub-contract is probably the one which receives the least attention from the authorities interested in any constructional work. From first to last on the job, the electrician is a —— nuisance. In the first place, he is a nuisance because he cannot squeeze a $\frac{5}{8}$ in. tube into $\frac{1}{2}$ in. space. At the end he is a nuisance because the very nature of his trade ordains that he shall be the last on the job. Irate principals, architects, and builders dance round the poor electrician while he fits the last lampholder, squealing with rage because the lampholder was not erected a week ago, quite oblivious to the fact that a week ago the ceiling was not even plastered.

In this connection I think it is a wise plan for all electrical contractors to keep uppermost in their minds the importance to their customers of the electrical sub-contract, and to lose no opportunity, right from the very start, of impressing this fact upon their customers. I myself go further; I always tell my customers before the work starts that ours will be the last workmen on the job, just as surely as the guard's van is the last compartment in a train to reach the platform. And, incidentally, the analogy of the guard's van is appropriate in other directions as well.

There is rather a stupid convention which, like many stupid conventions, is dying hard, to the effect that all the paraphernalia connected with the introduction of electricity into a house, such as the meter, the main switch and fuse, and the distribution board, must be placed in some grotesquely conspicuous spot inside the house which they serve. Moreover, it seems to be the view that it is sacrilege to touch this gear with a paint-brush, and it is the commonest sight in the world to see a well-chosen wallpaper utterly ruined by these excrescences.

Sins of the Architect.

It is, of course, largely the fault of the person responsible for designing the house. This designer has probably had the brilliant idea of providing somewhere adequate space for the storage of coal so that this fuel need not be kept in a heap in the hall, but this brilliance has probably not extended to giving him the idea of providing adequate housing for the electrical control gear which his intelligence should have anticipated.

However, I am pessimistic enough to think that it will be many, many years before architects will have learnt sufficient about electricity to persuade them to provide such accommodation. Therefore, as electrical contractors, we must try to solve the problem thus brought about in the best way we can.

The vast majority of houses now being built contain a garage, which, in many cases, is part and parcel of the construction of the house. This, to my mind, is the ideal site for the electrical control gear, so long as discretion is used in the matter of placing it upon a dry wall. A further advantage of using the garage for this purpose is that it is usually situated on that side of the house nearest to the road, and that means nearest to the supply company's mains, so that a service brought to the garage will incur a minimum of cost.

Although there are exceptions, supply undertakings are not in the habit of giving anything away unless they are pressed. I daresay if I, in my business, were protected by Acts of Parliament in the same way that they are, I also might in time develop a somewhat independent attitude towards my customers.

One of the most depressing examples of this attitude is found in the absolute insistence of supply undertakings upon their rights in giving a service of electricity only to a block of buildings, and not to individual consumers. A man living in one of the top storey flats of an eight-storey building requiring an electric radiator or an electric cooker is faced with the prospect of running a main right down through the block back to the point of entry of the supply company near the pavement, unless his landlord has previously, at his own expense, had such rising main installed. It is, however, rare (in my experience) to find that adequate rising mains have been provided in such buildings for contingencies of this sort. Even where rising mains have been provided it is usually found that they have been designed on the basis of one 1kW fire per flat.

An Interesting Analogy.

This state of affairs is a great pity, and brings to mind the dreadful state of affairs which would exist if the butcher, the baker and candlestick-maker all refused to deliver their goods to the flat door, but insisted on dumping them exactly one inch inside the main door of the block of flats. But then the butcher and the baker and the candlestick-maker are not protected by Acts of Parliament, so they have to lump it and deliver to the flat door. There is only one solution that I can see. It is for the electrical contractor to canvass personally all the flats in such a block, asking if the tenants will combine to provide rising mains. But, even in this case, it is asking them to provide for future tenants of those flats as well as for themselves, and they may reasonably object. Again, if the electrical contractor succeeds in collecting a quorum, then it is true that he will himself benefit by such electrical installation work as may be necessary, but he will also have carried out what is really a labour of love on behalf of the electricity supply undertaking, whose revenue will be proportionately increased, both by the sale of electrical energy, and, if the contractor is not very quick, by the supply of all the electrical appliances for consuming such current.

It is a hard world!

"To earth or not to earth" is a vexed question, and one into which I am not going to be foolhardy enough to leap. For some time yet it will remain a matter of personal opinion, and the rules followed in various installation jobs will be those which appeal to the contractor who is responsible for the work.

Nevertheless, I think it is as well that every contractor should make up his mind as to which school of thought he favours. Even though he may change his mind later, he should have some principle which governs all his work. Thus, it is perfectly absurd for an installation to include some pieces of apparatus which are earthed through a 3-pin plug and other pieces of apparatus which are not. If there is one piece of apparatus in a house which is not earthed, then the customer can consider that he has wasted an enormous amount of money on the comparatively elaborate precautions taken to earth the remaining pieces of apparatus. This sounds obvious, yet it is not quite the platitude which it may seem, for at the present time there is a tendency—not nearly great enough a tendency, but, nevertheless, a tendency—to increase the number of domestic electrical appliances in use in the home. In such cases it is surely foolish to recommend a 3-pin plug for a new outlet when there already exist half a dozen 2-pin plugs in that household. If the contractor believes in earthing, then he should try to persuade his customer to have all his 2-pin plugs altered to 3-pin plugs; alternatively, he should be frank with his customer and point out that it is sheer waste of money to put a 3-pin plug in. Apart from all this, however, there is a much more serious aspect of the case, for where there is a household with some 2-pin and some 3-pin plugs there will be no interchangeability of apparatus, and that is damning to the development of the electrical idea.

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"DRESSING" THE SHOPPING DISTRICT FOR CHRISTMAS.

Enlisting the Co-operation of Retail Traders in Creating a Festive Atmosphere—Successful Results of a Christmas Holiday Decorations Scheme—The Encouragement of Exterior Lighting for Private Houses.

By ERNEST A. DENCH.

IN many American communities the local business men combine to make the shopping streets radiate the Christmas spirit, by elaborate decorative and lighting schemes. It gives the city a festive atmosphere and tends to induce shoppers to come from near and far to inspect the gift wares offered by the local stores. For the benefit of electricity supply undertakings and installation contractors who desire to increase business in this way, the following experiences may be of interest.

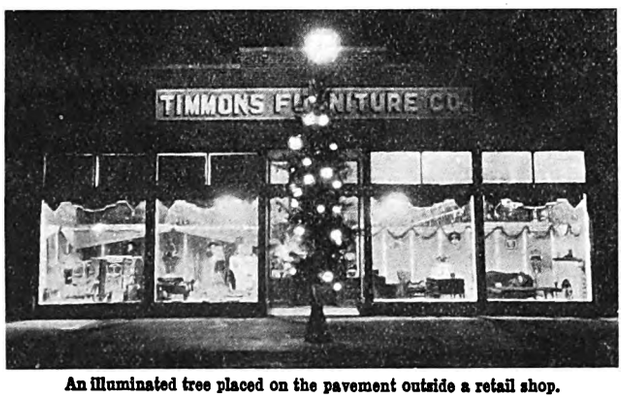
Co-operative Christmas illuminations in the shopping district of Salt Lake City.

In a small southern town last December, the retailers arranged, by being assessed so much a front foot for their business premises, for a series of coloured electric lamps to be strung along the main street. These lamps were hung in clusters at regular intervals on garland draped standards.

In other years the co-operating traders, for the good of the town, had defrayed the extra cost of the decorations in front of the premises of those retailers who refused to support the effort. Last year they tried to discipline their small-minded colleagues by allowing gaps to appear in front of certain shops. It didn't look well to outsiders, but it had to be done. Practically every retailer ought to be in accord with this exterior form of Christmas trading promotion. He may not think the financing is done correctly, or he may not like the layout, but these are minor details in comparison with the big issue.

A Holiday Decorations Committee.

None of the antagonistic spirit prevailing in the unnamed southern city marred the Christmas trade activities of the Retail Merchants' Bureau of the Salt Lake City (Utah) Chamber of Commerce. Here, the Holiday Decorations Committee decorated thirty blocks in the city's business district, where there are, all the year round, flag pole receptacles about 25 ft. apart. In each of these a 12 ft. Christmas tree was set. The Retail Merchants' Bureau purchased spruce trees with a minimum of 4 in. diameter at the butt. A 1 in. hole was drilled in the butt for a depth of 6 in., then two bands of heavy wire were clamped around the butt. A 12 in. length of pipe was next used; 6 in. in the base of the tree; while the other 6 in. went into the flag pole receptacles in the paving. This technique ensured the trees standing up through heavy wind storms. Last year 800 trees were used in the business district.



An illuminated tree placed on the pavement outside a retail shop.

Many of the co-operating stores added to the gala appearance of the trees in front of their premises by adorning them with coloured lights. The decorative scheme was enhanced by 210 evergreen wreaths, each of 3½ ft. diameter, hung upon the tramway trolley support wires midway between the curb and the outer tramway rail.

Salt Lake City's permanent street lighting system consists of standards supporting a series of three globes—two lower globes, with one above. Last December a special lantern designed by Mr. L. B. Gowans, illuminating engineer of the Utah Power and Light Co., was affixed to the two lower lights. The lantern, 3 ft. high and 20 in. in diameter, was made with sections or segments, in which were placed coloured glass. The decorative scheme last season embodied a straight coloured lighting effect—either green or red. The lantern was designed in four segments, so it will be possible, in forthcoming years, to vary the colour scheme with alternate sections of green and red. For special events, such as conventions and festivals, the prevailing colours can be duplicated at modest cost. In 1927, 210 of these lanterns were paid for out of the current year's budget. A further purchase of 210 lamps came out of the 1928 budget. The merchants in the business centre paid just over 1s. per foot of frontage for the service.

Example of Christmas lighting at a typical suburban home.

This Christmas spirit is infectious. One unexpected outcome was the spirited rivalry of residents in the suburban areas to duplicate, in some measure, the brilliance of the specially lighted streets. Here, of course, there was no uniform decorative arrangement; each home lover manifested his or her individuality, adapted to the type of house. Some of these lighting effects merit brief mention here.

At one of the most outstanding of the decorated residences of Salt Lake City, the front of the roof, over the small porch, was spanned with a large cut-out of Santa Claus and four reindeer; the whole illuminated by a spotlight from the edge of the roof. Near the chimney was what appeared at first sight to be a quarter of the moon. Actually, it was a cut-out attached to the chimney and bathed in a spotlight hidden on one of the trees in the garden. Beside each front entrance was a small decorated and lighted Christmas tree.

Near the back of the house, on the edge of the roof, was an allegorical figure in cut-out form of "The Three Wise Men of the East." Illiminated holly wreaths were in the house windows. In the garden there was a trellis studded with bouquets of coloured lamps.

Another dwelling had coloured electric lights attached to dwarf evergreens planted as a border against the house. Two rambler rose bushes were handled in the same manner and lighted wreaths of evergreens adorned the windows and doorway.

Experience at Salt Lake City has shown that this Christmas lighting is good for the electrical trade and for all the co-operating traders.

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BOOK-KEEPING FOR ELECTRICAL CONTRACTORS—II.

Books the Trader Must Keep—The Functions of "Working" Books—Dealing with Shop Orders—Keeping Track on Uncompleted Work.

By S. HOWARD WITHEY, F.C.I.

THE electrical contractor who desires to obtain the maximum of reliable information concerning the organisation, control, and the trend of the business, should keep the following books :—

TAKINGS BOOK, or Cash Sales Book, for recording particulars of the shop sales and services rendered on a cash basis.

DAY BOOK, for details relating to all fittings, accessories, motors, machines, batteries, instruments, switchgear, etc., supplied to customers on credit. At the end of this book a few pages should be reserved for entering up all returns inwards and allowances made to customers in lieu thereof.

CASH BOOK, for recording all cash received and all cash paid, whether in the form of cheques, notes, or coin.

PETTY CASH BOOK, for the classification of expenditure which it is either impossible or undesirable to detail in the cash book proper.

PURCHASES BOOK, or Bought Journal, for the systematic analysis of all apparatus, tools, engines, materials, and stores purchased, and for the recording of working expenses and other business charges as they accrue. The returns outwards and allowances should be entered in the end section of this book.

CONTRACT LEDGER, for the different contract accounts.

SALES LEDGER, for the personal accounts of customers and debtors.

PURCHASES LEDGER, for the accounts of suppliers and trade creditors.

A Locked Book.

GENERAL LEDGER, in which will be kept all management expenses, accounts, stock accounts, and asset and liability accounts, also copies of the periodical trading accounts, profit and loss accounts, balance sheets, and the costing statistics. This book should be provided with a lock and key.

In addition to these books of account, there will be a number of working books, the most important of which will be the order book. The entries made in the order book will constitute the real foundation for all entries made in the financial books, and for this reason it should be kept in a business-like manner.

The practice of depositing orders in a drawer or on the office desk is not a good one, and whether they come to hand through the medium of the post, from agents or representatives, over the telephone or are received by the contractor verbally or by messenger, they should be set down at once in a special book kept for the purpose.

Some electrical contractors prefer to use loose printed order forms as a part of what is called the slip system of account-keeping, the impression being that a considerable volume of clerical work is thereby avoided. In practice, however, this is not always the case, but the greatest disadvantage associated with the use of loose sheets is that some of them get filed away before the orders have been completed, or before the amounts involved have been properly charged against the customers. In those cases where the contractor is compelled to carry on without any clerical assistance, and where each order has his personal attention, the forms should be numbered in consecutive order and kept on a separate file, the completed orders being bound in book form to constitute a kind of order book and day book combined.

Where a considerable shop trade is transacted a duplicate book kept on the pen or the pencil carbon-copy principle will be very suitable for recording the orders. When the details have been set down the original form should be handed to the person or transferred to the department immediately concerned in the execution of the order, the copy being retained in the book for purposes of future reference. If another copy of each order is found necessary for use in the office, a manifold order book should be used, this book consisting of thin tissue leaves.

By far the best method, however, is the printed order book method, which ensures, as far as possible, that no business is lost through failure to carry out the instructions of customers. The precise ruling for this book will naturally vary to some extent in individual cases, according to the size of the business and the particular class of trade or kind of electrical products sold, but it will be necessary to provide for the insertion of the date on which each order was actually received ; the order number ; the customer's name and postal address ; details of the appliances or components required or a specification of the installation desired, and the rate or price. As a rule these columns can be filled in at once. Upon the fulfilment of an order, such particulars as the date of completion, or the date of despatch ; the goods or articles supplied or installed ; and the folio on which the transaction has been booked in the contractor's day book, should be entered, a good general style of order book being as under :—

ELECTRICAL CONTRACTOR'S ORDER BOOK.

Date Received.	Order No.	Customer's Name and Address.	Particulars of Apparatus, Components, Installation, etc., Required.	Rate or Price.	Date of Despatch or Completion.	Goods Supplied or Work Performed.	Day Book Folio.	Remarks

When any unusual conditions or stipulations accompany an order, these should be plainly stated in the "Remarks" columns, with the delivery and other instructions. Although in the majority of instances the details shown in the column "Particulars of Apparatus, Components, Installation, etc., Required" and those in the column headed "Goods Supplied or Work Performed," will correspond with each other, the contractor may be temporarily out of stock of the particular components specified by a customer, and may supply a part or parts differing only slightly from those mentioned in the original order ; consequently both columns should always be filled in.

At the end of each day's work it is a good plan to examine the entries made in the order book, and to scrutinise the "Day Book Folio" column. If all the orders recorded on any one page have been fulfilled, as proved by the existence of a day book folio against each, a neat line should be drawn diagonally across that page from corner to corner, thereby avoiding the need for wading through the book when reference has to be made to the details connected with an order on hand. All orders having no day book folio against them will, of course, constitute the unfulfilled orders, and the contractor should constantly have his attention directed to these, any that appear to have been outstanding for an unduly long time being subjected to investigation, to prevent any work being overlooked or only partly executed.

Sustained Demand.

Although demands for electrical products of both standard and special design are reflected in the contractor's order book, the creation of sustained demand is a problem calling for scientific treatment. Reiterated messages calculated to meet the eye, not only of the customer but also of the potential customer, usually have very definite and permanent results, and to increase turnover in these days of acute competition the man of business must adopt only those methods of advertising and publicity which have proved themselves to be consistent business pullers. Broadly speaking there are three kinds of advertisement, viz. :—The large displayed prestige advertisement, the object of which is to convey to the public a fixed idea of financial strength and stability ; the stock clearance advertisement which, by its nature, is only temporary ; and the sales continuity advertisement calculated to spread the turnover more or less evenly throughout the working year. To the average electrical contractor the latter method will be more satisfactory, but whether it should be effected in the press, through the medium of the post, or in the shop window, or by a combination of any of these, is a matter for the individual to decide.

Fulfilled orders automatically pass out of the category of orders and become sales or contracts, necessitating entries being made in the contractor's day book. In the next instalment of this series the best method of booking the sales, and also the returns inwards and allowances will be shown.

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NAVAL WIRELESS TELEGRAPH COMMUNICATIONS.*

Historical Details — Multiple Reception — Design of the Apparatus — Design of Transmitters for Long and Short Waves.

By G. SHEARING, B.Sc., M.I.E.E., and Capt. J. W. S. DORLING, R.N., M.I.E.E.

THE first experiments in wireless telegraphy in the Navy were commenced in 1896–7. Ranges up to 3½ miles were obtained. The transmitting apparatus consisted of a Heıtzian oscillator energised by an induction coil worked either from the electric light mains or from a 12 V battery. By the end of 1900, 43 ships and eight shore stations had been, or were being, equipped with wireless telegraph apparatus. In 1905 a naval wireless telegraph establishment was organised in " Vernon " and a 5 kW set installed in Portsmouth Harbour.

In 1906 the Wireless Telegraph Branch, in which men could specialise, was instituted, with good results. In subsequent years experiments were made with new wavelengths. In 1909 the crystal detector was first used. In 1910 a quenched spark set was built for a naval airship. During 1911–12 much experimental work was done with the Poulsen arc, and a 100 kW Poulsen arc was installed at Portsmouth in 1913.

Early Valve Reception.

In 1914 experiments on valve reception were commenced. Whilst spark and arc systems were mainly used on ships at sea during the war, it appeared probable that these systems would be superseded by the thermionic valve. Post-war developments have confirmed this view. Singl valves are now in use at sea capable of dissipating 8–10 kW at their anodes under oscillatory conditions.

Another feature has been the successful use of short wave communication.

Turning next to the requirements to be met by a naval wireless telegraph system, the authors point out that British men-of-war are to be found in all parts of the world. In the United Kingdom there are, therefore, wireless stations designed to communicate with ships in adjacent waters, and others for really long distance transmission. Each naval area has one or more wireless stations capable of communicating with (*a*) the Admiralty, either direct or through links; (*b*) the Commander-in-Chief of the station and his ships; (*c*) any merchant ships in the area; and (*d*) adjacent naval commands. To meet these requirements a medium power long wave valve transmitter of about 25 kW h.t. input, fitted for local working within a radius of, say, 1 500–2 000 miles, is usually fitted. For longer distances short-wave transmitters ranging from 2 to 10 kW h.t. input, are used.

Cruisers and other ships on foreign stations should be able to communicate with the shore station and with (*b*), (*c*) and (*d*). The equipment has the following characteristics:—(1) Range (long wave)—1 000–2 000 miles; (2) power (long wave)—12 kW h.t. input to transmitter; (3) power (short wave)—8 kW h.t. input; (4) valve transmitters are used in all cases; (5) receiving apparatus (long and short-wave), two or three sets are fitted; (6) direction-finding apparatus on the Bellini-Tosi system is fitted in most cruisers; (7) fire-control wireless sets are fitted for use when cruisers are concentrated in squadrons. It must also be robust, simple to handle, reliable under all climatic conditions, proof against vibration and the shock of gunfire, and capable of being maintained in full efficiency by the ship's wireless staff.

Next we must consider the main fleet, under the Commander-in-Chief who must be able to convey orders to any unit. Scouting units must be able to transmit information to the Commander-in-Chief and other senior officers. The Commander in-Chief must also be in touch with the Admiralty and other authorities.

All these lines of communication should work simultaneously without interference. This is usually done by multiple reception in the flagship, all transmissions being made by wireless guardships, pecially allocated for each wave. Short-distance apparatus is also fitted in special offices in the battleships, to permit of inter-communication within the fleet without interference with long distance lines. The striking feature of a fleet action is the speed with which everything happens. The two fleets may approach each other at 40–50 miles per hour; even with aircraft reconnaissance the time between first sighting the enemy and joining action may be only an hour or two. The volume of signalling during this period is very great, especially in the fleet flagship, and special means are necessary to ensure that no signal is delayed. The direction-finding sets fitted in some ships often prove of value in locating the exact position of enemy vessels or scouting vessels or aircraft. Wireless communications continue during the action. Also all ships use special low-power sets for fire-control.

In the next section of the paper the authors describe, by the aid of numerous sketches and diagrams, the design of offices and apparatus. Limitations of space on board ship have an important influence on design. Tests of apparatus are carried out by the contractor or dockyard under the supervision of H.M. Signal School, Portsmouth.

The powers supplies are next discussed. The power supply for both thermionic or spark wireless telegraph transmitters is mainly high tension low frequency a.c. For spark transmitters the frequency adopted was 350 cycles per sec. giving a note frequency of 700, but for valve transmitters this has been changed to 500 and 1 000 cycles respectively.

Power for the motor-generators is taken from d.c. busbars on power boards in the wireless office supplied from the ring mains, either 100 or 200 V being used. The ring main power supply is in duplicate. Duplication of machines and power panels is adopted, each motor-generator being installed complete with its own d.c. and a.c. control gear. Also either machine can be operated from either startor. The power panels are comprised in four main parts for the following purposes (1) d.c. supply and a.c. output board for the filament motor-alternators, (2) d.c. supply board for main alternators, (3) distribution board for lighting and auxiliary circuits, (4) a.c. distribution board for main alternator. Provision is also made for various indicating lamps and safety devices.

The authors next discuss in some detail the design of valve transmitters for long and short waves, the operating controls of valve transmitters, the design of valve transmitters having high constancy of frequency and transmitter oscillatory coils. Other features discussed are transmitting condensers and main aerial trunk and deck insulators. Two types of main aerial systems are employed:—(1) Sausage aerials having two or more legs, each comprising 10 wires on circular spreaders at about 1 ft. diameter, and (2) flat roof aerials of about 6–8 single wires in parallel, arranged along yards of 30 to 40 ft. in length. There is little difference as regards communication and the choice is settled mainly by mechanical considerations.

Accumulator Power Supplies.

The main receiving apparatus for heavy ships is installed in a silent room which forms a portion of the main wireless telegraph office. It is laid down as a general principle that all receiving instruments shall operate independently of the ship's mains, and the power supplies for anodes and filaments are therefore taken from accumulators. The question of providing an alternative power supply to the accumulator systems is now being studied. The wiring and arrangement of receivers to reduce interference has to be carefully carried out. Eight different sources of interference are mentioned. Interference from running machines is apt to prove especially troublesome.

Reference is also made to the design of receiving aerials and receiver design for wide frequency bands. Direction-finding apparatus has considerable tactical importance, and the authors, summarise various improvements which have made the process more expeditious.

* Abstract of a paper read before the Institution of Electrical Engineers.

BRISTOL ELECTRIC CLUB.

The Bristol Electric Club will celebrate its third birthday in January next, and at the second meeting of the Winter Session at the Crown Hotel, on December 13th, a supper and smoking concert were given. The performers at the concert were Messrs. S. Miller, E. Collins, G. Cooper, G. A. Davies, F. White, and Vie Davis, and the " Snooker " Cup, given by the president, Mr. A. H. Dowson, was presented to the winner, Mr. J. S. Mitchell, who is hon. secretary.

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CONTRACTING EPISODES.

More Leaves from the Notebook of an Old Electrical Engineer.

By "ELCON."

THERE are jointers and jointers, and some should spell it joiners.

A "T" joint found to overheat badly came into my hands for repair. The through cable had a copper core of about 1 in. dia., and the tapping a core of about ½ in. dia., and the join was effected as follows. All but the outer ring of strands of the tapping had been sawn short, the inner stump being then butted against the through core and a quantity of solder dabbed on. The outer ring strands of the tapping were then bent back and twisted round—not the through core—but the tapping, leaving nothing but a few surface cakes of solder effecting the join.

* * *

Another joint I made friends with was made thus. The two ends of a cut "through" core were bared for about 4 in., and on to this the bared end of the tapping was laid and bound with copper wire, giving a formation like a closed-up pawnbroker's sign.

The copper cores were in this case about 1 in. and 1 in. and ½ in., and no soldering had been attempted. When opened, all but a few strands had been eaten away, and the insulation was baked to a cinder.

* * *

A small supply company carrying out their own wiring work were, soon after the opening of the station, "bows under" with work, and obtained several new hands. One private unoccupied house was given over to two of these people, who promptly asked to be allowed to do the wiring on a contract basis. This was agreed to, and at the end of a fortnight there did not appear to be much of the 80-point job left unfinished, and they then wanted to leave and be paid up. Following them to finish the job off, I soon discovered that these smart lads had merely suspended some bits of wire through the ceilings and down the wall, not a single point having any connection with any other point, switch, or fuse board.

* * *

I have met this trick when blocks of houses have been wired for builders; bits of wire being pushed up the ends of conduit for switch points, and hung from the ceilings for light points, the one having no connection with the other.

* * *

In a certain building I was wiring with p.i.l.c. cable, I was called upstairs by a workman, to find a gasfitter, somewhat fuddled, trying to tap a compo pipe into one of my main cables. His perplexity at the difficulty of making a hole in the cable would have been amusing in someone else's job. His language at finding "the pipe stuffed full of goodness knows what" was well up to standard.

* * *

A firm I was with received a complaint that a sub-contract for wiring was not proceeding fast enough, and that no one appeared to be in charge to whom reference could be made. I was detailed to investigate the matter, and regarding the latter part, pointed out to the complainants that so and so, one of the wiremen, was in charge of the job. The elderly engineer to whom I offered this explanation remarked in reply: "My boy, my experience has been that wiremen are usually plumbers, joiners, or gasfitters, who are no d—— good at their own trade." In regard to those days, he was not very far wrong; nowadays they don't seem to try the other trades.

* * *

An advertisement for an electrician to put in a small private plant led to a meeting with a contractor who personally supervised and worked on the job. The plant consisted of about 40 lights run from a 50-V set supplied by surplus steam, the lights being, in about half of the cases, situated over clay drying trays from which clouds of steam arose day and night, saturating the shed roofs to a state of continual drip. The wiring system chosen by friend contractor was slip joint tubing, with a wood block in lieu of tees and elbows to cover the tube ends. Keyholders suspended by workshop flex from ceiling roses were used throughout. The cheapest grade of wire was also used, and joints galore pulled into the tubing. No joints were soldered, and the only covering was two or three layers of black tape. The switchboard was made of the wood from a packing case painted black. I was paid off when the job arrived at the stage of joining up to the dynamo, and expect the absence of "that d—— electrician I employed" came in pretty useful when he had to face the music later on.

* * *

Another sample of choice work I came across was an installation of lighting and some 500 H.P. of motors (three of which were large units, and all of 3-phase induction type) in a works where moisture was very much in evidence. The whole of the gear supplied, motors, controllers, fuse panels, etc., were designed for use with v.i.r. cable, but the whole of the power wiring was carried out with paper insulated lead sheathed stuff. No sealing ends to cables were used and no attempt whatever was made to protect the exposed paper insulation, which was treated throughout as though it had been v.i.r. The firm responsible for this job had its note-paper headed with a slogan "quality tells" or something of the sort. I anticipate the officials who finally inspected the work had something to tell that firm about quality.

"TO EARTH OR NOT TO EARTH?"

Interesting Contractors' Problem Discussed at I.E.E. Meeting.

THE informal meeting of the Institution of Electrical Engineers held on December 9th was for a discussion opened by Messrs. W. R. Rawlings and T. C. Gilbert, from opposing points of view, on the perennial question "To Earth or not to Earth?" The importance of the subject attracted a very large and representative gathering, and the views expressed showed that the earthing question, despite the official stipulation, is as moot as ever. Mr. W. E. Bradshaw was in the chair.

Mr. Rawlings said he had read with great interest Mr. Gilbert's articles and entirely agreed that the subject needed the fullest publicity. He felt that the Press notices of the last discussion did a great and valuable service to the industry in bringing home the importance of safeguarding the public against the possible dangers of alternating current at 230 V. He thought it must all result in a definite call for better materials and workmanship.

Mr. Rawlings said that as all were agreed upon the need for protection the discussion could be reduced to two points: (1) To earth or not to earth? (2) What system of wiring gives best protection to the public?

Upon the first point he held with Mr. Gilbert that to insulate is best, but he had still to learn how this can be effectively done. Until motors, cookers, radiators, fans, irons, kettles, etc., could be made of insulated material he believed there could only be one course, namely, to earth. He was fully aware that the present method of earthing had flaws and was misleading, but he pressed for a general and stricter observance of the practice.

Upon the question of the best system of wiring, he advocated earthed concentric wiring as providing a safe system which gives intimation of any leakage by automatically cutting off supply to the affected section.

Mr. T. C. Gilbert, who followed, said that if only a fraction of the time and energy spent in advocating the earthing of all exposed metal had been given to the consideration of ways and means for eliminating such metal we should to-day be in a much sounder position. The earthing idea seemed delightfully simple, and if it had proved as simple in practice there would be no opposition to it; but applied to domestic portable apparatus it was so remote from our idea of good practice that only legislation could enforce it. If after thirty years the practical man was still unconvinced, surely there must be good reason to suspect that the idea was unsound.

He agreed that very great harm was done to the industry by electrical accidents, and said that means must be found to reduce the risks, in view of the forthcoming universal a.c. supply. But he held that earthing was unworthy of being the sole reply of the industry to the menace confronting unskilled users of electrical apparatus. There were too many weak links in the chain, the failure of any one of which was probable. With universally earthed equipment, it would not be necessary for victims to get into baths or connect themselves to earth by similar means, as a convenient earth would always be at hand. Recently he found a child poking the metal handle of a toy into the element of a radiator; luckily the latter had not been earthed and a serious accident was avoided.

In some of the newer cookers it was extremely difficult to obtain a shock, owing to the thick coating of vitreous enamel

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with which they were covered. This was a step in the right direction, but even if we continued to construct cookers of iron our responsibility did not begin until we earthed the framework. There might be very high insulation between the boiling plate and the hob, and he could not repress a shudder when he thought of kettles, etc., used in proximity to this mass of earthed metal.

Mr. Gilbert declared that there was no domestic appliance in use to-day which could not be constructed of material other than metal, or, alternatively, could not be effectively insulated.

Dr. A. Ekström said that in his opinion earthing was a very dangerous practice to introduce into houses, because it brought a false sense of security. If we could not rely on it we were better without it, while in rural wiring it was very difficult or impossible to find an earth of sufficiently low resistance. In regard to domestic apparatus, he said that if only the handle of the iron or kettle were better insulated than at present a very great improvement would be effected. It was also desirable to insulate the knobs of water taps because they were firmly gripped.

Mr. S. W. Melsom was sorry that the advocates of earthing had confined their proposal to a dubious concentric wiring system. Could anyone doubt that the real solution was to insulate all apparatus? There was too much inclination to neglect the more reliable method of having the very best dielectric.

Mr. F. E. Phillips said that while tough-rubber insulated cables originated for use as colliery trailing cables, their use had been extended to all purposes. Government Departments used them largely, and innumerable important buildings had been so wired. Such cables could be exposed to the atmosphere or concealed at will. They withstood moisture and provided the ideal insulated system.

Messrs. C. J. Banister, A. J. Bousfield, W. E. Bradshaw, A. H. Dykes, A. Edwards, H. Willoughby Ellis, A. F. Harmer, B. Higgs, W. E. Lang, A. Morgan, W. A. Ritchie, E. S. Ritter, A. J. Stiling, and D. J. Watkins also spoke.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Standardised Page Sizes.

[To the Editor.]

Sir,—We have been very glad to see the correspondence in your columns on this subject, as it is one on which we feel very strongly. One of the great difficulties of the engineering advertiser has been that his preparatory charges were so disproportionate to the actual cost of space, due to the fact that while a "national" advertiser could repeat his advertisement in paper after paper, the engineering advertiser has had to have fresh blocks, and, perhaps, even a new drawing, for almost every medium.

Undoubtedly, a concerted movement for a standard page size will involve many difficulties for the trade journals themselves, but we are sure that they will meet these difficulties in a sympathetic way, bearing in mind that such a reduction in the preparatory charges will release a certain amount of money for expenditure on actual space.

We greatly hope that in a vast majority of cases it will be possible to standardise on the size of 10 in. by 7 in., without making use of the two alternatives put forward.—I am, etc.,

For Brookhirst Switchgear, Ltd.,
H. N. Goody,
Publicity Manager.

Chester,
December 13th.

[To the Editor.]

Sir,—We are heartily in favour of the proposals for the standardisation of the advertising page size in British trade and technical journals, as put forward by the Incorporated Society of British Advertisers.—I am, etc.,

For Eversheds and Vignoles, Ltd.,
A. W. Swan,
Publicity Department.

Chiswick,
December 13th.

[To the Editor.]

Sir,—I am in entire agreement with the letter under the above heading, which appeared in your issue of November 29th. Variations in page sizes are not only expensive, but are extremely inconvenient to the advertiser.

The additional expense involved in having special drawings and blocks made for certain papers is quite a considerable item in proportion to the total cost of buying and filling space in these papers. It seems absurd that one should have to spend possibly £4 to £5 on a revised drawing and new original half-tone block to occupy space which itself costs no more than that amount of money. Yet this is a very common experience of advertisers in technical and trade papers.

Advertisers, being human, naturally tend to eliminate from their programmes papers which are so far out of standard as to require individual alterations.

At present, probably 60% or 70% of trade and technical papers can use a block measuring 10 in. by 7 in., although in a number of these cases this can only be done by allowing extra white space round the advertisements. Of the remaining 30% or 40%, perhaps half can use blocks made in the same proportion as 10 in. by 7 in., while for the other half one has to have special drawings made.

Unfortunately, there are in this residium of unaccommodating papers a few journals of outstanding importance, which make it impossible for many advertisers to say that they will only take space in papers of standard size. Important though some of these papers may be, I would suggest that the size of their pages is a very diffinite handicap to them in getting and retaining business. The fact that such papers may at present be able to get all the advertising they need, is simply an example of the triumph of editorial merit over commercial ineptitude, and in no way justifies a policy which is manifestly inconvenient, expensive and objectionable to advertisers in general.

Standardisation of page size *must* come sooner or later. Individual papers will, of course, have their individual and peculiar difficulties to surmount in adopting a standard page size. Time, however, will not lessen these difficulties, but will tend rather to accentuate them.

Any objections which may be raised now by a particular paper will be still more cogent in five or ten years' time. Every month and every year of further delay in this vital matter will mean additional trouble and expense when the change is finally made.—I am, etc.,

H. E. Goody,
Advertising Department, The British Thomson-Houston Co., Ltd.

London, W.C.2.
December 16th.

Television.

[To the Editor.]

Sir,—I recently went to see an exhibition of Baird television at the offices of the British Broadcasting Corporation. The television was very successful, and I was easily able to recognise a moving picture of the Prince of Wales.

The picture, however, was only a few inches in diameter, and visible only to a small number of people, and for large pictures such as would be able to be seen by a large number of spectators, as, for instance, in cinematograph theatres, very considerable improvement upon present methods would be necessary.

As in present-day television the picture is divided into a number of parts or elements which are transmitted one after the other with sufficient rapidity to take advantage of visual persistence, the difficulty in the way of producing larger pictures is the dividing of the picture into a sufficient number of parts or elements to give reasonably close-grained results without interfering with other wireless transmissions.—I am, etc.,

A. A. Campbell Swinton.

London, S.W.1.
December 16th.

DIESEL ENGINE USERS' ASSOCIATION.

At a meeting of the Diesel Engine Users' Association at Caxton Hall, Westminster, on December 13th, a paper on "A Form of Coupling for Geared Diesel Engines for Land and Marine Purposes" was read by Mr. W. Brose. The form of coupling described was that developed in the Vulcan Yard, Hamburg, and based on the patents of Dr. Bauer. A keen and interesting discussion followed, in which a number of members and visitors participated.

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NEWS IN BRIEF.

The Birmingham Electric Club—American Wireless and Cable Communication Systems—Cardiff and the Glamorgan Electricity Co.—Proposing Marriage by Wireless.

OLDHAM Waterworks Engineer has been instructed to obtain quotations for the lighting by electricity of the waterman's house, Blackstone Edge.

Manchester Town Hall Extension Special Committee has asked the Electricity Committee to allow the Chief Engineer, or one of his representatives, to confer with the architect with regard to the lighting of the new library buildings.

Wokingham T.C. has under consideration a proposal to adopt electric lighting of the town hall.

Cheltenham Corporation has adopted a proposal to provide electricity for lighting and gas for cooking in council houses.

The annual general meeting of the Birmingham Electric Club will be held at 7 p.m. to-day, Friday, at the Grand Hotel.

During the past week a decorated municipal tramcar has been touring Dundee in connection with a collection for a Christmas treat for poor children.

Rotherham Transport Committee recommends that grants be made to men who have operated their tramcars or 'buses with the least amount of current and petrol.

A sub-committee of Edinburgh Lord Provost's Committee has decided to adhere to its previous recommendation to install automatic road traffic signals at certain points.

The unification of the American wireless and cable communication systems was advocated before the Senate Inter-State Commerce Committee recently by Mr. Owen D. Young, chairman of the Radio Corporation.

Brighton Electricity Committee has decided to pay £1 per point to any contractor who undertakes the wiring of houses which fall within the Corporation's assisted wiring scheme, subject to the materials used being approved by the Electrical Engineer.

Hull Corporation has asked the Property Committee to consider the installation of electrical or other apparatus to improve the acoustics of the Council Chamber.

"The Daily Mail" Schoolboys' Exhibition will take place at the Horticultural Hall, Westminster, from December 31st to January 8th. Electrical and wireless apparatus and a "noctovision" installation will be amongst the attractions.

Ossett Education Committee is to install an electric furnace, in connection with the art work at the technical school, at a cost not exceeding £70.

It is reported that the first man to make a proposal of marriage by Transatlantic wireless telephony has just been married in London as a result of his enterprise.

The Glasgow Director of Housing reports that a charge of £1 per cooker will be made where the installation of an electric cooker necessitates the removal of a gas cooker.

Marylebone (London) Establishment Committee recommends that an additional assistant mains engineer in the electricity department be appointed at a salary of £359 2s. 9d. per annum.

The Bell Telephone Co. of Canada expects to spend $160 000 000 on extensions and replacement during the next five years and to instal 250 000 telephones in the provinces of Ontario and Quebec.

Glasgow Corporation Committee on Wages has recommended an increase of 1d. per hour in the wages of fitters at the Coplawhill and Elderslie tramcar works. The A.E.U. asked, on behalf of the men concerned, for an advance of 2d.

London County Council Education Committee proposes to give permission for wireless apparatus to be connected to electric lighting installations in schools, provided that the Chief Engineer is satisfied as to the suitability of the apparatus.

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated December 20th, 1879:—*

Para rubber was quoted at 3s. 2d. per lb.

Glasgow had three rival telephone exchange companies, the Scottish Telephone Exchange Co.; the Edison Telephone Co.; and the Telephone Co (Bell's). Besides these, Mr. Graham, a telegraph engineer of the city, was prepared to establish private lines.

An electric detonator was used to fire a mine used in an attempt on the life of the Czar.

* * *

TWENTY-FIVE years ago it was stated in THE ELECTRICIAN *of December 23rd, 1904, that:—*

The L.B. & S.C. Railway was preparing specifications for electrically equipping a trial section of its system between Battersea Park and Peckham Rye.

A boy "short-circuited the conductors within the slot of the L.C.C. trams by means of an iron hoop."

An electric cigar lighter was introduced.

The de Forest Co., claimed to have established the longest overland wireless communication on record—a distance of 800 miles between Kansas City and Cleveland.

There were 27 tenders, ranging in price from £281 14s. to £550 10s. for the electrical installation in the Council House at Wandsworth.

* * *

FIFTEEN years ago THE ELECTRICIAN *of December 18th, 1914, reported that:—*

A shut-down at the L.C.C. Tramways power station caused a complete cessation of traffic on the system.

A German naval bombardment of Scarborough, Whitby and West Hartlepool, believed to be directed at the Scarborough wireless station caused no damage there.

* * *

TEN years ago, it was reported in THE ELECTRICIAN, *dated December 19th, 1919, that:—*

About 85% of the members of the British Insulated and Helsby Cable Co.'s staff had joined the newly-formed B.I. & H.C. Staff Guild.

Camberwell (London) Guardians have authorised an electric light installation in the master's house of the Constance Road Institution at a cost of from £40 to £50, plus fittings. The work is to be carried out by direct labour.

The Postmaster-General announces that the hours during which the reduced (night) charges apply on telephone calls from this country to Spain and Gibraltar are now 7 p.m. to 8 a.m., instead of 9 p.m. to 8 a.m. as hitherto. The charge for a three-minutes' call from London to Madrid is 14s. 3d. between 8 a.m. and 7 p.m. and 8s. 9d. between 7 p.m. and 8 p.m.

Bedford Chamber of Trade at a recent meeting, passed resolutions submitted by the Electrical Contractors' Section registering opposition to the proposal of the Corporation to open electrical showrooms, on the ground that it is an unwise expenditure of public money, and an unnecessary duplication of existing facilities provided by electrical firms in the town.

Cardiff Electricity Committee decided on Monday to suspend the Glamorgan Electricity Co. from the Corporation's list of contractors, in consequence of a report that the firm had sublet work allotted to them under the Corporation's "A" scheme of electricity extensions. The firm is to be at liberty to apply for reinstatement on the list at the end of twelve months.

Applications are invited for the following appointments: Overhead lines engineer in Hull Corporation's electricity department; chief lecturer in the electrical section of the engineering department of Halifax Municipal Technical College; borough electrical engineer and manager at Wolverhampton.

Nottingham Electricity Committee is making arrangements to open an electricity showroom on Smithy Row in the new Exchange block. A deputation of local electrical firms recently discussed with the Committee the possibility of some arrangement being made with them in regard to carrying out work for consumers.

On the occasion of a recent visit of members of the Western Centre of the Institution of Electrical Engineers to the Cardiff Engineering Exhibition, Mr. S. B. Haslam, chairman of the Western Centre, said there was need for a large public hall in Cardiff which would permit makers of electrical plant to participate in such exhibitions.

Coun. Bannister stated at a meeting of Nelson Town Council recently that several people were poaching electricity by tapping the power and using it for lighting. Ald. Smithson, chairman of the Electricity Committee, said the power rate was 2½d. per kWh, and that for lighting 5d. Those who used power plugs for lighting were liable to prosecution.

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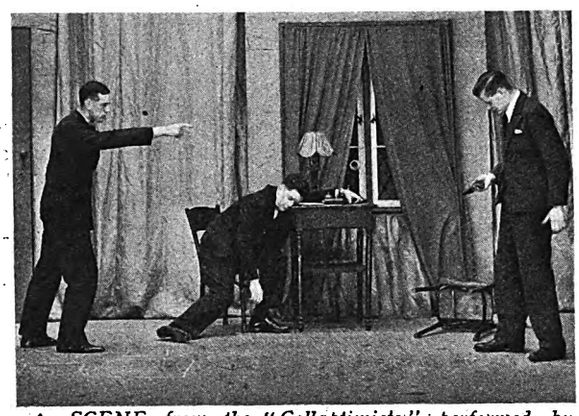
PERSONAL.

MR. R. H. Rawll, district installation engineer, Birmingham Corporation Electric Supply Department, has been selected to assist Mr. G. Rogers, who is in charge of the frequency change from 25 to 50 cycles of that undertaking in accordance with the Central England Scheme, and will be responsible for the necessary alterations to consumers' low tension plant and equipment. In the absence of Mr. Rogers, he will deputise for him in all matters relating to frequency charge work.



A SCENE from the "Collaptimists," performed by members of the M-V Apprentice Association. The play was staged at the M-V Club from December 11th to 14th inclusive.

Mr. George Tough, electrical engineer and manager, is retiring in April next, upon superannuation, from the service of the Coventry Corporation. He was first appointed mechanical assistant in 1899 and became electrical engineer and manager in 1908 so that he will have completed 31 years unbroken service. His term covers remarkable development as when he first went to Coventry the station, which had been opened three years, had only a capacity of 350 kW with 150 consumers while to-day the capacity is 70 000 kW with 21 291 consumers. The recently opened works at Longford which forms part of the national grid scheme, were planned by him and he supervised their erection and equipment.

The addition to the board of directors of Benn Brothers, Ltd., the publishers of THE ELECTRICIAN, of Miss F. Robinson and Mr. F. E. Hamer is an event of double significance. On the one hand a distinguished woman member of the staff joins the board—the first time that the honour of a seat on the directorate has been conferred upon one of her sex. On the other hand, the traditional policy is continued of appointing directors working in the business (of which the board is entirely composed), and a still larger proportion of its members now consists of those who have "risen from the ranks," having begun their careers with Benn Brothers upon equal terms with any of their colleagues doing the same sort of work. Miss Robinson has been for a long period staff manager, and secretary to Sir Ernest Benn, the chairman of the company and Mr. Hamer is the editor of "The Chemical Age." Made on the eve of the Jubilee Year of Benn Brothers, Ltd., these two appointments have not only given a lively pleasure to the immediate colleagues of Miss Robinson and Mr. Hamer, but have brought many congratulations from their numerous friends in the world of technical and trade journal publishing.

Obituary.

SIR HENRY JACKSON, on December 14th, aged 74 years. Sir Henry's name will always be coupled with the progress of wireless in the Fleet. In the 'nineties of last century he was among the first to engage in the practical application of Hertzian waves to telegraphy. He early made the acquaintance of Marconi, the two collaborating in important researches. In 1895 Sir Henry began systematic experiments and trials under sea-going conditions, inclusive of the use of balloons and kites, with the view of utilising the effect of Hertzian oscillations for naval signalling purposes. The results were embodied in a paper read before the Royal Society, entitled "On Some Phenomena Affecting the Transmission of Electric Waves over the Surface of the Sea and Earth," and in 1901 the Royal Society elected him into its fellowship. From 1929 to 1929 he was chairman of the Radio Research Board.

OVERSEAS TRADE.

Electrical Exports for Eleven Months Over £10 000 000 in Excess of Imports.

EXPORTS of electrical machinery, apparatus and materials shipped from the United Kingdom during November last amounted to £1 827 048 or £177 451 more than during the same month last year. Imports of similar goods during November, 1929, amounted to £897 672 as against £659 783 during November, 1928, representing an increase of £237 889.

For the eleven months of this year electrical exports amounted to £17 822 826, an increase of £924 641 when compared with the same period last year, while imports for the same period were valued at £7 488 386, an increase of £1 671 494 by the same comparison. These figures show that electrical exports during November last exceeded imports by £929 376, while for the eleven months the excess was no less than £10 334 440.

Exports of wires and cables, other than rubber insulated, improved during the month by £85 014; submarine telegraph and telephone cables also improved when compared with the same month last year, the increaseb eing £16 903. Increased shipments in telegraph and telephone instruments were recorded, the figures having advanced by £55 443.

We give below detailed figures for November, 1929, contrasted with those for the same month last year, and for the eleven months of the year compared with the same period of 1928 :—

	Month of November.		Eleven months.	
IMPORTS.	1928. £	1929. £	1928. £	1929. £
Electrical Machinery	135 988	161 196	1 573 049	1 702 475
Electrical Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	21 153	20 430	172 774	226 339
Insulation other than rubber (not being Telegraph or Telephone Wires or Cables)	58 076	70 172	548 346	595 886
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	1 782	2 299	68 219	41 615
Submarine Telegraph and Telephone Cables	—	—	—	—
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	99 048	171 524	622 535	1 514 859
Carbons, Electric	15 641	10 534	118 476	139 798
Electric Lamps and Parts thereof—				
Electric Glow Lamps	23 460	60 750	402 273	408 625
Arc Lamps and Electric Searchlights	256	488	6 095	6 885
Parts thereof (except Carbon Rods)	2 578	1 837	28 261	14 812
Batteries and Accumulators (including parts)	111 358	132 060	662 439	786 264
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (excluding Ammeters, Voltmeters, etc.), House Service Meters, and Scientific	22 144	53 299	255 634	365 834
Switchboards, other than Telegraph and Telephone	651	12	1 588	1 972
Electrical Goods and Apparatus, all other Sorts	167 648	213 077	1 356 843	1 683 022
Total of Electrical Goods and Apparatus	659 783	897 672	5 816 892	7 488 386

	Month of November		Eleven months	
EXPORTS.	1928. £	1929. £	1928. £	1929. £
Electrical Machinery—				
Railway and Tramway Motors	36 252	19 162	458 205	275 640
Other Motors and Generators	252 564	219 733	2 258 579	2 057 432
All other Sorts	363 424	335 220	3 474 926	3 486 427
Electric Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	144 615	141 452	1 286 060	1 519 861
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	148 136	233 150	1 360 505	1 589 930
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	77 608	59 295	798 827	1 019 962
Submarine Telegraph and Telephone Cables	13 134	30 037	579 164	362 797
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	187 663	243 106	2 410 547	2 574 570
Carbons, Electric	545	2 279	13 315	10 573
Electric Lamps and Parts—				
Electric Glow Lamps	50 392	66 697	485 204	605 821
Arc Lamps and Electric Searchlights	1 336	1 928	11 921	12 593
Parts thereof (except Carbon Rods)	1 271	2 285	6 987	10 655
Batteries and Accumulators (including parts)	83 167	96 132	1 005 111	930 582
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	37 338	33 456	356 251	358 315
Switchboards, other than Telegraph and Telephone	4 936	7 395	67 140	59 526
Electrical Goods and Apparatus, all other Sorts	247 216	335 721	2 325 443	2 947 841
Total of Electrical Goods and Apparatus	1 649 597	1 827 048	16 898 185	17 822 826

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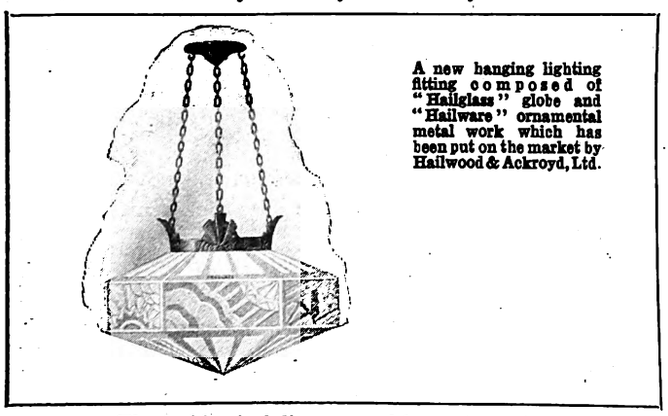
DOMESTIC ELECTRICAL APPARATUS AND APPLIANCES.

New Bakelite Accessories and Fittings—A Novel Adaptor for Domestic Use—Lamps for the Motorist.

CONSIDERABLE interest has lately been shown in the use of bakelite for electrical purposes, and contractors will be interested to hear that METRO-VICK SUPPLIES (Trafford Park, Manchester) are now manufacturing a line of bakelite accessories. These include a ceiling rose, a lampholder, and—the most recent addition—a bakelite adaptor. The ceiling rose is made in the popular size of 2½ in. diameter in both two- and three-way types. Colours are brown or cream, there are few parts—rendering wiring rapid and simple—and the material used combines lightness with mechanical strength. It is stated that the number of breakages in transit and in use are negligible. The fixing holes have 2 in. centres, suitable for B.E.S.A. conduit boxes, and the rose can be easily adapted for surface wiring by removing a small portion of the rim. Pillar-type terminals of adequate size for looping in are provided. The "Emvee" patent cordgrip will support a weight of 56 lbs.

The new lampholder has a universal application, as it will take flexibles of all sizes from twin to cab-tyre. The patent cordgrip clamps over a large area of the flexible, giving complete efficiency in service and at the same time reducing installation time to a minimum. "Emvee" plungers of the solid type are fitted, and it is claimed that they cannot stick or come loose. The incorporation of "Mycrome" alloy springs appears definitely to obviate the risk of springs softening while under heat—a report of the National Physical Laboratory, quoted by the firm, states that "Mycrome" springs, after being subject to a temperature of 200 deg. C. for 48 hours, slightly increased in tension." The Met-Vick bakelite adaptor also has a universal cord grip, and it is so designed as to eliminate strain of the conductors on the terminal screws. The terminals are substantial, and oval-shaped contacts are provided.

We have received from W. E. BEARDSALL AND CO., LTD., of 5, Victoria Bridge, Manchester, a sample of the "Xtra-Point" lampholder and plug, of which the company is now the sole selling agents. The unit can be substituted for the ordinary lampholder and will hang straight. The plug entries are inconspicuously placed in the upper part of the holder, and the unit is made of bakelite with metal parts of ample carrying capacity. A cord-lock effectively separates the flexibles without compression. The plug takes the current direct to the iron or other apparatus used, and not *via* the lampholder plungers, and will carry 5 A without overheating. The plug reversed will control either the light, the appliance or both. A Home Office pattern with skirt for use with portable tools in factories will shortly be ready followed by an Edison screw



A new hanging lighting fitting composed of "Hailglass" globe and "Hailware" ornamental metal work which has been put on the market by Hailwood & Ackroyd, Ltd.

pattern. The holder is fully covered by patents both at home and abroad.

FALK, STADELMANN AND CO., LTD., of Veritas House, 83–93, Farringdon Road, London, E.C.1, announce the addition to their range of "Ideal" domestic appliances of an automatic kettle. A button is provided for resetting the switch. The kettle is available in polished copper or nickel plated. The 2 pint size has a loading of 750 W, and the 3 pint a loading of 1 000 W.

A cabinet type loud-speaker possessing the various technical features of the well-known "Pure Music" range of instruments has now been placed on the market by the MULLARD WIRELESS SERVICE CO., LTD., of Mullard House, Charing Cross Road, London, W.C.2. The speaker, which is known as Type "K," consists of a balanced armature movement driving a 13 in. diameter cone, the whole being mounted in a polished oak cabinet, 19 in. square, with an attractive fretted front. By means of sockets at the back of the instrument either one third, two thirds or the whole of the speech coil can be utilised

The three-valve all-mains receiver of Radio Instruments Ltd., mounted in a special cabinet, fitted with a moving coil loud-speaker. We understand that the set was tested this week three miles from Brookman's Park, and cut out the 261 metre transmission at 10 deg. As there are 25 degrees between 261 metres and the normal London transmission of 356 meters, selectivity is assured.

so that the impedance of the speaker can be adjusted to suit the output circuit of the receiver. The front fret has been designed to present the minimum obstruction to the sound waves, and the back of the instrument is also of open construction, so that the natural reproduction from the balanced armature unit is not impaired by the presence of the cabinet.

It is claimed that a special grade of moulded composition is used in the manufacture of "Ebolite" by S. G. LEACH AND CO., LTD., of 26–30, Artillery Lane, London, E.1. The material is applied to table standards and wall brackets of a type particularly suitable for use in bath-rooms. The standard (No. 6 001) has an overall height of 10½ in., and a base diameter of 5½ in. It is well balanced on a lead loaded base, and is said to be shockproof. An advantage of moulded composition—especially when buyers of fittings wish to instal them temporarily and later to remove them elsewhere—is its light weight. The approximate weight of the wall bracket (No. 6 003) is 7 oz.

Several advantages are presented by the range of cut-outs marketed by THOMPSON AND CO., 1 and 3, Old Swan Lane, London, E.C.4. The "Gardy" fuses can be replaced by unskilled persons with safety and freedom from trouble. No mistake can be made, for the reason that no other fuse but the correct one will fit the base. Pins and sockets are graded in diameter according to fusing capacity. Burn-outs can be instantly located by means of the mica window which exposes to view a part of the fuse wire which is of pure silver. Other advantages are the small number of component parts and the fact that any model can be adapted to different amperages without dismounting. The wide range of models offered appears to cover the needs of all systems of distribution—included is a combined cut-out with neutral link for use where a continuous earthing system is favoured. The "Gardy" tamper-proof model, which is covered by a separate patent, allows of guarding against interference by means of the substitution of an insulated socket for one of the pins, thus making it impossible for a foreign fuse to be inserted.

The daylight-blue automobile lamps of PHILIPS LAMPS, LTD., Philips House, Charing Cross Road, London, W.C.2,

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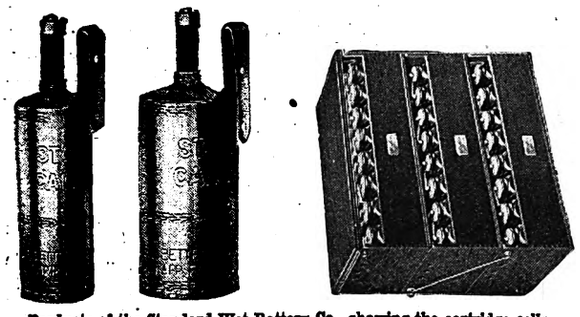
employ a specially prepared blue glass to eliminate part of the red rays from the filament and make the light thrown upon the road approximate to daylight. It is claimed that the use of these lamps improves the driver's power of observation, reduces fatigue, and gives less dazzle than ordinary head lamps. Another solution of the anti-dazzle problem is claimed in the use of "Philips Duplo" lamps. The bulbs are provided with two filaments of equal lighting power, the first



Products of the Standard Wet Battery Co., showing the cartridge cells as separate units and in complete battery form.

giving a powerful beam for normal use, while the second—being partly enclosed in a metal cup—directs its light towards the upper part of the reflector, whence it is deflected on to the road. As this second filament is out of focus, the light is spread out across the road. In foggy weather the anti-dazzle beam is especially useful, as the full intensity of the beam can be directed on the road. The lamps can be fitted to all makes of cars, having twin filament lamps, without alteration to the wiring, and in the case of cars with single filament lamps, only a slight adjustment is necessary.

Following the success of the "Phililite" range of pendant fittings, Messrs. Philips have introduced a series of "Phililite" ceiling fittings. Owing to their small overall height, these fittings should be very suitable for low ceilings. The bowls are of three-ply glass having a low absorption factor, and the ceiling plate is of a pattern which makes erection quite simple. Sizes 26 and 30 are suitable for lamps of 60 to 100 W, and size 33 for lamps of 100 to 200 W.

A new type of h.t. wet battery for radio is announced by the STANDARD WET BATTERY CO., 184–188, Shaftesbury Avenue, London, W.C.2. The new battery is of the cartridge variety, and the manufacturers claim it to remove all grounds for objection to a wet battery where "messiness" in general is concerned. The standard cartridge was formerly composed of two separate electrodes—sac and zinc: it is now supplied as one complete component ready to be placed in the jar. Evaporation or spilling of the electrolyte is prevented by a waxed cork. Other features include push-clip connectors between units, and the treating of the zinc with special paint. It is stated that "10 dry cells in parallel give an equal life to one No. 4 standard cell."

The PERFECTA SEAMLESS STEEL TUBE AND CONDUIT CO. (1923), LTD. (Plume Street, Aston, Birmingham), have sent us particulars of their latest output of conduit and conduit fittings. The specifications of the various types of conduit are as follows:—Class A: (1) Light gauge close joint conduit. (2) Light gauge brazed conduit. (3) Light gauge seamless or solid drawn conduit. Class B: (1) Heavy gauge welded conduit. (2) Heavy gauge brazed conduit. (3) Heavy gauge seamless or cold-drawn conduit. All classes of conduit can be supplied either stove enamelled or hot galvanised. The machine used for straightening Perfecta conduit is said not only to leave the tube perfectly straight, but also to make it impossible for any particle of scale to adhere—so that an entirely clear surface is left for enamelling. The range of conduit fittings comprises four general types. The ordinary plain or socket fittings are intended for use with plain conduit or for competitive work where no continuity test is required. The competition type pin-grip fittings are of standard dimensions and are cast with a raised pillar to enable a $\frac{3}{32}$ in. screw to be used. Lug-grip type fittings also fall into the continuity group, and are of standard dimensions for use with class "A" conduit; they are of malleable iron, with nozzles bored to size and the lugs fitted with steel screws; these fittings are recommended by the makers for use on contract work where a screwed conduit system is not considered necessary. The fourth type consists of screwed fittings.

A new shadowless lamp for use in operating theatres is on view in the London showrooms—at Imperial House, Regent Street—of KELVIN, BOTTOMLEY AND BAIRD, LTD., of 18, Cambridge Street, Glasgow. Known as the K.B.B.–Galloi's Ideal Shadowless Lamp, it is designed to provide a light which is both intense and diffused. The shadowless illumination is produced by the design of the reflecting surfaces, no lenses being employed. The whole field of operation is sufficiently well lit, and sharp contrasts—which recent research into surgical lighting has shown to be the chief cause of fatigue to the surgeon—are avoided. The light is strong enough to illuminate adequately any wound, however deep. Dazzlement and noticeable heat are both obviated by the design of this lamp; which, also, is aseptic and adjustable in all directions. Included among the several models available are the large suspension model for the operating theatre proper, the wall bracket type for dental use, the portable floor-stand type and the floor stand type operated by accumulators as an emergency light.

We are given to understand that the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has adopted a special process of manufacture for "Magnet" h.t. batteries, and all models now have super-grip terminals to facilitate the making of intermediate tappings. An interesting "Gecko" line is the combined h.t.-accumulator and charger for a.c. and d.c. mains. Charging and discharging are controlled by a simple switch having two positions marked "Radio" and "Charge." The charger in the a.c. model consists of what is stated to be a new type of electrolytic rectifier, employing an electrolyte which gives off no fumes, remains cool, forms no sediment, is non-corrosive, and requires no attention. Another line, the "Gecko" 2 V unspillable accumulator, solidified type, is claimed to give complete purity of tone as a result of the absence of resistance and the even rate of discharge. The charge rate is 2 A and the overall dimensions $3\frac{1}{4}$ in. by $3\frac{1}{8}$ in. by 6 in.

An automatic heat-controlling device of particular use to those who use domestic irons is being marketed by E. R. MORTON, LTD., 117, Charlotte Street, London, W.1. This accessory, known as the "Safegard" heat control, consists of a brown bakelite appliance plug. It incorporates a thermal strip to which varying degrees of tension can be applied by means of a small disc. This disc is easily rotated by a milled edge, and the user can set it to any desired point, and the varying tension applied provides a wide range of temperature—varying in the case of an electric iron up to approximately 580 deg. Fahrenheit. At any point the temperature of a domestic electric appliance is kept even, the "Safegard" switching off automatically when the desired temperature is reached and switching on again when the temperature falls. The control is independent of the user and the device is in addition a protection against forgetfulness or carelessness, for should an iron to which it is fitted be left in circuit the temperature is maintained even by alternate switching off and on of the current. It is estimated that one-third the normal current used in ironing is saved by means of this device, which provides an even temperature of approximately 290 deg. F. at "medium" for average ironing, and 500 deg. F. at "hot" for heavy damp work. The device can also be used with any electrical appliance taking not more than 660 W. The present model is available for operation on a.c. only, from 100–250 V. Being fitted with Beaver patent sockets, it will fit practically any domestic appliance.

A New Cooker.

A new model of the Berry-McClary cooker marketed by BERRY'S ELECTRIC (1928), LTD., of Touchbutton House, 85–87, Newman Street, London, W.1, has the grill inside the oven, an arrangement that is claimed to have definite advantages in saving smell of cooking and loss of heat, and in enabling the grill to be of larger capacity than formerly. The use of the oven is not affected in any way. The whole oven interior, which is of vitreous enamel, can be removed for cleaning, and the round corners of the oven prevent any grease accumulating. The boiling plates, which are totally enclosed and in two sizes—9 in., 1 600 W, and $7\frac{1}{2}$ in., 1 250 W, are guaranteed for two years.

Eight new models have lately been added to the range of "Belling" electric fires produced by BELLING AND CO., Bridge Works, Southbury Road, Enfield. The "Empire" series has been introduced to meet the demand for a reliable fire at a very low price. The framework is of fine grain cast-iron with neat ornamentation, and the 2 kW size is in stoved matt black finish. Although inexpensive, this new fire has none of the disadvantages sometimes associated with cheap apparatus. The multi-parabola firebar is fitted as standard and in addition to the 2 kW size, this fire can be supplied

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fitted with either one or three 1 kW firebars or with two, three or four 600 W firebars. It should be specially suitable for hiring purposes, housing schemes, etc. The "Radiant" is a reflector type of fire of attractive appearance. It is made in two sizes and fitted with horizontal plug-in elements lying in chromium plated wells. Amongst the other new fires are an imitation coal fire which, like all other "Belling" coal fires, is fitted with a flickering flame effect and two new reflector fires, one of which is of the "well" type and specially suitable for fitting into existing grates.

More New Fires.

The "Redot" electric fires of LIGHTING TRADES, LTD., 30–31, Farringdon Street, London, E.C.4, are chiefly notable for their comparatively low price and the standardised plug-in type of element, which—except in the instance of bowl fires—is loaded at 1 kW. The "Redot" fire bars appear unusually robust and are easily examined by lifting back their hinged support—in the upright type of fire. A novel fire of this series is E.77 047, which has a circular element in the centre of a screen, giving an effect not unlike that of a moving coil loud-speaker with sounding board. This fire is made of bronze throughout, is 24 in. high, 18½ in. wide, and has a rating of 800 W. Lighting Trades, Ltd., are also entering the cooker field. One of their principal lines comprises an oven unit and a hot-plate unit, which are sold separately or mounted together to form a complete cooker. The oven measurements are—inside, 12 in. high by 13 in. wide by 11 in. deep—overall, 19½ in. by 17 in. by 14 in. The hot-plate unit measures 4¾ in. by 17 in. by 14 in. When the units are sold separately iron stands are supplied as extras. The oven has a rating of 2 000 W, equally divided between the top and bottom heats; it is controlled by one rotary switch. The hot-plate also has a rotary switch, giving low, 700 W, medium, 800 W, and high, 1 500 W. Another small cooker is of sheet steel finished in black enamel with white enamelled drip plate and polished steel top. It has simmering ring, griller and boiling ring in addition to the oven, and the respective full heat ratings of these units are 550, 1 000, 1 450 and 2 200 W. A more complete model has an enamelled back piece supporting a plate rack. The door is fitted with snap latch and spring hinges.

A Portable Cardiograph.

For a number of years the electric cardiograph has played an important part in the diagnosis and treatment of heart disease. Until recently, however, the elaborateness and size of the equipment has limited its use to a few of the larger hospitals. Now, however, many physicians wish to utilise the cardiograph in their private practice, and to meet this condition the CAMBRIDGE INSTRUMENT CO., LTD. (of 45, Grosvenor Place, London, S.W.1) has introduced a portable electro-cardiograph, which is compact, robustly constructed and designed to need only a small amount of adjustment. The company has the portable cardiograph on view alongside the old style equipment, and the contrast between the formidable dimensions and complicated mechanism of the older machine and the simple neatness of the new is almost amusingly striking. Yet both instruments achieve the same results—as the records obtained from the same patient with the two models plainly testify. The recording system adopted for the new cardiograph is, in fact, the same as hitherto—this is essential, in order that records may be compared with published work—and it consists in essence of an Einthoven string galvanometer working at a projection distance giving a magnification of 600 diameters. This galvanometer, though of the Einthoven type, is of novel form, being particularly compact and light in weight. A fibre tension adjustment enables the sensitivity to be varied; it is shorter than in the standard instrument, and more readily accessible, owing to a new form of protecting sheath. The light from a 12 V lamp is focused on the fibre by an optical condenser carried on a sliding tube within the galvanometer. It is then projected by an apocromatic objective and suitable eyepiece. The beam of light is subsequently interrupted by the spokes of a rotating disc (which affords the time base for the records) and is reflected by a silvered lens on to a mirror, from which it is again reflected on to a photographic film. By this arrangement the full projection distance necessitated by the Einthoven convention is obtained within the compass of the portable case. The accessories, which include the holders for the sensitised film, the battery, the electrodes for strapping to the patient, and the leads, are all arranged for transporting easily in the minimum of space.

VALUE OF EXHIBITIONS.

Paper at the Second Manchester E.D.A. Sales Conference.

THE E.D.A. Officer for the North-Western Area, Mr. R. C. Hawkins, gave a paper on the "Value of Exhibitions to the Electrical Industry" at the second of the E.D.A. Sales Conferences being held at Manchester this season. Mr. L. Romero presided.

Mr. Hawkins claimed that, with more and more exhibitions held each year, they had to ask themselves the question whether or not they were worth while. He mentioned the various classes of exhibitions and said that his lecture mainly dealt with the "ideal home" type, the "general trade" type and "local" type.

He referred to the success which had attended all-electric houses at exhibitions in his locality and warned those present of the danger of these turning into mere displays of furniture. It was, therefore, essential that there should be an attractive story in every room in the house. It was impossible to think of an exhibition devoted to the home without adequate presentation of the "electrical story." It was essential to have demonstrations, but if satisfactory results were expected, simplicity should be aimed at, and what the speaker referred to as the "junk shop" should be avoided. By this he meant a large number of fancy cookers, kettles, etc., which only confused, and did not allow sufficient room for proper demonstrations.

They had had several general trades exhibitions in his area in which the supply undertakings and contractors had held stands, and these had proved successful. It was generally realised to-day that in spite of the great increase in the number of showrooms, the local exhibitions organised by supply undertakings with the help of contractors were essential to electrical progress. Mr. Hawkins explained that the reason an exhibition had a special value over and above the ordinary showroom and other forms of publicity was that it had much greater press publicity, and therefore had far greater local interest. The salient points were really applicable to all types of exhibitions. The question of how often to hold exhibitions was entirely dependent on local conditions. The duration should not be more than two weeks and exactly how long depended on the size of the particular town. It was impossible to assess the exact value of an exhibition or what business was due to it. Enquiries came very many months and even years afterwards. The great question was could the electrical industry afford to neglect the opportunity of telling its story in this way to the public. Several of the audience spoke on the subject of exhibitions but there was very little real discussion as most of those present agreed with the lecturer.

BRITISH INDUSTRIES FAIR.

Among those firms who will be exhibiting in the Wireless Section of the British Industries Fair, which is to be held in the new and reconstructed Olympia, London, from February 17th to 28th next, the following have definitely taken space: Amplifiers, Ltd., London; Bakelite, Ltd., London; E. K. Cole, Ltd., Leigh-on-Sea; Cooks Wireless Co., Ltd., Ipswich; Darwins, Ltd., Sheffield; J. J. Eastick and Sons, London; Ever Ready Co. (Great Britain), Ltd., London; the Formo Co. (Arthur Preen, Ltd.), London; Halcyon Wireless Co., Ltd., London; the Igranic Electric Co., Ltd., London; Indurite Agency, London; John and James Laker Co., Ltd., Beckenham, Kent; Eric J. Lever (Trix), Ltd., London; Lissen, Ltd., Richmond; the London Radio Manufacturing Co., Ltd., London; M.L. Magneto Syndicate, Ltd., Coventry; Neophone Engineering Co., London; Ormond Engineering Co., Ltd., London; Read Radio, Ltd., London; Rees Mace Manufacturing Co., Ltd., London; Whittingham Smith and Co., London.

The British Broadcasting Company formally came to an end on December 12th, when the last meeting of members was held at the Hotel Cecil to receive from Sir John Reith, the liquidator, an account showing how the property of the company had been disposed of. It was on November 14th, 1922, that the first B.B.C. programme was sent out from 2LO. Birmingham and Manchester followed next day, and Newcastle on Christmas Eve of the same year. The British Broadcasting Corporation, which succeeded the British Broadcasting Company, was instituted under Royal Charter on January 1st, 1927.

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LEGAL INTELLIGENCE.

Corporation's Right to Purchase—Declaration Sought as to Terms.

MR. Justice Bennett, in the Chancery Division on December 11th, commenced the hearing of an action by Oxford Corporation against the Oxford Electricity Co., Ltd., claiming a declaration that, by virtue of the Oxford Electric Lighting Order, 1890, and a notice given in December, 1928, the corporation were entitled to purchase and the company was bound to sell its undertaking as from the date of the notice. The corporation further claimed that the price to be paid was to be fixed by ascertaining the amount of the company's capital as shown by their books to have been properly expended upon the undertaking at the date of the notice, and calculating its income at £5% on such capital, and then capitalising the income by multiplying it by the appropriate number of years' purchase. To find the number of years' purchase the corporation said one had to take the value of money at the date of notice to purchase. They further claimed they were entitled to the profits of the undertaking as from the date of the notice. Finally they asked for specific performance of the defendants' obligation to sell the undertaking to them and for an inquiry to ascertain the price payable in stock of the corporation.

Mr. Tyldesley Jones, K.C., and Mr. Wilfrid Hunt appeared for the corporation, and Mr. Wilfrid Greene, K.C., Mr. Craig Henderson, K.C., and Mr. Ronald Burrows for the company.

Mr. Jones said the City of Oxford had been extended by Act of Parliament since the date of the original electricity Order. The defendant company were the authorised undertakers to supply electricity in the city, including both the old and the later area. The Act extending the city boundaries expressly provided that nothing was to affect the rights of the corporation to purchase the electricity undertaking. In 1892 defendants constructed a generating station in the old city and laid down mains. In 1924 they extended their mains into the area which had been added to the old city. In 1928 the city council resolved to purchase the electricity undertaking at a price to be ascertained, in accordance with the 1890 Order. The Electricity Commissioners gave their consent to the purchase.

Mr. Justice Bennett asked who was to fix the "appropriate number of years'" purchase.

Mr. Greene: "I take the view that question will never arise."

His lordship said he understood the defendants were saying plaintiffs had to pay 20 years' purchase of the net profits.

Mr. Jones replied that that was so. The corporation said it should be 5% per annum on the capital of the company properly shown to have been expended. That would be a reasonable profit at the date of the original Order (1890) as, at that date, 2½% Consols stood at par and a 5% electrical investment at that time would be a good one.

Counsel's Speech for the Company.

Mr. Wilfrid Greene, K.C., for the company, said the term "capitalised net profits" was used in the 1890 Order and net profits could only refer to something real. If they took an imaginary rate of profit of 5% how could they describe that as net profits? What plaintiffs were contending for was not the capitalisation of net profits, but the capitalisation of a purely imaginary and notional figure of 5%. Mr. Tyldesley Jones had assumed that the draughtsman of the Order or the legislature which passed the Order was going to treat 5% as a reasonable return in 1890 on an investment in an electric lighting company. But, in 1890, electric lighting was in its infancy. You could not have got people to regard 5% as the sort of profit to be expected from an investment in such a new industry. Mr. Jones had referred to 2½% Consols being at par in 1890, but that circumstance had no sort of relevancy to the question the Court had to decide. The true criterion was the profit to be expected from the new industry in 1890. It was clear the basis on which the plaintiffs were proceeding was that less than 20 years' purchase was the proper price. Five per cent. to-day from an electric lighting undertaking would not be sufficient for the ordinary investor. If the construction of capital expenditure put forward by Mr. Jones were to prevail, it would mean that over £111 000 of capital expenditure would pass to the corporation without their paying anything for it.

The hearing finished, and Mr. Justice Bennett reserved his judgment.

IN PARLIAMENT.

Government Hints at Possible Nationalisation of Electricity Supply Industry.

IN the House of Commons last week, Mr. D. Hopkin submitted a motion that the House was of opinion that electricity supply should be organised on such a basis that national economic interests would be paramount. The Electricity Commission, he said, required more ginger. Col. Ashley defended the Commissioners from the charge of inefficiency. Mr. Chuter Ede said in one district in Surrey there was at present a very great fear of American money. There was, for instance, the Greater London and Counties Trust, which was largely financed by American money and was partly controlled by members of the late Government. It was feared that the development of that part of the country would be utilised to enrich American investors unless something was done to ensure that these trust undertakings would be bought out and placed under public control. Mr. G. Balfour thought it was unfair to compare municipal enterprises with private undertakings, because the former served compact lucrative and densely populated districts, while the private companies served large and sparsely populated areas. The Minister of Transport said the progress made in recent years was very impressive. He believed that in the near future it would have to be considered whether the electricity supply could safely be left to private enterprise or whether it should be taken into the hands of the community, with business management, and carried on in the public interest. Sir Philip Dawson said the remarkable work done by the Central Electricity Board was not generally realised.

The motion was carried.

Replies to Questions.

The following are points from recent answers to questions in the House of Commons:—

Negotiations are in progress in regard both to the general development of electrical power in Tanganyika and to a scheme for the production of electric power from the Pangani Falls. Every endeavour has been made, and will be made, to expedite the matter.

The Post Office has provided or authorised 124 public telephones recently at rural post offices and railway stations in Northern Ireland. The question whether telephones can be provided at a number of the remaining 280 offices and stations without such facilities is under consideration.

The Postmaster-General has been informed that five transatlantic cables were damaged by the earthquake off Cape Breton on November 11th, in addition to a number of cables between Newfoundland and the coast of North America, and that on December 9th 12 transatlantic cables were working.

Mr. Thomas (Lord Privy Seal) does not think extensions and improvements of the London tube railways which are the subject of an application under the Development (Loan Guarantees and Grants) Act should be delayed as a result of the recent announcement of the Government's policy in regard to the co-ordination of London passenger traffic.

In reply to a suggestion that a small inclusive charge should be made for fitting a plug and socket arrangement for a telephone instrument to be used in a separate room instead of the present charge of 14s. a year, the Assistant Postmaster-General says owing to the necessity for maintenance, the substitution of an inclusive initial payment would not be practicable, but the question of reducing the annual charge is under consideration.

Barmouth U.D.C. by an Act passed in July of this year obtained authority to give a supply of electricity in an area including their urban district. The Electricity Commissioners have been informed that the question of the construction of the electric line from Maentwrog to Barmouth is now receiving the close attention of the North Wales Power Co. who are charged with the duty of affording the bulk supply.

Habitual users of the trunk telephone service were inconvenienced by the interruptions caused by the telephonist when offering successive extensions of time under the old procedure. Under the new system, operators are instructed to notify the passing of time 10 seconds before the expiry of each three-minute period, and subscribers are given the right to extend calls by one minute periods, instead of three minutes, on distances over 35 miles. The Assistant Postmaster-General is considering whether greater accuracy can be attained by mechanical aids.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

DUNDEE CORPORATION.—Electric light installation, etc., at the slaughterhouses. Particulars from Mr. G. Baxter, city engineer, 91, Commercial Street, Dundee.

MILLOM URBAN DISTRICT COUNCIL, December 20th.—Haverigg extension scheme, comprising e.h.t. and l.t. cables, pillar box, etc. (section A); and e.h.t. and l.t. switchgear, transformers, etc. (section B). .Specification, etc., from Mr. A. Lawrence, solicitor, clerk to the Council.

QUEENSBURY EDUCATION SUB-COMMITTEE, December 20th. Electric light installation at Catherine Slack Council School. Specification from Mr. B. Leah, Education Office, Bingley.

BARMING HEATH MENTAL HOSPITAL, December 21st.—Electrical installation for lighting, heating, etc. Specification, etc., from Mr. E. E. Hoadley, Corporation Electricity Works, Maidstone; deposit £2 2s.

CENTRAL ELECTRICITY BOARD, December 21st.—Supply and erection of 132 000 V transformers in connection with Mid-East England Electricity Scheme. Specification (No. M.E.E.F.T.1) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

DARTFORD URBAN DISTRICT COUNCIL, December 21st. Supply of about 3 400 yards of 0·1 sq. in. three core e.h.t. cable. Specification, etc., from the Electrical Engineer.

HALIFAX CORPORATION, December 21st.—Electrician's work in connection with erection of new Girls' High School at Craven Lodge. Names of intending contractors to be sent by December 21st to Mr. A. C. Tipple, borough engineer, Crossley Street, Halifax; deposit £2 2s.

WIRKSWORTH PARISH CHURCH, December 21st.—Electric light installation. Specification from Mr. T. H. Greatorex, The Birches, Cromford Road, Wirksworth; deposit £1 1s. Only members of the National Register of Electrical Installation Contractors are invited to tender.

EDINBURGH EDUCATION AUTHORITY, December 23rd.—Electrical installation at Nursery School, Tollcross. Schedules from Mr. J. Stewart, Education Offices, Edinburgh.

LIVERPOOL CORPORATION, December 23rd.—Supply of 12 750 kVA, three-phase, 50 period, 6 600/400 V, oil-cooled, step-down transformers. Tender form from the City Electrical Engineer, 24, Hatton Garden, Liverpool.

GLASGOW CORPORATION, December 26th.—Electric lighting installations at (1) Ashfield, and (2) Braidfaulds Street No. 1 housing schemes. Specifications, etc., from the Electricity Department, 75, Waterloo Street, Glasgow.

LEEDS GUARDIANS, December 27th.—Supply of electric lamps until March 31st, 1930. Specification, etc., from the clerk, Mr. J. H. Ford, 11, South Parade, Leeds. Stamped, addressed envelope to be sent.

BRADFORD CORPORATION, December 31st.—Electric passenger and good lifts in block of shop and office premises in Leeds Road, Bridge Street and Hall Ings. Specifications, etc., from the City Architect, Town Hall, Bradford.

NORTH-WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, December 31st.—Supply and erection of extra high pressure and low pressure overhead transmission lines. Specification from the clerk, Mr. H. H. Battle, Stoke-on-Trent; deposit £2.

METROPOLITAN ASYLUMS BOARD, January 2nd.—Re-plating 500 Ah storage battery at St. Luke's Hospital, Lowestoft. Specification, etc., from the Office of the Board, Victoria Embankment, E.C.4.; deposit £1.

METROPOLITAN ASYLUMS BOARD, January 2nd.—Alterations of electric lighting installation at South-Western Fever Hospital, London Road, Stockwell, London, S.W.9. Specifications, etc., from the office of the Board, Victoria Embankment, London, E.C.4; deposit £1.

CENTRAL ELECTRICITY BOARD, January 6th.—Supply and erection of 132 kV overhead transmission lines (special crossings and high spans), in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.—P.L. 2) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

WHARFEDALE RURAL DISTRICT COUNCIL, January 6th.—Electrician's work in connection with erection of 10 non-parlour houses, in three blocks, on housing site at Mill Lane, Pool. Bills of quantities, etc., from the Surveyor, Council Offices, Menston; deposit £1 1s.

ISLINGTON (LONDON) GUARDIANS, January 9th.—Supply and erection of five full-automatic push-button electric lifts at the Infirmary, Highgate Hill, N.19. Specification, etc., from Mr. Albert King, Guardians' Offices, St. John's Road, Upper Holloway, N.19; deposit £2.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 13th.—Maintenance of electric lighting, heating and power installations, telephones, etc. (tender form H), and supply of electric lamps (form S). Forms of tender from the Borough Engineer.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 17th.—One year's supply of cables, electricity meters, cable terminal and other boxes, switches, wires, lamps and sundries. Specification, etc., from the Town Clerk, Municipal Buildings, Upper Street, London, N.1.

CENTRAL ELECTRICITY BOARD, January 20th.—Supply and erection of 3·3 kV, 6·6 kV, and 11 kV switchgear, for connecting the Board's supply to undertakers' busbars. Specification (N.W.E.—G.S.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

METROPOLITAN WATER BOARD, January 21st.—Supply and erection of four steam turbines, with pumps, and two electric generators, for Surbiton pumping station. Specification, etc., from the Chief Engineer (Room 173), 173, Rosebery Avenue, London, E.C.1; deposit £3 3s.

GRIMSBY CORPORATION, January 23rd.—Manufacture, supply and erection of 10 000 kW three-phase turbo-alternator, with condensing plant. Specification, etc., from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., December 20th.—Supply of (1) glass boxes for accumulators; (2) plates for accumulators, and (3) wood separators for accumulators. Specification, etc., from the secretary, Mr. S. G. S. Young, White Mansion, 91, Petty France, Westminster, S.W.1; on payment of £1 for No. 2 and 10s. each for Nos. 1 and 3 (not returnable).

IRISH FREE STATE PUBLIC WORKS DEPARTMENT, December 20th.—Electric lighting installation at Stationery Office, Beggar's Bush Barracks, Dublin. Specification, etc., from Mr. T. Cassedy, secretary, Office of Public Works, Dublin; deposit £1.

COPENHAGEN LIGHTING DEPARTMENT, December 21st.—Oil-cooled 10 000 kVA transformer, with pumps, motors and other accessories. (Reference B.X. 5 945.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 27th.—Telegraph material, including g.i. tubular arms, insulators, upper tubes for poles, etc. (tender No. 175). (Reference A.X. 8 734.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, December 28th.—Supply and erection at site of Mankabad Barracks of three Diesel engine driven electric generators, and sinking of two wells. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineet, 41, Tothill Street, Westminster, S.W.1.

LOURENCO MARQUES TENDERING DEPARTMENT OF THE TREASURY, January 3rd.—Supply of oil-engine driven d.c. generator and battery. (Reference B.X. 5 961.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 4th.—Supply and erection at site of Meadi Barracks, Cairo, of two Diesel engines to drive existing generators. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

JOHANNESBURG MUNICIPALITY, January 4th.—Supply of automatic traffic signals (contract No. 305). (Reference B.X. 5 924.)

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EGYPTIAN MINISTRY OF PUBLIC WORKS, January 6th.—Supply and erection of plant for supply of filtered and unfiltered water, including pumps, electric motors, etc. (Reference A.X. 8 746.)

CAPE TOWN MUNICIPALITY, January 7th.—Supply of 3-core 11 000 V cable (specification No. 482/1929.) (Reference B.X. 5 925.)

TENERIFFE (CANARY ISLANDS) MUNICIPALITY, January 14th.—Supply of tramcars, rails and tramway equipment. (Reference A.X. 8 872).

CAPE TOWN MUNICIPALITY, January 15th.—Supply of direct-coupled, electric motor driven, centrifugal pump for sewage works (specification No. 475/1 829). (Reference A.X. 8 836.)

INDIA STORE DEPARTMENT, January 15th.—Supply of wood separators for train-lighting cells. Form of tender (5s.) from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

NEW ZEALAND GOVERNMENT RAILWAYS, January 15th.—Supply of automatic telephone exchange equipment for new station at Auckland. (Reference B.X. 5 841.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 16th.—Plug covers for telephone switchboard plugs. (Contract P. and T. 151/1 943.) (Reference B.X. 5 879.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 16th.—Supply of crude oil engine driven electric generating sets (tender No. 1 589). (Reference B.X. 5 926.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 21st.—Spare parts for automatic telephones. (Reference B.X. 5 917.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 21st.—Four electric motor driven ventilating fans. (Reference A.K. 8 857.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 27th.—Supply of breastplate transmitters. (P. and T., 151/1 994). (Reference B.X. 5 956.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 28th.—Supply of 50 kV oil-immersed circuit breakers, with current transformers and relays (section 299). (Reference B.X. 5 878.)

POSTMASTER-GENERAL'S DEPARTMENT, January 28th.—Supply of telephone cycle signalling equipment. (Reference B.X. 5 906.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 28th.—Supply of induction coils and register plates (schedule No. C. 533). (Reference B.X. 5 899.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct-coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 3rd.—Supply of protector blocks (carbon and porcelain). (Reference B.X. 5 948.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 5th.—Supply of indication alarm fuses. (Reference B.X. 5 947).

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 13th.—Supply of opal lamp caps (P. and T., 151/2 025). (Reference B.X. 5 955.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 18th.—Telephone jacks and number plates (Schedule No. C. 541). (Reference B.X. 5 940.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Jumper rings and terminal strips (schedule C. 543). (Refference B.X. 5 941.)

Overhead Lines.

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1. (£10 5s., not returnable).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-transformers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457.) (Reference B.X. 5 793.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., April 12th.—Electrical and other equipment for the various departments of the company's iron and steel works to be erected at Pretoria. Further information from the Committee of Consulting Engineers of the South African Iron and Steel Industrial Corporation, Ltd., c/o the International Construction Co., Ltd., 56, Kingsway, London, W.C.2.

Tenders Accepted.

LLANDUDNO URBAN DISTRICT COUNCIL.—A. Fairlie, wiring 17 houses, £105.

BLEAN GUARDIANS.—Amalgamated Lamp Co., supply of electric lamps for six months.

CLUTTON GUARDIANS.—J. H. Winter and Co., electric light installation at the Institution.

BRISTOL EDUCATION COMMITTEE.—J. H. Winter and Co., electrical work in connection with erection of secondary school at Cotham, £560.

AYRSHIRE EDUCATION COMMITTEE.—M. and R. Young, electrical work in connection with erection of a Primary School at Heathfield, £234.

STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—Lucy and Co., Ltd., supply of section pillars, in connection with extension of distribution system, £324. (Recommended.)

SLEAFORD URBAN DISTRICT COUNCIL.—Callender's Cable and Construction Co., Ltd., renewing public lighting cable in Watergate; General Electric Co., Ltd., supply of switchgear.

NEWMILL URBAN DISTRICT COUNCIL.—Yorkshire Electric Power Co. supply and fixing of a cubicle at the Council Offices sub-station to control 11 000 volt line to Lee Mills, £104.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—J. and J. Bescoby, Ltd., supply of cable drum carriage (carrying capacity, 6 tons), £94. (Recommended.) British Insulated Cables, Ltd., also tendered, £122.

ROTHERHAM CORPORATION. A. Reyrolle and Co., Ltd., supply of two pairs of 10 000 kVA 660 V type switches, £256 per pair; plus £9 11s. 3d. per switch for automatic control; British Thomson-Houston Co., Ltd., supply of two oil switches and meter panel, £249 10s.

GENERAL POST OFFICE.—Telephone exchange equipment, Woking, Automatic Telephone Manufacturing Co., Ltd.; Popesgrove (Twickenham) and Rock Ferry, Siemens Bros. and Co., Ltd.; telephone repeater equipment, Dundee, Standard Telephones and Cables, Ltd.; power plant for repeater station, Dundee, Haslam and Newton, Ltd.

GLASGOW CORPORATION.—Macfarlane Engineering Co., two frequency changers, £572; Metropolitan-Vickers Electrical Co., Ltd.. two reconstructed rotary convertors, £246 12s., and nine motors, £1 061 13s.; Crompton Parkinson, Ltd., 29 motors, £516 8s.; English Electric Co., Ltd., 24 motors, £268 11s.; R. Johnson, Clapham and Morris, Ltd., d.c.c. wire. (All recommended.)

LIVERPOOL CORPORATION.—Tramway special trackwork: Breck Road and Breckfield Road, North Junction, Titan Trackwork Co., Ltd., £659; Grove Street and Upper Parliament Street Junction, Hadfields, Ltd., £2 155; High Street (Wavertree Clock Tower) North Junction, E. Allen and Co., Ltd., £626; London Road and Moss Street Junction, Titan Trackwork Co., Ltd., £2 169. (All recommended.)

ROTHERHAM CORPORATION.—Callender's Cable and Construction Co., Ltd., supply of 1 200 yds. of three core e.h.t. cable, required in connection with a supply to Kilnhurst colliery, £620, and 2 600 yds. of 0·1 three-core e.h.t. cable in connection with Dalton trolley vehicle routes, £1 352; A. Reyrolle and Co., Ltd., supply of l.t. switch equipment, in connection with supply to Kilnhurst colliery, £228; British Thomson-Houston Co., Ltd., supply of one 450 H.P. and one 110 H.P. a.c. motors for circulating water pump and Parsons' ventilating fans, £630. (All recommended.)

HACKNEY (LONDON) BOROUGH COUNCIL.—Simon-Carves, Ltd., additions to boiler plant at Millfields Road generating station, including installation of three water-tube boilers each having evaporative capacity of 125 000 to 150 000 lb. of steam per hour, travelling grate, mechanical stokers, economisers, superheaters, mechanical draught plant, and independent chimney to each boiler, foundations and civil engineering work, steel-framed brick boiler house, and coal handling and storage plant. Total value of boiler plant contract £250 000 (approximately). (Tender recommended for acceptance).

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WORK IN PROSPECT.

ALMONDBURY (YORKS.) — 36 houses. Particulars, Borough Engineer, 25, Ramsden Street, Huddersfield.

BARTON-ON-HUMBER.—New secondary school. Particulars, Mr. H. G. Gamble, architect, Bank Street Chambers, Lincoln.

BATTERSEA.—New stores, etc., for B.C. Particulars, Mr. Dresden, borough surveyor.

BELFAST.—Erection and completion of extensions to the Dufferin Hospital. Particulars, Messrs. Young and MacKenzie, architects, Belfast.

BIRMINGHAM.—New premises for Ansell's Brewery, Ltd. Particulars, Mr. H. W. Hobbins, 33, New Hall Street, Birmingham.

BLACKPOOL.—New hospital. Particulars, Messrs. J. S. Gibson, and Gordon, 5, Old Bond Street, London, W.1.

BOSTON.—Hospital extensions. Particulars, the Borough Surveyor.

BRIDLINGTON.—Municipal offices. Particulars, Borough Surveyor.

BRISTOL.—Large factory. J. S. Fry and Sons, Ltd. Particulars, Major Cadbury.

CANNOCK.—Schools and extensions. Particulars, the secretary, Mr. W. E. Swift.

CARSHALTON.—Church. Particulars, Messrs. H. N. and E. H. Philcox.

CHALFONT ST. PETER.—Cinema theatre. Particulars, Mr. C. M. Street.

CHELMSFORD.—Houses (124). Particulars, the Borough Surveyor.—School (250 places). Particulars, the Priest in Charge.

CHESTERFIELD.—Extensions, Royal Hospital. Particulars, the Secretary.

CROYDON.—Houses (20). Particulars, the Borough Engineer.

DEPTFORD.—Blocks of shops. Particulars, the Superintending Architect.

EAST HAM.—Hospital extensions. Particulars, the Borough Engineer.

EALING (LONDON).—17 houses. Particulars, Haymills, Ltd., 1, Grand Parade, Forty Lane, Wembley Park. 24 houses. Particulars, Messrs. Langley and Robinson, 237, Golder's Green Road, N.W.11. Six shops and flats. Particulars, Reinforced Concrete Houses, Ltd., Adelphi Terrace, 2, Robert Street, Adelphi. Eleven houses. Particulars, Mr. A. G. S. Lyford.

FAILSWORTH.—Housing scheme. Particulars, the Surveyor.

FARNHAM ROYAL (BUCKS).—Hotel. Particulars, Taylor, Walker and Co., brewers, Limehouse, E.

FOLKESTONE.—Schools and extensions. Particulars, the Director of Education.

GRANTHAM.—School (200 places). Particulars, the Director of Education.

GREENFORD.—40 houses. Particulars, Richard Costain and Sons, Fitzalan House, Arundel Street, London, W.C.2.—112 houses. Particulars, Mr. R. A. C. Churchward, architect, 12, Victoria Street, London, S.W.1.

HALE (SALISBURY).—Village hall. Particulars, the hon. sec., Mr. L. C. Currie.

HALIFAX.—New Girls' High School. Particulars, Mr. A. C. Tipple, borough engineer, Crossley Street, Halifax.

HORNCHURCH.—Senior school. Particulars, Mr. J. Stuart, Chelmsford.

HOVE.—Schools and extensions. Particulars, the Director of Education.

IRLAM.—Houses (50). Particulars, Joseph Chapman and Son (Patricroft), Ltd., Eccles.

KENILWORTH.—School. Particulars, the Director of Education, Leamington.

LAINDON.—School extensions. Particulars, Mr. J. Stuart, Chelmsford.

LIVERPOOL.—Cinema. Particulars, Mr. E. Shennan, architect, 14, North John Street.

MAIDSTONE.—Transport offices. Particulars, the Borough Surveyor.

MANCHESTER.—Alterations to Langham Hotel. Particulars, Messrs. Pye and Bennett, architects, 2, Booth Street.—New dairy and offices. Particulars, Mr. Peter Cummings, 51, King Street, Manchester.

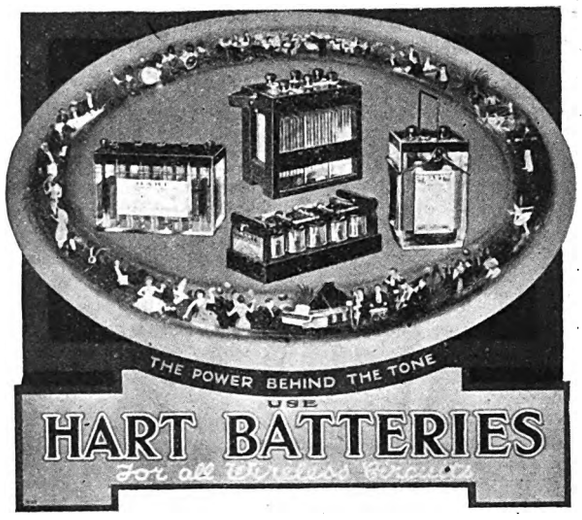
NANTWICH.—Housing scheme. Particulars, the Surveyor.

NEWCASTLE-UNDER-LYME.—Shop premises. Particulars, Messrs. G. Hallins and R. Jones, architects, Lloyds Bank Chambers.

TRADE PUBLICATIONS.

A RECENT issue of the BASTIAN METER CO., LTD., of Slough, is leaflet No. 36 dealing with electric heaters.

The December blotter of MAVOR AND COULSON, LTD., 47, Broad Street, Glasgow, S.E., has been received.



A new coloured showcard issued by the Hart Accumulator Co., Ltd.

TRELLEBORGS EBONITE WORKS, LTD., 4, Union Place, Wells Street, London, W.1, have issued new literature relative to new retail prices.

The current stock list of SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., of 38/39, Upper Thames Street, London, E.C.4, has been received.

The AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., Strowger Works, Liverpool, has sent us a new folder relative to private automatic telephone exchanges.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has published folder L.5 234 describing the company's bakelite electric bells and accessories.

We have received from the SHAFTESBURY RADIO CO., 184-188, Shaftesbury Avenue, London, W.C.2, a newly published leaflet describing the "Water Star" loud speaker unit.

Publication No. 6 637, dealing with "Igranic-Elkon" rectifiers and superseding No. 6 477, has been issued by the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4.

The MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, London, W.1, has published a new catalogue dealing with receivers, loud speakers, valves, batteries, chargers, mains units, electrical pick-ups, etc.

Folder 4102/6 embodying the ratings of "Cosmos" lamps has been issued by METRO-VICK SUPPLIES, Metro-Vick House, 155, Charing Cross Road, London, W.C.2. This issue supersedes form M.S. 4892, and may be overprinted.

"Blindfolded and Handcuffed" is the title given to the latest publication of the BENJAMIN ELECTRIC LTD., Brantwood Works, Tariff Road, Tottenham, London, N.17. The issue deals with the subject of correct lighting. The reference is No. 1101.

We have received from FALK STADELMANN AND CO., LTD., 83/93, Farringdon Road, London, E.C.1, copies of pamphlet No. 1375 dealing with the "Efesco" vacuum cleaner, and letter No. P.1376 on the same subject and intended for use as a covering letter when posting the pamphlet.

KORTING AND MATHIESEN ELECTRICAL, LTD., 711/715, Fulham Road, London, S.W.6, have published four new leaflets, covering "Pilolite" fittings, "Kandem" reflectors, "Farlite" lanterns, and "Catena" couplings. The references are 91 029, F.14 529, L.21 529, and A.11 228, in the order given.

A new electrical accessories catalogue has been issued by "M.K." ELECTRIC, LTD., Wakefield Street, Edmonton, London, N.18. The new issue gives particulars of a number of new lines including safety plugs, moulded adaptors, B.S. gauge three-pin, 15 A switch plugs and d.p. horizontal 15 A switch plugs.

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ELECTRICITY SUPPLY.

Bradford Mains Extensions—New Plant for Exeter—Mansfield Assisted Wiring Scheme—Portstewart Declines Bulk Supply—Eastbourne Parade Lighting—St. James' and Pall Mall Co.'s Reduced Charges—Rotherham Corporation's Bill.

COVENTRY Electricity Committee is to extend mains at a cost of £4 018.

Maidstone T.C. has received sanction to borrow £36 683 for mains, services and works.

Bradford Electricity Committee seeks sanction to borrow £200 000 for mains and services.

Sheffield Electricity Committee has authorised mains extensions at a cost of £8 525.

Hampstead (London) B.C. has been recommended to seek sanction to borrow £47 000 for cables.

Blackburn Electricity Committee is applying for sanction to borrow £20 000 for mains and services.

Leeds Electricity Committee has obtained sanction for loans of £175 000 for services and £50 000 for assisted wiring.

Exeter Electricity Committee recommends the purchase of a steam turbo-alternator at an estimated cost of £65 000.

Blackpool Corporation is applying for sanction to a loan of £5 000 for an electricity feeder cable and £2 550 for tramway feeder cable.

Coventry Electricity Committee has approved extensions of plant at the Longford generating station, at an estimated cost of £162 000.

Walsall electricity department is to carry out extensions to supply to houses on the Wolverhampton Road housing site at a cost of £3 150.

Barnstaple T.C. has applied for a loan of £4 231 17s. 10d. for work in connection with the electricity scheme submitted by Mr. J. H. Rider.

Highbridge U.D.C. has withdrawn its opposition to the erection of overhead lines in Church Street by the North Somerset Electric Supply Co.

The North Somerset Electric Supply Co. has informed Langport R.D.C. of its intention to apply for consent to erect overhead lines from Butleigh to Somerton. The Council is offering no objection.

Newry U.D.C., subject to the approval of the Electricity Commissioners, has decided to apply for loans totalling £7 500 for the purpose of carrying out free wiring of houses in the urban district and for extending the electric mains.

Portsmouth Electricity Committee has received sanction to borrow £1 759 for the purchase of sites and erection of sub-stations at Lee-on-Solent, Gable Head and Stubbington, and £16 000 for mains in connection with the extension to Sarisbury.

The South London Electric Supply Corporation, Ltd., announces that from and after the December meter readings, the lighting flat rate will be reduced from 6d. to 5¼d. per kWh. and the unit charge from 1d. to ¾d. under the domestic and business " all-in " rates.

Dungannon (Co. Tyrone) U.D.C. has received a request from the Dungannon Gas Co. for the Council's consent to the grant to the gas company of an Electricity Order in respect of the urban district and adjacent rural area. The Council has decided to take no action.

Wimbledon Electricity Committee has decided to provide a 3 750 kW turbo-alternator with switchgear and auxiliaries, at a cost of £20 000, to meet the growth of demand for electricity.—The Committee has obtained sanction to borrow £30 000 for mains and services.

Godalming T.C. has been notified by the Aldershot Gas Water and District Lighting Co. of its intention to make immediate application to the Electricity Commissioners for a Special Order to sanction the transfer to them (the Aldershot Gas, etc., Co.) of the Urban Supply Co.'s undertaking at Godalming.

Birkenhead Corporation has decided to include in its Bill in Parliament a clause to secure power to extend the limits of the electricity supply area.—The Electricity Committee has received sanction to borrow £8 966 for extensions of mains.—The Committee is to seek sanction to borrow £21 653 for a new h.t. switchboard and rotary convertor for the Bentinck Street electricity station.

Bristol Electricity Committee recommends that powers be included in the Corporation's proposed Bill to authorise the construction of sub-stations and transforming stations in any street within the area in which the Corporation is authorised to supply electricity and for powers to include within the city boundary land used for siding accommodation adjoining the new station at Portshead.

In connection with the assisted wiring scheme, the Borough Electrical Engineer of Mansfield has given detailed costs of 29 installations carried out by the department, and he has been given authority to carry out 50 more installations with a view to arriving at a definite conclusion as to whether it would be in the town's interest that the assisted wiring scheme should be carried out by the department or put out to contract.

Clauses are to be included in Rotherham Corporation's Bill in the ensuing session of Parliament extending the electricity supply area at Thorpe, so as to include the whole of Thorpe Hesley and Hesley Bar.—The Housing Committee has instructed the Borough Engineer to arrange for staircase lights with two-way switches in about 1 400 houses at Eastdene, at a cost not exceeding £1 3s. per house, the work to be carried out by the electricity department.

The St. James' and Pall Mall Electric Light Co., Ltd. (London), has reduced the charge for electricity for power, heating and cooking from 1d. to ¾d. per kWh. The minimum charge for lighting has also been reduced from 10s. per quarter to 6s. per quarter for the two winter quarters and to 4s. per quarter for the two summer quarters. The charge for lighting was reduced at the commencement of this year to 4d. per kWh for the first 2 000 kWh per annum and 3d. per kWh for further consumption.

The report to the Canadian Department of Trade and Commerce on the electricity and gas inspection services for the year ended March 31st, 1929, states that 324 998 electricity meters were tested, an increase of 31 673 over the previous year, and the number of meters in service increased by about 78 000 to a total of about 1 500 000. Electricity produced for export during the year was 1 604 212 276 kWh, a decrease of 70 643 731. Revenue collected by virtue of the export duty was $351 109, a decrease of $22 567.

Mr. S. R. Henry, chairman, reported at a meeting of Portstewart U.D.C. last week that he and the electricity works manager, Mr. M'Mullan, had attended a conference in Coleraine in reference to proposals of the Antrim Electricity Supply Co. The figures at which the company would be prepared to give Portstewart a bulk supply, when added to the distributing cost and cost of maintenance would represent about 0d. per kWh. That did not seem very attractive, especially to the Portstewart and Portrush people, who had already their own plants installed. Mr. H. Lynch said the electricity supply in Portstewart should be run entirely as a separate department, and the cost of steet lighting and the pumping of water by electricity made a charge on the rates. This suggestion was agreed to.

Stoke-on-Trent Electricity Committee has decided to give a supply of electricity to Harrison and Sons, Joiners' Square mill, opposite the central power house, Hanley, on a restricted hour basis for the long hour power load of not less than 200 H.P., at £4 per kVA and ¼d. kWh, with the usual coal clause.—In connection with change-over work on consumers' premises, it has been decided to seek sanction to borrow £5 000 for change-over of consumers' apparatus, for as long a period as possible.—The Electricity Committee has voted £6 500 for mains and equipment in connection with supplies to the Springfield Tileries of Messrs. Wheatley and Co., at Stone Road, Trent Vale, and mains are to be extended, at a cost of £3 500, in connection with supplies to the works of Messrs. Bullers, Ltd., at Milton.

Sanction to borrow £25 000 for extension of mains and services; £5 000 for sub-stations; and £7 837 for parade lighting is being sought by Eastbourne Electricity Committee.—In anticipation of the granting at an early date of the application by Eastbourne Corporation for a Fringe Order to supply certain specified premises in East Dean and Friston, the Finance Committee seeks sanction to borrow £11 430.—The Electricity Committee has authorised the consulting engineer to invite tenders for l.t. work in the parishes of East Dean and Friston.—Revised plans and estimates dealing with the substitution of underground for overhead transmission lines have been lodged with the Electricity Commissioners. The total estimated capital expenditure for underground transmission is £11 430, and overhead transmission £6 800.

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ELECTRICAL NEWS OF THE WEEK IN PICTURES.

The popularity of lotteries on the Continent has resulted in the development of electrically-operated calculating machines, and the instrument shown in the picture is one of the latest designs for automatic working.

Admiral of the Fleet Sir Henry Jackson, whose death on December 14th is referred to on page 768.

The latest comfort provided by American railways is the telephone, by means of which communication may be established with any part of a train. The service is free.

The January E.D.A. window display. The general effect is obtained by pleating the ends of ten lengths of crêpe paper and fixing these firmly to the window background. Each piece of crêpe is then stretched to its full length, the end rolled over a small stick or strip of cardboard and nailed to the background. The whole of the material is now available from the E.D.A.

The recent bad weather and earthquake disturbances in the bed of the North Atlantic have been responsible for a number of cables breaking down. Cable ships are already repairing the damage, and in this view of Sennen Cove, Cornwall, part of a new section of cable may be seen being hauled ashore.

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BUSINESS ITEMS.

THE LIGHTING TRADES, LTD., of 30-31, Farringdon Street, E.C.4, announce that they supplied the lighting fittings for the airship R101 to the special requirements of Messrs. Haslam and Newton.

The address of the BRITISH PORCELAIN CO., LTD. has been changed to Artillery House, Artillery Row, London, S.W.1. The telephone number remains Victoria 0615.

A special Christmas display of fittings, radiators, kettles, irons, curling tongs, standards, fancy shades, cigar lighters, etc., by Mr. Harry Moss. The large stone columns rather spoil the picture but the display when seen is unusually attractive.

The CLARKSON THIMBLE TUBE BOILER CO., LTD., 613, Australia House, Strand, London, W.C.2, announces that AUSTINLITE, LTD., have removed to Lighthouse Works, Smethwich, Birmingham.

An agent, established at Suresnes, is desirous of obtaining the representation of British manufacturers of electrical apparatus and specialities. The Department of Overseas Trade has further details. (Reference No. 626.)

A well-established firm in Salonika wishes to represent in Macedonia and Thrace, British manufacturers of electrical machinery, storage batteries, turbines, Diesel engines, steam engines and boilers, etc. Further particulars from the Department of Overseas Trade. (Reference No. 630.)

Important orders received by HART ACCUMULATOR CO., LTD., recently include one for two batteries, each consisting of 25 " STF. 67 " cells, having a capacity of 9 693 ampere hours, to be installed in the new Whitehall Telephone Exchange.

M. W. WOODS, LTD., Denmark Street, Colchester, announce that the association of interests between S. G. Leach and Co. Ltd., and themselves has been terminated, and an office has been opened at Kingsway Chambers, 46, Kingsway, London, W.C.2, with Mr. M. G. Woods in charge.

The ELECTRO DYNAMO CONSTRUCTION CO., LTD., 733B, Old Kent Road, London, S.E.15, announces the appointment of Mr. G. H. W. Gasper, 48, Palatine Buildings, Victoria Street, Manchester, G. W. Mayle and Co., 134, St. Vincent Street, Glasgow, C.2, and Mr. D. Baldwin, 69, Albion Street, Leeds, as agents for Lancashire, Scotland and Yorkshire.

The MARCONI'S WIRELESS TELEGRAPH CO., LTD. Marconi House, Strand, London, W.C.2, announces that short-wave wireless messages transmitted by the exploration party of Major C. Court-Treatt, from a portable Marconi equipment in the Sudan, have been received as far afield as the U.S.A.

We understand from a telegram received from Australia that Central and Paddington automatic telephone exchanges have just been successfully opened for public service at Brisbane. The event is notable because the transfer of these two exchanges, totalling nearly 10 000 lines, is the largest yet undertaken in Australia. The conversion to the automatic system was commenced in 1925 when South Exchange with nearly 4 000 lines was opened. Since then the system has steadily grown until it now comprises three main automatic exchanges and seven satellite exchanges equipped for a total of over 20 000 lines. All the automatic exchanges in Brisbane area have been manufactured and installed by SIEMENS BROTHERS AND CO., LTD., Woolwich.

ELECTRIC TRACTION.

Underground Railway Committee and Development in the Manchester Area.

THE report of the Underground Railway Committee will be considered at the New Year meeting of Manchester City Council. The scheme approved by the Committee comprises an inner circle tapping the five big railway stations and also the busy areas of Piccadilly and New Cross. From this circular route five radial lines would run to Didsbury, Levenshulme, Openshaw, Newton Heath and Cheetham Hill. The cost of the scheme is estimated at £11 000 000, of which it is hoped that the Government will contribute 50%. The Committee recommends that the Council approve the scheme, and asks Salford to take joint action and approach the Government on the subject of financial aid.

Newport (Mon.) Corporation is to replace its tramcars on the Chepstow Road route by railless trolley vehicles.

Lieut.-Col. Anderson, of the Ministry of Transport, has approved Bradford Corporation's Allerton railless trolley route.

Llanelly Electric Lighting and Tramways Committee proposes to scrap the electric tramway system and to run trolley buses.

Maidstone T.C. has decided to equip a further trackless trolley route from St. Luke's Church to the top of St. Philip's Avenue.

Croydon T.C. has received sanction to a loan of £1 610 for doubling the tramway track near the " Rising Sun," North End.

The Hastings and District Tramways Co. is introducing a bill in Parliament for powers to run trolley buses on many new routes in the town, and to Battle.

Nottingham Corporation on December 2nd authorised the promotion of a Bill in Parliament to secure powers to extend the municipal trolley omnibus services.

Leicester Tramways Committee recommends the City Council to apply for powers to convert any of its existing tramway routes to trackless trolley omnibuses.

It is stated that the Pennsylvania Railway will shortly place an order for 150 electric locomotives, estimated to cost £3 200 000, for use on the New York-Philadelphia-Washington line.

The Southern Railway Co. has announced that the work of electrifying the Brighton line will be put in hand within the next few months, and the new services should be running in two or three years.

Glasgow Corporation is promoting a Provisional Order, which contains a suggested provision that railways in the city shall be worked by electricity or other motive power which does not involve the emission of smoke.

Trolley Buses for London.

The London Underground Group is promoting a Bill in Parliament, including clauses to authorise the use of railless trolley vehicles. The first experiments with such vehicles are to be made in the neighbourhood of Kingston.

The London United Tramways Co. is promoting a Parliamentary Bill to authorise the running of trackless trolley omnibuses in place of the existing tramcars. If the Bill is passed it is intended to experiment on certain routes.

Wath-upon-Dearne U.D.C. has not yet consented to the promotion of a Bill by the Dearne District Light Railway Committee (which operates the Dearne Valley tramway) to authorise the conversion of the whole or part of the tramway to the railless trolley system. At a recent meeting of the Wath Council, voting upon the question was equal.

On the occasion of the recent opening of Salford's new bus garage and tramcar depôt, in Eccles New Road, Ald. W. Greenwood, chairman of the Tramways and Motor Omnibus Committee, said that the day of the tramcar was not over was shown by the fact that about a million and a half passengers per annum were carried on the Corporation tramcars.

For many years there has been criticism in Carlisle City Council regarding the condition of the track of the city tramways, which are run under Parliamentary powers by the Carlisle and District Transport Co., Ltd. The Council has adopted the recommendation of the General Purposes Committee that the Council exercise its powers by seeing that the track is put into a satisfactory state of repair and maintained in good order in future.

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COMPANY NEWS.

Further Fall of Electricity Supply Securities—Burma Electric Supply Co. Abandons Omnibuses—Reports and Dividends—New Companies.

THE principal movement shown this week by our usual comparison of electrical share price quotations is a further fall of nearly 4s. 6d. in County of London Supply ordinary shares, from 46s. 3d. to under 42s. The new shares were dealt in at 3s. 6d. premium, after opening at 3s. 9d. Bournemouth and Poole shares have weakened 1s. 3d., from 58s. 9d. to 57s. 6d., and Yorkshire Power from 33s. 9d. to 32s. 6d., while Midland Counties Supply shares are 6d. down at 27s. 6d. London Power Company 5% debenture stock (of which there is in issue nearly 14 millions sterling) has moved up a point to 98. Tokyo bonds at 92 are a couple of points lower.

Hydro Electric Securities at under 42 have lost more than half of last week's advance, and International Holdings are a little lower. Radio Corporation of America shares have maintained the higher level reached a week ago, and are a point higher at 45. Cables and Wireless stocks have remained steady. Several cablegram companies' stocks have moved up slightly, Eastern preference and debenture issues and Eastern Extension debenture stock improving a point, and Western Telegraph debenture stock following suit. American Telephone and Telegraph capital stock has been sold by profit-takers and the quotation, at 225, has lost the 10 points gained last week. The same remark applies to International Telephone and Telegraph Stock, which has relapsed from 85 to 80 dollars. Marconi International Marine shares, too, at 47s. 6d., have lost half of the 2s. 6d. gained last week. Anglo-American Telegraph ordinary and preference stocks, United River Plate Telegraph debentures and New York Telephone mortgage bonds are all a point to the good.

In the transportation and equipment sections, British Electric Traction preferred ordinary stock has risen two points and London and Suburban "A" debentures 2½. British Columbia Electric Railway preference stock has risen a point, to 88½. English Electric Co.'s ordinary shares have changed hands at 3s. 9d., and the quotation has been marked down to that figure. W. T. Henley's shares are up 1s. 3d., to 118s. 9d., and Siemens debenture stock is a point higher at 92½. General Electric "B" preference shares have put on 6d., to 25s. 6d.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1926 to 1928. Highest.	Lowest.
	Electricity Supply.				
6	Adelaide El. Sup. 6% Cum. Pref..	20/6	20/6	22/6	19/9
6½	" " C. Cum. Pref. ..	20/6	20/6	23/6	20/6
15	B'mouth & Poole El. S. Ord. ..	57/6	58/9	71/-	29/9
6	" " " 6% Cm. Pf.	23/-	23/-	24/-	21/-
(d)	Brompton & Kensington Ord. ..	25/6	25/6	35/6	23/9
(f) 12	Calcutta E. Supp. Ord.	50/7½	50/7½	56/-	32/6
5	" " 5% Cum. Pref.	21/3	21/3	23/3	19/10
4	Central Elec. Sup. 4% Deb. ..	94½	94½	95½	88½
(e)	Charing Cross Elec. Ord. (£1) ..	26/6	26/6	51/-	24/3
4½	" " " 4½% C.P. (£1)	17/-	17/-	18/3	16/6
(b)	Chelsea Elec. Sup. Ord.	25/-	25/-	45/3	24/-
10	City of Lond. Elec. L'ting Ord. ..	31/10½	31/10½	52/10½	26/-
6	" " " " 6% C.P.	22/6	22/6	24/3	21/6
8	Clyde Valley Electl. Power Ord.	38/9	38/9	41/6	26/6
8	" " " " 8% Pref.	27/6	27/6	29/6	26/-
7	Cornwall Power 7% Pref. ..	23/9	23/9	25/6	19/-
10	County Lon. Elec. Sup. Ord. ..	41/10½	46/3	68/6	25/9
6	" " " " 6% C.P.	22/6	22/6	24/-	21/3
7	Edmundson's Elec. Corp. 7% Pref.	24/-	24/-	27/-	21/6
(g)	Electric Supp. Corp. Ord. ..	48/1½	48/1½	59/6	29/6
6	" " " 6% Cum. Pref...	21/6	21/6	23/-	20/4
9	Elec. Distrib. of Yorks Ord. ..	33/9	33/9	45/-	26/9
4	Fife Tram. Lt. & P Ord.	12/6	12/6	23/6	10/-
6	" " " " 6% C.P. ..	15/-	15/-	20/6	16/-
5	Folkestone E.S. 5% C.P.	17/6	17/6	19/-	17/6
4½	" " 4½% 1st Mt.Deb.Stk.	89	89	92	80½
—	Hydro Electric Securities ..	41½	43	87	20
—	International Holdings	6	6½	35½	6½
(c)	Kensington & K'bridge Ord. (£1)	26/-	26/-	27/6	23/9
7½	Lancs E.L. & P. Ord	27/-	27/-	32/9	22/10
6	" " " 6% C. 1st. Pref. ..	27/-	27/-	28/6	24/9
7	" " " 7% Part. Cum. Pf.	27/-	27/-	31/3	24/6
1/9½	Lon. Elec. Sup. Ord. (£1) ..	26/6	26/6	37/6	23/-
5	London Power Co. 5% Deb. Stk.	98	97	104	95
10	Melbourne Electric Ord. Stk. ..	173	173	180	150
1/9½	Metro. Elec. Sup. Ord.	37/6	37/6	53/-	24/9
4½	" " " 4½% C.P. ..	17/-	17/-	18/3	16/3
6½	Mid. Counties E.S. Ord.	27/6	28/-	33/3	18/9
8	Mid. E. Corp. for Power Dist. Ord.	33/9	33/9	57/3	29/10
7½	N'castle & Dis. Elec. Ltg. Ord. ..	27/6	27/6	31/9	17/6
1/2½	N'castle-upon-Tyne Elec. Sup. Ord.	23/9	23/9	30/3	19/3
6	N. Metro. Elec. Ord.	47/6	47/6	51/6	31/-
6	Notting Hill 6% C.P. (£10) ..	11	11	11½	9½
11	River Plate Elec. Ord. Stk. ..	210	210	226	187½
(c)	St. James & P.M. Ord. (£1) ..	26/-	26/-	28/6	23/6
8	Scottish Power Ord.	29/-	29/-	35/9	22/-
6	Shrops. Worcs. & Staffs. Power Pref.	22/-	22/-	—	—
8	Smithfield Mkts. E.S. Ord. ..	25/-	25/-	26/-	21/9
8½	S. London E.S. Ord.	25/6	25/6	30/11	23/9
7	S. Met. E.L. & P. 7% 1st Pref. ..	25/-	25/-	27/-	24/3
6½	S. Wales Power 6½ C.P.	18/9	18/9	21/-	18/3
6	Tokyo Elec. 1st Mt. Ster. Bonds ..	92*	94	98½	86½
7	Urban E.S. Ord.	35/-	35/-	46/6	18/-
5	Victoria Falls Power Ord. ..	57/6	57/6	69/-	46/3
1/9½	W'minster Elec. Sup. Ord. (£1) ..	25/-	25/-	52/9	24/-
4½	" " " 4½% C.P. (£1)	17/6	17/6	17/10½	16/7½
7½	Whitehall Elec. Inv. Pref. ..	23/6	23/6	25/3	18/9
6	" " 1st Mt. Deb. ..	102	102	106	97½
8	Yorks Elec. Power Ord.	32/6	33/9	38/9	24/6
6	" " " 6% C.P. ..	23/6	23/6	26/9	20/7
	Railways and Tramways.				
4½	Birmingham Dist. P. & T. 1st Deb.	81½	81½	85	70½
5	British Col. Elec. Rly. Pref. Stk...	88½	87½	98	82
8	Brit. Elec. Trac. Pfd. Ord. Stk. ..	119½	117½	152	117
7·67	" " " 6% Pf. Stk.	123½	123½	133	103½
6	Calcutta Trams Ord.	14/4½	14/4½	24/-	14/6
5	" " " 5% Cum.Pf.	13/9	13/9	15/9	13/6
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	71	71	72	54
4½	" " " 4½ Pf.	79½	79½	85½	78
4	" " " 4% Deb.	77	77	83	77½
5	City & S. London, Cons. Ord. ...	67	67	64	58
4	" " 4% Perp. Deb. ..	76½	76½	81	76½
5	Lon. Elec. Rly. Cons. Ord. Stk. ..	71½	71½	75½	42½
4	" " " " 4% Pf. Stk.	71	71	77	68
4	" " " " 4% Deb. ..	77	77	83	76½
5	Lon. & Sub. Trac. A. Deb. ..	96	93½	97½	74
4	Lon. Un. Trams, 1st Deb. ..	51½	51½	63	39
4½	Met. Elec. Trams, 4½% Deb. ..	74	74	73½	62
5	" " " 5% Deb. ..	70½	70½	70½	65½
3½	Met. Rly. Cons. Ord. Stk. ..	62½	62½	81	54½
3½	" " " 3½% Pf. Stk. ..	61	61	76	60½
3½	" " " 3½% Deb. ..	68	68	73½	67½
5	Met. Dist. Rly. Ord. Stk.	72	72	77½	52½
4½	" " " 4½% 1st Pref. ..	79½	79½	84	74½
6	" " " 6% Perp. Deb. ..	112½	112½	118½	110
5	Rio de Janeiro Trm. 50 yr. Mt. Bds.	82½	82½	95½	82
4	S. Met. Elec. Trams, 4% Deb. ..	70	70	70	64½
9	Torquay Trams Ord.	25/-	25/-	30/3	20/3
7	Underground Electric Rlys. Ord.	21/6	21/6	28/8	11/-
5	Winnipeg Elec. Refdg. Mt. Stk. ..	83½	83½	92	77
—	Yorks. (W.R.) Trams, Ord. ..	5/-	5/-	16/-	3/-
4½	" " " 1st Deb. ..	57	57	78	60
	Electrical Manufacturing				
6	Associated Elec. Indus. Ord. ..	25/7½	25/7½	58/6	26/3
8	" " " 8% C.P...	51/10½	51/10½	56/9	49/6
4	" " " 4% Mt. Deb.	75½	75½	79½	73
12½	Automatic Tele. Mfg. Ord. ..	37/6	37/6	58/9	40/6
7	Brit. Elec. Transformer 7% C.P...	13/1½	13/1½	19/10	4/6
15	Brit. Insulated Cables Ord. ..	75/-	75/-	86/3	56/-
6	" " " 6% C.P. ..	22/6	22/6	23/10	21/-
7	British Thomson-Houston Pref. ..	22/9	22/9	24/9	19/7
7	" " " 7% Deb.	102½	102½	109½	102½
10	Brush Electrical Ord. Stk. ..	126	126	153½	120
15	Callender's Cable Ord.	72/6	72/6	91/3	66/-
6½	" " 6½% C.P. ..	25/-	25/-	25/9	22/-
7½	" " 7½% B. Pref. ..	27/6	27/6	28/3	25/-
17½	Consolidated Signal Ord.	42/6	42/6	52/-	6/6
6	" " 6% C.P. ..	17/6	17/6	20/6	14/9
8	Crompton Parkinson 8% Cum. Pf.	25/-	25/-	27/-	14/-
6	" " 6% Cum. 2nd Pf.	18/3	18/3	19/6	9/7
7½	Edison Swan Elec. 1st Pref. ..	24/4½	24/4½	13/-	7/4½
5	" " " 1st Deb. Stk.	84½	84½	92	81½
5½	Elec. Construction Ord.	15/-	15/-	32/6	23/6
7	" " 7% C.P. ..	20/-	20/-	22/9	21/-
4	" " 1st Mt. Deb. ..	66½	66½	75	68
20	Enfield Cable Works Ord.	97/6	97/6	82/-	60/-
7½	" " " 7½% Cum.Pf.	26/3	26/3	27/9	24/6
—	English Elec. Ord.	3/9	6/3	15/9	3/-
—	" " 6% C.P.	7/6	7/6	18/9	7/-
5½	" " 1st Mt. Deb. ..	88	88	103½	86
6	" " Conv. Deb. ..	71½	71½	107½	63
7	Ericsson Telephones 7% Pref. ..	20/-	20/-	22/7½	17/6
35	Ever Ready (Gt. Britain) Ord. ..	19/-	19/-	92/3	18/1
10	" " 7% Partic. Pref. ..	29/-	29/-	34/2	23/9
6	Ferranti 6% Pref.	18/-	18/-	19/4½	16/9
7	" 7% 2nd Pref.	21/3	21/3	19/3	13/9
10	General Elec. Ord.	47/6	47/6	46/6	26/6
6½	" " "A" C.P.	24/-	24/-	26/-	22/-
7½	" " "B" C.P. ..	25/6	25/-	27/9	28/9
7	" " 1st Mt. Deb. ..	102½	103½	109	100½
5	Greenwood and Batley Ord. ..	11/3	11/3	13/9	10/1
25	W. T. Henley's Ord.	118/9	117/6	120/-	69/3
10	International Auto. Telephone Ord	36/3	36/3	50/6	35/-
10	Johnson & Phillips Ord.	36/3	36/3	67/11	34/-
7½	Lon. Elec. Wire & Smith's Pref...	23/9	23/9	25/-	22/3
10	Nat. Elec. Construction (10/-) ..	20/-	20/-	19/3	13/6
7½	Siemens Bros. & Co. Ord. ..	26/3	26/3	36/6	24/9
10	" " " Cum. Pref.	32/6	32/6	34/3	28/9
4½	" " " Deb. Stk. ..	92½	91½	95	88½
10	Telegraph Const. Ord. (£12) ..	23	23	30½	20
8	Waste Heat & Gas Elec.	21/3	21/3	23/6	17/3
	Telegraph and Telephone.				
9	Amer. Tele. & Teleg. Cap. Stk.	225	235	212½	144½
4½	" " " Conv. Gd. Bds.	110	110	105½	102
3½	Anglo-Am. Teleg. Ord. Stk. ..	61½	60½	63½	56½
6	" " " 6% Prefd. Stk...	101½	100½	105½	91
1½	" " " Deferred Stk..	24½	24½	25½	22
8	Anglo Portuguese Tele. Ord. ..	21/3	21/3	26/-	12/3
—	Cables and Wireless—				
—	7½% "A" Ord. Stk. ..	76½	76½	—	—
—	"B" Ord. Stk.	37½	37½	—	—
—	5½% Cum. Pref. Stk. ..	96	96	—	—
3½	Eastern 3½% Pref. Stk.	62½	61½	70½	59
4	" 4% Deb.	76	75	81½	74
4	Eastern Extension 4% Deb. Stk.	76	75	80	74½
22	Great Northern Telegraph (£10)	29½	29	43½	26
10	Indo-European (£25)	52½	52½	48½	30
—	International Teleph. & Teleg. ..	$80	$85	161½	48½
15	Marconi Int. Mar.	47/6	48/9	90/-	16/6
4½	New York Telep. 4½% Mt. Bds...	97½	96½	101	96
12	Oriental Telephone Ord.	38/9	38/9	65/-	42/-
—	Radio Corporation of America ..	45	44	115½	18½
4½	United R. Plate Teleph. 4½% Deb.	88½	87½	89½	82
4	Western Tel. 4% Deb. Stk. ..	77	76	82	76

(a) 19·9d. per share. (b) 1s. 9·93d. per share. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 7·181d. per share. (f) Plus 4d. bonus. *Ex dividend. (g) 2s. 2½d. per share.

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Directors' Reports, etc.

QUEBEC POWER CO.—Qrtrly. div. of $⅝ on common stk. will be payable on Jan. 15.

CITY OF BUENOS AYRES TRAMWAYS CO. (1904), LTD.—Deb. stk. transfer books will be closed from Dec. 18 to 31, inclusive.

POSTAL TELEGRAPH AND CABLE CORPORATION.—Directors have declared qtrly div. of 1¾% on 7% non-cum. pfd. stk. payable Jan. 2.

EASTERN TELEGRAPH CO., LTD.—Div. at rate of 3½% p.a., less tax, will be paid on Jan. 15, on pref. stk. for quarter endg. December 31, 1929.

AUTOMATIC TELEPHONE MFG. CO., LTD.—Div. on pref. shs. for half-year to Dec. 31, 1929, has been declared, and warrts. will be posted on that date.

AUTO-ELECTRIC DEVICES, LTD.—First rept. covering period July 14, 1928, to Sept. 30, 1929, states that, owing to many disapptmts. and difficulties, productn. of self-winding motor has been held up.

BENN BROTHERS, LTD.—The usual divs. will be payable, less tax, on Feb. 15, 1930, viz.: 3% on pref. sh. for half-year endg. Dec. 31, 1929, and intm. divs. of 6¼% on ord. shs. and 1s. 3d. p. sh. on dfd. shs.

ANGLO-ARGENTINE TRAMWAYS CO., LTD.—Divs. of 2s. 9d. p. sh., less tax, on 5½% cum. 1st pref. shs. and 3s. p. sh., less tax, on 6% cum. 2nd pref. shs., both for half-year endg. Dec. 31, will be payable on January 1.

MEXICAN ELECTRIC LIGHT CO., LTD.—Coupon 49 of the 5% 1st mtge. gold bonds will be paid on and after Jan. 1 at the Bank of Montreal, 47, Threadneedle Street, London, E.C., where listing forms can be obtained.

LISBON ELECTRIC TRAMWAYS, LTD.—Div. for six months endg. Dec. 31, 1929, on 6% cum. pref. shs., less tax, and intm. div. of 3% net on ord. shs. on acct. of earngs. for year ended Dec. 31, 1929, will be payable on Jan. 1.

COLUMBIA GAS AND ELECTRIC CORPORATION—Earngs. of Corporation and subsidiaries for qrtr. to Sept. 30, $22 310 305, agst. $20 356 915. After provisn. for operatg. excs., res., and taxes, net earngs. were $5 702 654, agst. $4 872 211. for correspondg. qrtr.

AMERICAN AND FOREIGN POWER CO.—It is reported that this company has taken a financial int. in the Andhra Valley Power, the Tata Power and the Tata Hydro Electric Co., which are managed by Tata, Sons and Co., of Bombay.

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD.—Transfer books of 4½% deb. stk., 5% deb. stk. and 6% pref. shs. (London register) are closed until Dec. 31, inclusive, for purpose of preparing int. and div. warrts. payable Jan. 1.

MEXICO ELECTRIC TRAMWAYS, LTD.—Coupon No. 63 on 5% 1st charge debs. to bearer will be paid on and after Jan. 1 by the Canadian and General Finance Co., Ltd., 3, London Wall Bdgs., London, E.C.2, where listing forms can be obtained.

BRITISH ELECTRIC TRANSFORMER CO., LTD.—Directors announce that, after deductg. last year's carry fwd., tradg. for six months ended June 30 resulted in loss of £5 595. They add that in spite of continuance of unrestricted competitn. factories are now workg. full time.

EDISON BELL, LTD.—Net pft. for year ended Sept. 30, £28 146, compared with net blce. of £20 158 for previous 15 months, plus £33 139 from sale of foreign trading interests. Fin. div. 5%, making 10%, agst. 12½%. Written off pref. issue exes., £3 000. Last year £20 000 was placed to reserve. Fwd. £8 676, agst. £9 780.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—The special arrangemts. whereby certificates of subscriptn. for additional ord. shs. cd. be exchanged for definitive certificates without the delay and risk of transmission to Canada has terminated, and all certificates of subscription must be sent for exchange to National Trust Co., Ltd., Toronto, Canada.

COMPANIES TO BE STRUCK OFF THE REGISTER.—The following companies will be struck off the register unless cause to the contrary is shown before February 26:—Airships Electric Advertising Co., Chippenham Electric Supply Co., Dunlop Marine Course Signal Syndicate, Eureka Electric and Wireless Maintenance Guarantee Co., International Inventions and Patents Exploitation Co., Melksham Electric Supply Co., Midland Electrical Tube Co., Trowbridge Electric Supply Co., Winchcomb Electric Light and Power Co.

INDO-EUROPEAN TELEGRAPH CO., LTD.—Directors certify that Part 3 of agreemt. dated Nov. 22, 1929, and made between Imperial and International Communications, Ltd., of the first part, H. L. M. Tritton and others of the second part and certain shhldrs. of Indo-European Telegraph Co., Ltd., of the third part became unconditnl. and operative on Dec. 13, 1929, and the directors also state that any shhdr. of the Indo-European Telegraph Co., Ltd. who intends to accept the offer of Imperial and International Communications, Ltd., to purchase his shs. should do so at once, as the offer will be withdrawn very shortly.

AMERICAN RADIO AND CABLE MERGER.—Details of the proposed agreemt. betwn. the Radio Corporation and the International Telephone and Telegraph Corporation, were given to the U.S.A. Senate Committee last week. The International Telephone and Telegraph Corporation is to pay 400 000 shs. to the Radio Corporation for the combinatn. of the business, the paymt. of stock to be spread over five years. General G. N. Harboard, president of the Radio Corporation, recommended to the Senate Interstate Commerce Committee that legislation be passed to legalise the merger.

EDISON BELL (INTERNATIONAL), LTD.—Rept. for period from Sept. 13, 1928, to Sept. 30, 1929, shows pft. £5 620, which is carried fwd. Directors state that, while prospectus estimates have not been fully justified, plans for developmt. of company have proceeded satisfactorily. Turnover is increasg. month by month, and business is now on a sound basis and making steady progress. Subsidiary companies are in active and successful operatn. in France, Italy and Yugoslavia, business in the Far East is progressg. in satisfactory manner, and general tradg. in other countries is being gradually extended on profitable basis.

Company Meeting.

BURMA ELECTRIC SUPPLY CO., LTD.—Mr. C. O. Webb, presiding at the meeting on December 11th, said the earnings for the year to July 31st were £19 184, compared with £25 213 for the previous 12 months, the reduction following the diminution of the traffic receipts of the trams and motor omnibuses, this being due to competition of omnibuses run chiefly by individual owners. The board has decided to discontinue the company's experimental service of omnibuses. They had proved by their experiment that it would not be possible to run a regular service with a properly equipped fleet of buses at the low fares which they had charged on their trams. For no adequate reason which had reached the board, the adoption of rules to control the running of other owners' omnibuses had been postponed from month to month, and no steps had been taken to enforce them. With regard to the supply of current for lighting and power, during the past year they had made considerable progress in the change over from the original system of supply at 500 V to a standard voltage of 250. Their receipts from the sale of current showed an increase of £1 496, which was due to increased sales and not to the alteration in their rates on the change over to the lower voltage, which had not affected last year's figures. As regarded the future of the tramways, they hoped the authorities would eventually realise the disservice they might be rendering to the travelling public if the present conditions were allowed to continue. The report and accounts were adopted and a dividend on the ordinary shares of 2½%, less tax, making a total of 5% for the year, was approved.

New Companies.

R. J. ROBINSON AND CO., LTD.—Cap., £1 000. Engineers, electricians, etc. Solicitors: Falkner, Son and Roberts, Louth, Lincs.

HYPERLITE UNITS, LTD.—Cap., £100. Manufacturers of hyperlite units, electrical signs and apparatus, etc. Reg. Office: 25, Islington Green, London, N.1.

GRAINGER AND THRELFALL, LTD.—Cap., £1 000. Manufacturers of and dealers in glass tubing, electrical goods, etc. Solicitor: J. Haswell, 32, West Street, Gateshead.

VULCANIZED FIBRE MARKETING BOARD, LTD.—Cap., £1 000. To promote marketing of vulcanised fibre and insulating materials, etc. Director: F. N. MacEchern (chairman), Merven, Christchurch Avenue, Finchley, London, N.12.

CHAS. PRESTON AND CO., LTD.—Cap., £3 500. To acquire business carried on by L. St. Alphonse, as Chas. Preston and Co., and to carry on business of agents for, and factors of, electrical, wireless and builders' appliances, fittings and accessories, etc. Reg. Office: 41, Berners Street, London, W.1.

CONTRACT FINANCE CORPORATION, LTD.—Cap., £10 000. The objects are to finance contracts and hire purchase or other agreements, and to carry on the business of manufacturers of, and dealers in, plant, machinery for electrical, mechanical and chemical industries, wireless apparatus, etc. First directors are not named. Qualification: holding 500 shares, of any class, in the Bank of London, Ltd. Reg. Office: 11, Pancras Lane, London, E.C.4.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ABRAHAMS, S. W., Station Approach, Well Hall, wireless dealer. £17 19s. October 22nd.

ARCHERS (ELTHAM), LTD., 74, High Street, Eltham, wireless dealers. £21 5s. 8d. October 23, and £14 18s. 2d., October 22nd.

BRITISH ELECTRICAL MANUFACTURING CO., Alexandra Works, Brentview Road, Hendon, manufacturers. £114 17s. 6d. October 1st.

BROSAN, MR. R., 267, High Road, Willesden Green, wireless dealer. £21 10s. 4d. October 18th.

CROMPTON, S. AND J., 129, Chiswick High Road, Chiswick, wireless dealers. £13 10s. October 28th.

RED TRIANGLE ELECTRIC CO., LTD., 37, Tothill Street, Westminster. £13 15s. 8d. October 18th.

WESTON ELECTRIC LAMP CO., 47, Victoria Street, S.W., manufacturers. £17 5s. 10d. August 21st.

Receiverships.

BABINGTON (B.) AND CO., LTD.—H. Mason, of 156, Moor Street, Birmingham, was appointed receiver on December 2nd, 1929, under powers contained in debentures dated November 6th, 1911.

CLEETHORPES RADIO SUPPLY, LTD.—A. J. Weaver, corporate accountant, of 77, Victoria Street, Grimsby, was appointed receiver on November 22nd, 1929, under powers contained in mortgage debentures dated April 23rd, 1928, and May 1st, 1929.

DODMAN (E. V.), LTD.—T. W. Daffern, of 19/20, High Street, Coventry, was appointed receiver and manager on November 23rd, 1929, under powers contained in debenture dated December 7th, 1927.

GLADDEN AND DAVIES, LTD.—C. E. W. Lavender, C.A., of Trafford Park, Manchester, was appointed receiver on December 5th, under powers contained in debenture dated October 11th, 1929.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BRITISH BATTERY CO., LTD., Watford.—Registered November 29th, £300 debenture, to E. H. E. Morley, The Homestead, Sydney Road, Watford; general charge. *Nil. October 18th, 1928.

ELECTRICAL ENTERPRISE, LTD., London, S.W.—Registered November 22nd, £6 000 debenture to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; general charge; also registered November 22nd, £2 450 debentures; general charge (2nd charge). *Nil. May 13th, 1929.

RIDGED CONE CO., LTD., London, W.C., wireless engineers. Registered December 3rd, £800 debentures; general charge. *Nil. December 31st, 1928.

RUNBAKEN MOTOR AND ELECTRICAL ACCESSORIES, LTD., Manchester. Registered November 26th, £5 000 debentures; general charge.

Satisfaction.

HEWITTIC ELECTRIC CO., LTD., Hersham. Satisfaction registered December 4th, £10 000, registered November 1st, 1927.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

MAJESTONE, LTD., 20a, Russell Street, Leeds. The statutory meeting of the creditors in the voluntary liquidation of this company was held recently, when a statement of affairs was submitted which showed ranking liabilities of £1 823, of which £1 584 was due to the trade, and £239 to cash creditors. In addition, there were fully secured creditors for £150. There was also a contingent liability on bills of exchange amounting to £262, none of which was expected to rank. The assets comprised machinery £10, estimated to realise £5; fixtures and fittings £39, expected to produce £10; stock £591, valued at £400; book debts £962, estimated to realise £850; deposit £3 10s.; cash at bank £14, making a total of £1 282. After allowing £65 for preferential claims, the net assets were £1 217, or a deficiency as regarded the creditors of £606. The issued capital is £201, and the deficiency as regards the shareholders £807. It was reported that the company was registered on July 1st last to take over certain stock, etc. The trading of the company had been disappointing and the directors had declined to finance it further. No remuneration had been drawn by any of the directors. The turnover had only been £2 138, with a gross profit of £454, and a net loss of £416. The deficiency was accounted for by the loss on the trading, and the depreciation written off the assets. During the meeting a suggestion was made that the cash creditors should postpone their claims, and it was decided to confirm the voluntary liquidation of the company with Mr. S. Croudson, I.A., 12, East Parade, Leeds, as liquidator, with a committee. The principal creditors are: Hardman and Co., £432; Clareth Reproductions, Ltd., £195; Grainge, —., £71; Taylor, E., £38; Redhead, W., £30; L. L. Magneto Co., Ltd., £25; Dewhirst and Ibbotson, £19; Mullard Wireless Co., £18; Cinema Utilities, Ltd., £345; Ellison and Lees, £117; Tate, M. A., £45; Longhorn, P., and Son, £33.

London Gazette, etc.

Bankruptcy Information.

BROWN, John James, Handysides Arcade, Newcastle-upon-Tyne, wireless agent. First meeting, December 20th, 11.30 a.m., Official Receiver's Office, 81, St. Mary's Place, Newcastle-upon-Tyne. Public examination, January 8th, 10.30 a.m., Court House, 56, Westgate Road, Newcastle-upon-Tyne.

Notices of Dividends.

JOLIVARD, Kenneth Paul James, described in the Receiving Order as K. JOLIVARD AND CO., 66, Victoria Street, London, S.W., electrical engineer. First and final dividend, 4d. per £, payable Bankruptcy Buildings, Carey Street, London, W.C.2.

PRICE, Frederick, and TARVER, Charles Reekes, 15, Working Street, Cardiff, electrical engineers, trading as FRED PRICE, TARVER AND CO. First and final dividend, 1s. 6½d. per £, payable December 24th, Official Receiver's Office, 34, Park Place, Cardiff.

Notices of Intended Dividends.

BLAIR, Edward Winnington, electrical engineer and contractor, 6, Queen's Parade, Brent Street, Hendon, Middlesex, trading as BLAIR AND SON. Last day for receiving proofs, January 2nd. Trustee, T. Gourlay, 29, Russell Square, London, W.C.1., Official Receiver.

WOODHEAD, Titus Ernest, 26, Central Drive, Blackpool, electrical factor. Last day for receiving proofs, January 2nd. Trustee, H. Parker, 9, Cannon Street, Preston, Official Receiver.

WRIGHT, Ronald Reginald, trading as WRIGHT BROS., 36, Normanton Road, Derby, wireless dealer. Last day for receiving proofs, January 3rd. Trustee, L. A. West, 22, Regent Street, Park Row, Nottingham, Official Receiver.

Partnerships Dissolved.

ASHELL AND CO. (Hubert ASHWORTH and Tom MITCHELL), automobile electrical engineers and exide battery service agents, Yorkshire Street, Bacup, by mutual consent as from December 9th, 1929. Debts received and paid by H. Ashworth, who will continue the business.

WEIR ENGINEERING CO. (Henry Lawrence Dingwall FORDYCE and Joseph Reginald Montague STANFIELD), general mechanical automobile motor boat and electric engineers, by mutual consent as from November 30th, 1929. Debts received and paid by J. R. M. Stanfield.

METAL AND CHEMICAL PRICES.

		TUESDAY, December 17th. Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£75 15 0	5s.	—
Electro Wirebars	„	£84 0 0	—	—
H.C. Wires, basis	per lb.	11¾d.	—	—
Sheet	„	11¾d.	—	—
Phosphor Bronze—				
Wire (Telephone), basis	per lb.	1s. 2¾d.	—	—
Brass (60/40)—				
Rod, basis	per lb.	9d.	—	—
Sheet „	„	10¾d.	—	—
Wire „	„	10¾d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£3 15 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 15 0	—	—
Lead Pig—				
English	per ton	£22 15 0	—	—
Foreign or Colonial	„	£21 7 6	—	—
Tin—				
Ingot	per ton	£189 5 0	£11 10s.	-
Wire, basis	per lb.	2s. 6½d.	2d.	—
Aluminium Ingots	per ton	£95 0 0	—	—
Spelter	„	£20 2 6	—	5s.
Mercury	per bottle	£23 0 0	—	—

Sulphur—Flowers, Ton £12 0 0 Roll, „ £10 10 0 *Copper Sulphate* .. Ton £25 to £25 10 0 *Boric Acid* (Crystals) „ £23 0 0

Sulphuric Acid (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb., 2¾d. *Sodium Bichromate*—Per lb., 3¾d.

Rubber—Para fine, 8¼d.; plantation, 1st latex, 8d.

∴ The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

302 286 Associated Electrical Industries, Ltd. Electrical control devices. (13/12/27.)
319 167 J. Feldman. Construction of transformers, choking-coils, and other parts of wireless apparatus to facilitate assemblage. (13/12/28.)
302 908 British Thomson-Houston Co., Ltd. Electron-discharge devices. (22/12/27.)
319 175 E. F. Schafer. Combined table-lamp and loud-speaker. (24/12/28.)
319 176 W. Guy-Pell. Lamp shades. (2/1/29.)
304 656 Siemens-Schuckertwerke Akt.-Ges. Projecting-screen, more particularly for daylight projection. (23/1/28.)
305 049 Siemens and Halske Akt.-Ges. Power-supply apparatus suitable for use in supplying thermionic valves and the like. (27/1/28.)
318 956 Standard Telephones and Cables, Ltd. (G. Deakin and L. Polinkowsky). Automatic and semi-automatic exchange systems. (13/6/28.)
318 957 Standard Telephones and Cables, Ltd. (G. Deakin and L. Polinkowsky). Automatic and semi-automatic exchange systems. (13/6/28.)
319 063 Standard Telephones and Cables, Ltd. (G. Deakin and L. Polinkowsky). Automatic and semi-automatic exchange systems. (13/6/28.)
319 292 General Electric Co., Ltd., and W. Wilson. Electric relays. (20/4/28.)
319 198 Dr. M. Wilderman. Electric batteries. (17/5/28.)
319 199 H. Friedlander. Sound-amplifying constructions and the like. (12/6/28.)
319 229 General Electric Co., Ltd., and C. H. Marshall. Wagon-tipping apparatus. (14/6/28.)
292 131 A. Vogel. Process for preventing the occurrence of excess voltages in electrolytic cells for the electrolysis of water. (14/6/27.)
319 385 A. H. Marks and P. Russell [legal representatives of E. C. R. Marks (deceased)]. (Riley Stoker Corporation.) Magnetic separators. (14/6/28.)
319 193 J. J. V. Armstrong (Telefunken Ges. für Drahtlose Telegraphie). Low frequency and high frequency automatic telephone systems. (9/3/28.)
319 375 S. G. S. Dicker (N.V. Philips Gloeilampenfabrieken). Resistance-coupled amplifiers. (19/3/28.)
307 329 N. V. Hengelosche Elektrische en Mechanische Apparatenfabriek and H. A. W. Klinkhamer. Asynchronous motors. (5/3/28.)
319 388 H. G. Brown and D. P. Battery Co., Ltd. Electric accumulator plates (16/6/28.)
292 476 M. Surjaninoff. Three-phase induction motors. (18/6/27.)
319 389 British Thomson-Houston Co., Ltd., S. F. Davies, L. J. Davies, and H. W. H. Warren. Devices for causing the intermittent illumination of a surface. (18/6/28.)
319 297 F. D. Pitt. Electric radiator. (18/6/28.)
319 259 Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories, Inc.). Vacuum-tube oscillator circuits. (18/6/28.)
319 260 C. W. Cox and C. E. C. Shawfield. Electric fuses and busbar and circuit connections therefor, specially applicable to distribution fuseboards and the like. (19/6/28.)
319 298 J. A. Reavell. Electric heating-apparatus for heating bituminous or other materials. (19/6/28.)
319 391 J. A. Reavell. Electric heating-apparatus for heating bituminous or other materials. (19/6/28.)
319 304 J. L. Baird and Television, Ltd. Television apparatus and the like. (20/6/28.)
319 305 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Mercury arc rectifiers. (20/6/28.)
319 306 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Mercury arc rectifiers. (20/6/28.)
319 400 A. N. Hazlehurst. Electric storage batteries or accumulators. (21/6/28.)
319 401 British Thomson-Houston Co., Ltd., and J. C. Read. Mercury arc rectifiers. (21/6/28.)
319 418 Igranic Electric Co., Ltd., and D. Sinclair. Direction-finding radio receivers. (26/6/28.)
319 419 J. H. Buchanan and Associated Electrical Industries, Ltd. Protective gear for alternating-current electric systems. (26/6/28.)
319 421 B. Hesketh. Method of controlling variable electric condensers and like apparatus. (26/6/28.)
319 423 C. E. Fry. Prepayment-devices for use in connection with electric meters. (29/6/28.)
319 425 Oliver Pell Control, Ltd., and C. Oliver. Electromagnetic reproducers for use with gramophone and the like records. (30/6/28.)
319 429 W. H. Scott, G. J. Scott, and H. D. Wheeler. Motor-generator control for electric winches and the like. (4/7/28.)
319 431 W. T. Gray and Associated Electrical Industries, Ltd. Electric motor control systems. (5/7/28.)
294 247 Kalle and Co. Akt.-Ges. Manufacture of light-sensitive materials. (21/7/27.)
319 439 A. H. Marks and P. Russell [legal representatives of E. C. R. Marks (deceased)]. (Apex Electrical Manufacturing Co.) Clothes-washing machine. (19/7/28.)
319 454 P. J. De Wet. Apparatus for television and like purposes. (2/8/28.)
295 045 British Thomson-Houston Co., Ltd. Electric control systems and apparatus therefor. (5/8/27.)
319 456 Oliver Pell Control, Ltd., and C. Oliver. Electromagnetic-reproducers for use with gramophone and the like records. (3/8/28.)
296 402 British Thomson-Houston Co., Ltd. Electric regulators. (31/8/27.)
319 458 A. Preen. Anti-vibration wireless valve-holders. (7/8/28.)

Applications for Patents.

September 5th.

27 064 Automatic Telephone Manufacturing Co., Ltd. and F. T. Belas. Telephone systems.
27 065 Automatic Telephone Manufacturing Co., Ltd. and C. Gillings. Telephone systems.
26 979 W. A. Burns. Supply of power to wireless receiver.
27 066 Cie Lorraine de Charbons pour l'Electricite. Treating plastic materials. (19/9/28, France.)
26 964 W. R. Cox and General Electric Co., Ltd. Electric supply systems.
27 053 Electrical Research Products, Inc. Systems of control for a.c. motors. (19/9/28, U.S.)
27 049 L. Emanueli. Electric cables.
27 029 H. E. Gamble. Wireless receiving systems.
27 059 Gramophone Co., Ltd. and R. K. Spencer. Wireless receivers.
26 935, 26 936 T. M. Inman and Relay Automatic Telephone Co., Ltd. Electric signalling apparatus.
26 994 International General Electric Co., Inc. Electric switches. (8/9/28, Germany.)
26 955 J. McLean. Shade rings for lampholders.
26 956 J. McLean. Electric lampholders.
27 033 Maschinenfabrik Oerlikon. Electric drives for carding engines. (7/9/28, Switzerland.)
27 050 Soc. Francaise Radio-Electrique. Electrical measuring instruments (27/9/28, France.)
27 040 Standard Telephones and Cables, Ltd. Gas detection systems, etc.
26 951 E. Thomas. Electric switches, etc.

September 6th.

27 163 Associated Electrical Industries, Ltd. and H. H. Long. Lamp reflectors.
27 170 S. G. Brown. Megaphone attachments for telephone receivers.
27 080 W. W. Buck. Lightning switches for wireless aerials.
17 154 N. R. Campbell and General Electric Co., Ltd. Mechanisms controlled by light.
27 167 Felten and Guilleaume Carlswerk A.G. Pupin coil boxes. (2/10/28, Germany.)
27 168 Felten and Guilleaume Carlswerk A.G. Pupin coil boxes. (6/10/28, Germany.)
27 086 Ges. für Elektrische Apparate. Microphones, etc. (7/9/28, Germany.)
27 137 W. H. Grinsted and Siemens Bros. and Co., Ltd. Intercommunication between telephone systems.
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THE ELECTRICIAN,
December 27, 1929.

FIRST ANNUAL REVIEW NUMBER

THE ELECTRICIAN

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Electricity in 1929.

ELECTRICITY finds employment in so many fields of human activity, and during the past year has made so many developments in its existing applications, not to speak of others in entirely new directions, that the task of reviewing this progress is one that cannot lightly be attempted. The ramifications of electricity are in fact so great that the large industry concerned with its exploitations is one of the most specialised and sectionalised of all the industries. Such specialisation is, of course, inevitable, though it has its disadvantages. One of the more obvious of these is the lack of knowledge that exists in one section about the developments that may be made in other branches. Those who are able to keep abreast of the mass of technical literature that is published during the year are able to gain from it a fair idea of what is being accomplished by electrical men in other parts of the industry, but there are many electrical engineers who either have not sufficient time, or think they have not, to keep in touch with these developments, though they may be well-informed on matters that are of immediate concern to them. As both classes, particularly the latter, can gain useful knowledge from a symposium of "progress reports" on the most important sections of the industry, we present, in the pages that follow, a collection of brief reviews of technical progress made in 1929 in various phases of electrical work. All of these reviews have been written by men who can speak authoritatively on their own special subjects, and the concise form in which the information is made available has made it possible for us to deal with a very wide range of subjects in an 18-page section of this, our first Annual Review Number.

THE sectionalisation of interests which we have referred to above has naturally led to the establishment of a multitude of professional and trade associations. Most, if not all, of these bodies are doing valuable work, and though we would hesitate to say that any one of them was unnecessary, we do think that there should be brought into existence, on the association side, something analogous to the "grid," in order to bring about a closer degree of interconnection, a freer exchange of knowledge, and a greater degree of co-operation in furthering industry policies. The idea of making all these bodies into one great Electrical Association is by no means new. It has been debated more than once during 1929; let us hope there may be results in 1930. If any fresh arguments were needed for the development of a central co-ordinating association for the British electrical industry they can easily be found in the section of this issue in which the secretaries and other officials of most of the existing associations give brief reviews of their work during the year. In extent and variety this work is little short of amazing, and much of it will come as news, even to those who, through membership, might be expected to be well acquainted with it. Study of the various reports will show, however, that there is a certain overlapping of interests which might be easily avoided by some form of "loose-linking" under a central body.

* * *

GENERALLY speaking, the year which is just closing has seen many interesting developments in the electrical industry. On the power station side generating plant has been more noteworthy for the rapid extension of the use of welded steel construction than for increases in the size of the plant, the largest set in operation in this country being the 50 000 kVA machine at Barton. In the boiler house there has been a distinct movement towards higher steam pressures, though little is being done over 500 lb. per sq. in. The use of pulverised fuel has progressed faster than in some recent years, but the tendency is to neglect the separate pulveriser house in favour of the unit system, as exemplified in the Hams Hall station. In switchgear there have been some radical departures from precedent, and there has been a considerable development of protective gear. In transformer manufacture marked progress has been made in the development of on-load tap-changing devices, while, on the transmission side, 1929 has seen the first employment in these islands of 132 000 V overhead lines and the manufacture, for the first time in Europe, of 66 000 and 132 000 V oil-filled cables for use underground. In line construction great interest has been

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shown in the possibilities of reinforced concrete line-supports, and on rural lines the use of h.t. fuses has increased.

* * *

ELECTRICITY, as always, has continued to be associated with many innovations of public interest, notably in the "Tote" and the "talkies." On the industrial side electricity has extended its services to many processes which formerly relied on expensive and often inefficient hand labour. Perhaps the industry on which it has made the most marked impression this year has been shipbuilding. The use of electricity for auxiliary services afloat has been extending gradually for some years, but 1929 has been remarkable for the increasing use that is being made of electric propulsion.

* * *

So far we have only referred to a few of the directions in which there has been useful development during the year; many others are recorded by the authors of our technical review section. We may, however, draw attention in passing to one direction in which little, if any, useful development is visible. We refer, of course, to the electric battery vehicle, which, through apathy, has lost even the ground which it had slowly gained in the years immediately before the war. This position is the more regrettable in view of the phenomenal development of mechanical road transport and of the complete satisfaction which existing big users of "electrics" derive from their fleets. Much, though not all, of the blame is directly applicable to those supply authorities which still fail to appreciate the value of the battery vehicle as an "off-peak" load.

* * *

ELECTRICAL manufacturers can rest assured that trade during the year has in no way declined when compared with 1928. The summary of electrical overseas trade which we publish elsewhere in this issue, shows that with the exception of four months, electrical exports advanced during each of the eleven months so far dealt with by the Board of Trade returns. It is true that the favourable trade balance of exports over imports is this year £746 853 less than for the corresponding period of 1928, but it must be remembered that the reductions in prices of materials and manufactured goods which have taken place since this time last year played their part in export values. That our overseas trade this year was greater than last is shown by the fact that total exports for the eleven months of 1929 were £924 641 in advance of the 1928 figures for the corresponding period, notwithstanding the price reductions previously referred to. Shipments of electrical machinery during the eleven months of this year declined by £392 231 when compared with the return for the same months of last year, while various wires and cables, including submarine cables, improved by nearly £1 500 000. These two heads represent equipment and materials which are marketed in severe competition with foreign products, and the lower cash value in machinery exports does not necessarily mean shipments of less volume; the absence of serious unemployment in the industry suggests the reverse.

* * *

APART from overseas trading a very satisfactory position has been maintained in the home market, and during the year a large number of substantial contracts have been placed by railways, municipalities and others for electrical machinery and equipment. Probably the most important individual buyer of electrical manufactures during the year, was the Central Electricity Board, which was alone responsible for the placing of over £6 000 000 of orders. In view of the new electricity schemes being developed under the "grid," one would naturally expect the Central Board to figure as a large buyer of British products, and though the value of the orders so far placed is comforting, contracts for the North-West England and North Wales, the Mid-East England, and the North-East England Schemes have yet to be placed.

* * *

WE publish elsewhere a selection of contracts, apart from those of the Central Board, successfully tendered for during the year by British firms, and from these it will be seen that the municipalities and railways were the largest buyers, that is, their contracts were of the largest value. Other contracts placed during the year were of smaller value but in many cases were repeated two or three times, representing very often a greater total value than the larger individual contracts. The contracts referred to elsewhere represent well over £3 000 000, and this sum added to the value of the Central Board contracts plus the total value of eleven months exports gives us an aggregate of £26 867 662. This sum, large as it is, cannot be considered as even a conservative estimate of the total value of contracts placed with the British electrical industry during 1929, for in our selection, no mention is made of contracts valued at less than £30 000, and since there were literally hundreds of orders placed at values slightly under this figure the turnover of the industry as a whole, including sales apart from those by tender, must stand at a sum comfortably in excess of that attained last year. The British electrical industry has little reason for pessimism regarding the achievements of 1929, and can look forward with confidence to the coming year.

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TECHNICAL PROGRESS IN 1929.

A Specially Contributed Review of Some of the Past Year's Most Important Developments in Various Spheres of British Electrical Activity.

IN an industry of the size and ramifications of that which is concerned with the development of the uses of electricity and the provision of the electrical energy and the apparatus which makes that energy available to the user, it is impossible for anyone individual to be fully conversant with the progress that is being made in all its branches. It is similarly impossible for one writer to provide this knowledge. However, with the aid of a band of contributors who are acknowledged specialists in the various branches of electrical work, we are able to present below a concise account of what has been accomplished in 1929. *British practice is normally referred to, but certain developments abroad are touched on in relation to British problems. The views expressed throughout are those of the writers, and are not necessarily in accord with our own.*

TURBO-ALTERNATOR PLANT.

By J. A. KUYSER, M.I.E.E.

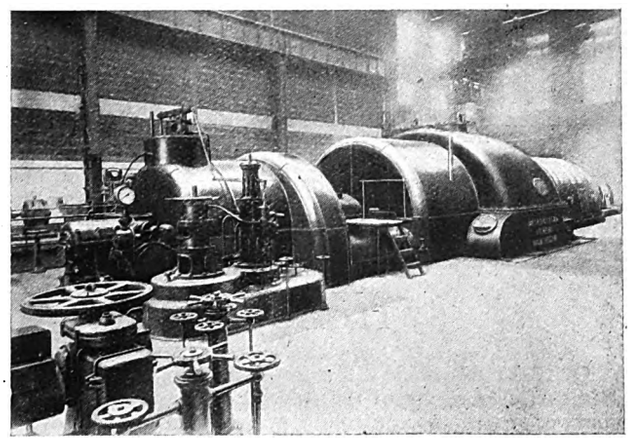
PROGRESS during the past year in the field of turbo-alternators has been particularly marked in the manufacture of the large 1 500 r.p.m. sets required for the new super power stations or extensions to existing large stations. One of the most interesting of these sets is the 50 000 kVA, 1 500 r.p.m., 6 600 V set installed in the Barton power station, Manchester, which is the largest set now in operation in this country. An interesting feature on this set—new in this country—is the provision of an auxiliary alternator mounted on an extension of the shaft end, and a double exciter which supplies current to the fields of the main alternator and auxiliary alternator from two independent armatures, which are assembled on the same shaft and mounted in a single yoke. The provision of a direct coupled auxiliary alternator supplying the current for the auxiliary motors appears to become a standard feature in large power stations. Another special feature on this set is the system of ventilation, which is partly by internal, and partly by two separate external motor driven fans. An exceedingly high efficiency at ordinary working loads is obtained by this arrangement, as one fan is shut down at 80% load, and both fans at lower loads.

Further interesting units under construction are the 62 500 kVA, 1 500 r.p.m., set for the Portishead station, Bristol, the 71 500 kVA, 1 500 r.p.m. set for the Clarence Dock station, Liverpool, and the two 80 000 kVA, 11 000 V sets for the new Battersea station of the London Power Co.

New Design Features.

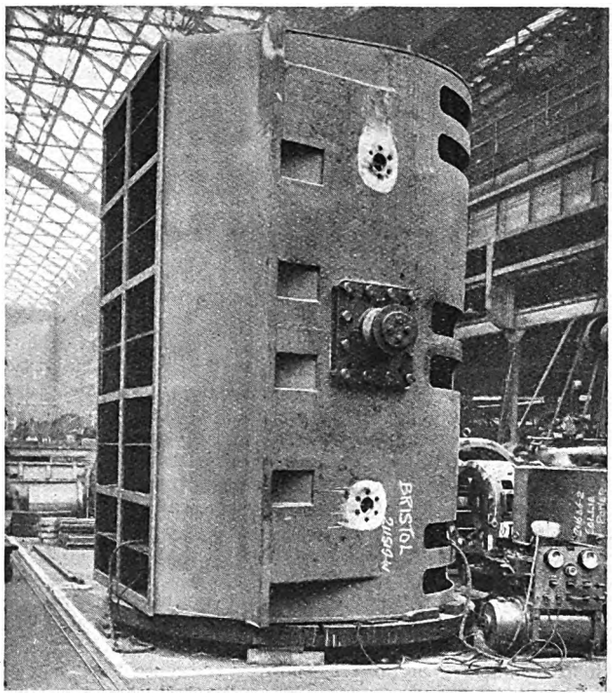
The latter sets are the largest being manufactured in this country, and some new features are incorporated in their design due to their exceptional size. The rotors exceed the maximum size desirable for one-unit forgings, and for this reason a three-part construction has been adopted, in which a hollow central cylinder and two shaft ends are assembled into one unit by means of shrink lines.

Progress in large 3 000 r.p.m. sets is marked by the 40 000 kVA single unit alternators for Battersea Borough Council, the 40 000 kVA, 10 500 V sets for the Victoria Falls Power Co., and the 37 500 kVA set for West Ham Corporation; the last-named set is of particular interest, due to the fact that it s designed for the particularly difficult conditions as regards armature reaction which are met with in two-phase machines.



The 50 000 kVA set installed at Barton power station.

An interesting feature is the continued successful operation of the 31 250 kVA, 3 000 r.p.m. alternator in the Brimsdown power station of the North Metropolitan Electric Supply Co. This set is designed for 33 000 V, and supplies current directly to the mains. It was placed in service in September, 1928. During recent years the importance of efficiency and the minimising of losses has received increased attention, and in the past year progress has been made in this respect by the more general introduction of non-magnetic high-tensile steel for the rotor end caps, and the resultant reduction in stray load losses in the inactive iron parts at the ends of the stator.



The stator for the new 62 500 kVA alternator for Bristol.

A considerable extension has taken place in the use of welded steel construction during the past year. Great advantages are obtained by the use of this construction to replace the large yoke castings, bedplates and stator end shields. The accompanying illustration shows the stator for the previously mentioned new 62 500 kVA alternator for Bristol. The reduction in weight due to the use of welded steel construction on this stator amounts to 17 tons. As a consequence it will be possible to manufacture and test the alternator completely in the manufacturers' works. Apart from the decreased weight the welded steel construction has the advantage of increased strength, elimination of defective castings, elimination of patterns, and reduced time of manufacture.

THE BOILER HOUSE.

By THOMAS ROLES, M.I.E.E.

IN so far as this country is concerned, the increase in size of generating units employed, and the demand for higher efficiencies, have resulted in considerable developments being made in connection with steam raising plant.

The tendency is still in the direction of higher steam pressures, chiefly of the order of from 300 to 500 lb. per sq. in. Little further development is indicated in the use of higher pressures than the latter figure. The very large boiler plant at the Synthetic Ammonia Co.'s works at Billingham-on-Tees, designed to operate at a pressure of 800 lb., has, however, been put into operation, and the erection of the 1 100 lb. boiler at

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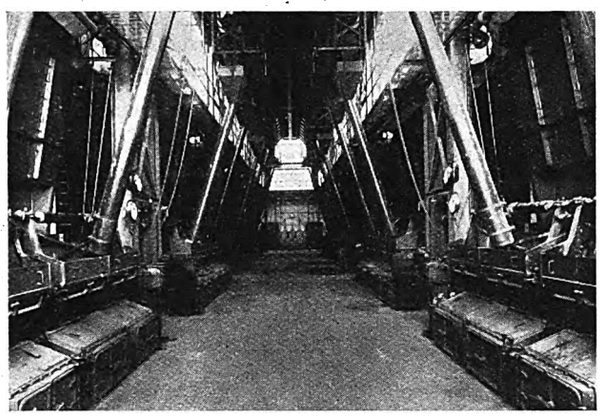
the Bradford Corporation's power station is now practically completed.

Final steam temperatures are not being increased to any extent above 750 or 800 deg. F., owing to added risk of failure when ordinary materials are used, and the high cost of special metals claimed to be suitable for higher temperatures.

On the whole, little departure has been made in the general design of the watertube boiler, apart from the development of the "Steam Generator," such as has been installed in the Brighton Corporation's Southwick power station.



View in the boiler house of Slacks Valley power station, which was formally opened on October 16th.

The tendency to increase the volume of the combustion chamber, which first became marked in connection with boilers constructed for use with pulverised fuel, has extended to boilers arranged to work in conjunction with various types of stokers. It is more and more becoming the practice to construct the boiler so that integral portions thereof enclose the furnace, rather than adhere to the practice adopted for so many years of surrounding the furnace with walls constructed of refractory material, the boiler itself forming only the roof of such furnace. As the cost of the renewal of refractories is one of the heaviest items in the boiler house maintenance bill, the aim of modern furnace design is to eliminate refractories as far as possible by the adoption of water-cooled walls of the "Murray Fin," "Bailey" or ordinary plain tube type. The additional tube surface thus exposed to the radiant heat of the furnace has greatly increased the rate of evaporation per unit of heating surface of boilers, thereby reducing their sizes for given outputs.

In some installations a portion of the furnace wall is made up of a radiant heat superheater, which under certain circumstances is preferred to, and in others used in conjunction with, a superheater of the interdeck type. The number of radiant heat superheaters in this country is increasing.

The Steaming Economiser.

The practice, which is becoming increasingly common, of raising the temperature of the boiler feed by means of stage heating, has limited the application of the ordinary type of economiser, which in some cases has been replaced entirely with the air heater. The steaming economiser has been developed to meet the new conditions, and where this is installed the boiler heating surface is consequently reduced. In the case of the steam generator mentioned, the steaming economiser is in reality an integral portion of the boiler.

Pulverised fuel firing continues to make progress, more particularly when effected on the direct or unit system. It has much to recommend it when applied to large boiler units, on the score of ease of application, flexibility in operation and high furnace efficiency, which can be obtained only with the water-cooled furnace and highly pre-heated air. Some trouble has been experienced in connection with a number of installations by reason of the amount of ash leaving the chimneys with the exit gases. Several methods of eliminating the ash from the gases have been evolved which are claimed to be effective.

The chain or travelling grate continues to be the stoker usually adopted for the firing of watertube boilers, although recently the retort type has made some headway, being regarded by some engineers as more suitable for large units. The latter type of stoker, which proved very successful in dealing with the coal used in power stations in the Eastern States of America, when introduced into this country a number of years ago, failed on the whole to give satisfaction with English and Scotch coals. It is now claimed that modifications have been made to certain makes of retort type stokers which render them at least as efficient and satisfactory as a chain grate stoker.

Modern chain grate stokers are practically all of the compartmental type, which has been developed owing to the use of balanced draught having become almost standard practice. There is perhaps some tendency to provide too many sections in the latest types of these stokers, and, taken on the whole, they suffer from the disadvantages of added complications, greater liability to failure, and difficulty to repair on account of inaccessibility.

Chain Grate Improvements.

Chain grates of improved design have been made in widths of 22 ft. and over. The suspended type of arch is necessary in connection with stokers over about 9 ft. in width, and in some cases water-cooling has been adopted to increase the life of the refractories of which the arch is built. Water boxes in the side walls have also been, with advantage, introduced to prevent the formation of clinker at the grate level.

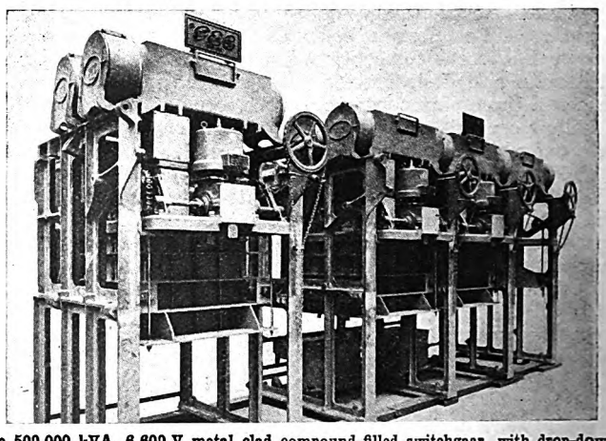
The temperature of pre-heated air which can be used in connection with chain grates is limited to approximately 350 deg. F., due to the tendency of the fuel to coke on entering the furnace, thereby retarding combustion, and increasing the ash-pit loss and maintenance costs.

Air at considerably higher temperatures can be employed with pulverised fuel firing, but the increased furnace temperature greatly reduces the life of refractories where such are used in connection with the furnace.

One method adopted in order to overcome this difficulty is the introduction of a small percentage of inert gas (flue gas) with the air for combustion. This, it is claimed, has been attended with beneficial results and improvement in furnace efficiency. In some of the latest stoker-fired plants heated air is being injected above the fuel bed for the purpose of increasing furnace efficiency and reducing the emission of smoke.

The possibilities of automatic combustion control, which is largely in use in the United States of America, continue to attract attention on this side, and several additional equipments are in the course of erection or contemplated.

It is becoming more than ever recognised that the use of evaporators for the supply of make-up, and deaerators for the removal of occluded gases from the feed water, is essential in a modern power station.



The 500 000 kVA, 6 600 V metal clad compound-filled switchgear, with drop-down isolation installed by Stockport Corporation.

As for the maintenance of efficient operation in the boiler house, reliable and robust instruments on each boiler have proved indispensable. Instrument makers have been giving much attention to such instruments, and their efforts have been attended with considerable success.

SWITCHGEAR.

By C. C. GARRARD, Ph.D., M.I.E.E.

A QUESTION which will arise in the mind of a close and impartial observer of the past year's development in the domain of switch and controlling gear is whether that development is the result of the intelligent application of scientific principles to an engineering problem, or a mere extension of rule-of-thumb methods. Consider, for example, the oil circuit breaker. The Central Electricity Board is at present installing some hundreds of gigantic oil reservoirs, each containing some thousands of gallons of oil, and passing under that name

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but which differ little, except in size, from Ferranti's oil switch of thirty-five years ago. As was to be expected from reputable British manufacturers, these circuit breakers leave little to be desired in the way of strength and reliability, and in these respects they compare favourably with the products of any other country.

It is remarkable, however, that, speaking generally, no method of dealing with the rupturing of currents of large voltages and power has been evolved other than a mere increase of size of the circuit breaker.

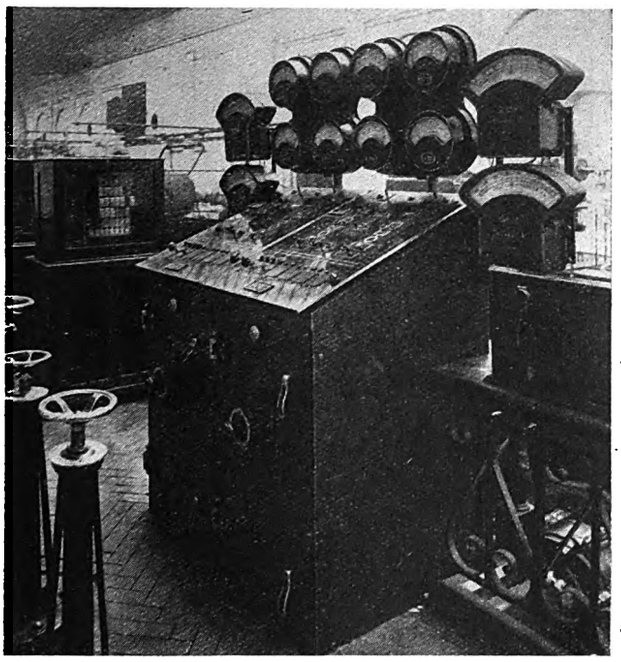
The varied designs of the respective manufacturers of the 132 000 V breakers indicate some unsolved problems, even with the apparatus as it stands to-day. Thus, circuit breakers having explosion pots are being supplied by some manufacturers, while others embody the multi-break; in some cases four breaks per phase are being used, in others six. Again, as regards bushes, various types are being installed, the paper tube condenser type being favoured by some, and the sub-divided oil-filled by others. The Central Electricity Board is in a unique position to obtain the experience which will show which is the best of these various forms of construction.

Porcelain Bushes.

As regards bushes, quite recently a new construction has appeared, made entirely of porcelain. This consists of a number of concentric tubes of porcelain fitting closely one inside the other, and fixed together by a special process. This type has not yet been used, however, in this country.

It is probable that it was a recognition of the need of some entirely different method of arc rupturing which caused the Electrical Research Association to attack that problem, as they did, from fundamentals. The wisdom of that action will, it is likely, soon be recognised. That other nations are alive to this also is shown by a recent publication of the A.E.G. describing their proposals to rupture a high tension arc by an air blast instead of its immersion in inflammable oil.

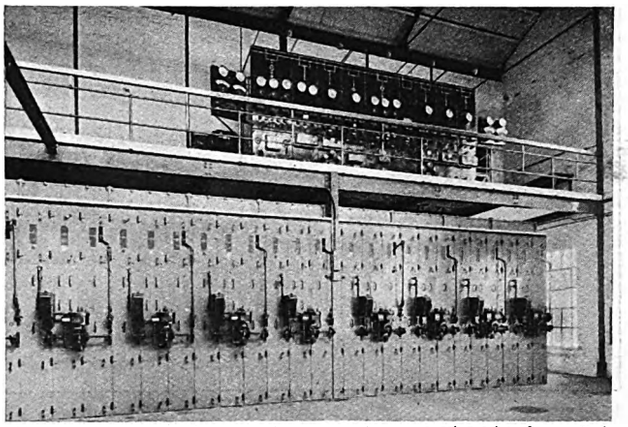
If we consider recent progress apart from the indications of radical departures just mentioned, the most marked development of indoor switchgear is the advance in the metal-clad construction. This has been applied up to 66 000 V with bus bar and other enclosures oil filled. This latter is an expensive one to build, and it will be interesting to see whether the results obtained will be better than those experienced with the indoor-open type adopted by the Central Electricity Board for their 66 000 V sub-stations in the London area. For voltages up to 33 000 V, however, metal clad compound (or oil) filled switchgear is at present the most used



A supervisory control board supplied to Southend-on-Sea Corporation for controlling two sub-stations.

system, although several large new power houses have been recently completed embodying switchboards of the cubicle design. It cannot be denied that this latter construction still has numbers of very competent defenders.

For the highest voltages, outdoor type switchgear has been adopted by the Central Electricity Board in this country and that is also the case in the Shannon scheme of the Irish Free State. This corresponds in general with the practice of other



11 000 V stonework cubicle switchgear with compound-filled busbars supplied for the Oxford Electric Light and Power Co.

countries, although in Germany there is a tendency to revert to indoor gear on account of deposits from the atmosphere on outdoor insulators.

Protective Gear.

During the past year there has been a considerable development of protective gear, chiefly in connection with overhead lines. Many improved methods of impedance protection have been evolved. What looks like being a new departure in this connection has been proposed by Carrothers and Kapp, who have suggested a differential system using a pilot wire incorporated within the overhead earth wire. Thus the advantages of pilot wire protection are obtained without the great expense of special pilot cables. An installation of this scheme is now in course of erection.

Supervisory control and carrier current communication over overhead lines have both made good progress during the past twelve months, and, in this regard, the carrier telephone system of the Shannon scheme may be mentioned. This development is of particular interest to switchgear engineers, as the extended use of differential protective gear using a carrier channel instead of a pilot cable is bound to come. In fact the work done in this country on this subject during the past year will, there is little doubt, lead to practical applications before very long.

TRANSFORMERS.

By H. W. BISKEBORN.

TECHNICAL progress in the problems met with in the manufacture of large transformers such as are being manufactured for the "Grid" has been the chief development in 1929. The largest units so far ordered in this country are the 80 000 kVA 3-phase units ordered this year for the Battersea station by the London Power Co.

It is too early to say that operating troubles have been avoided with the methods of manufacture and design that have been decided upon, but one point that has arisen recently from troubles experienced on the Continent, illustrates the necessity to design these large units with very low densities in the core.

It is interesting to note that specially treated wood is being increasingly used in this country for h.t. transformers. Experience definitely proves that treated wood is superior to bakelised paper and paper base materials. It is chemically stable, possesses greater mechanical strength, and has superior dielectric properties; an important feature is that, having a specific inductive capacity very near to that of oil, "tracking" is eliminated.

Tap Changing Devices.

During the year, considerable progress has been made with on-load tap changing gear. The equipping of transformers of such capacities as 5 000 and 10 000 kVA with on-load tap changing, is a relatively simple matter compared to the electrical and mechanical problems that are presented with the equipping of large, high voltage units, such as are being manufactured for the "Grid." It is interesting to note that there are three methods being used in this country:—

(1) The split winding method—where the tapped section

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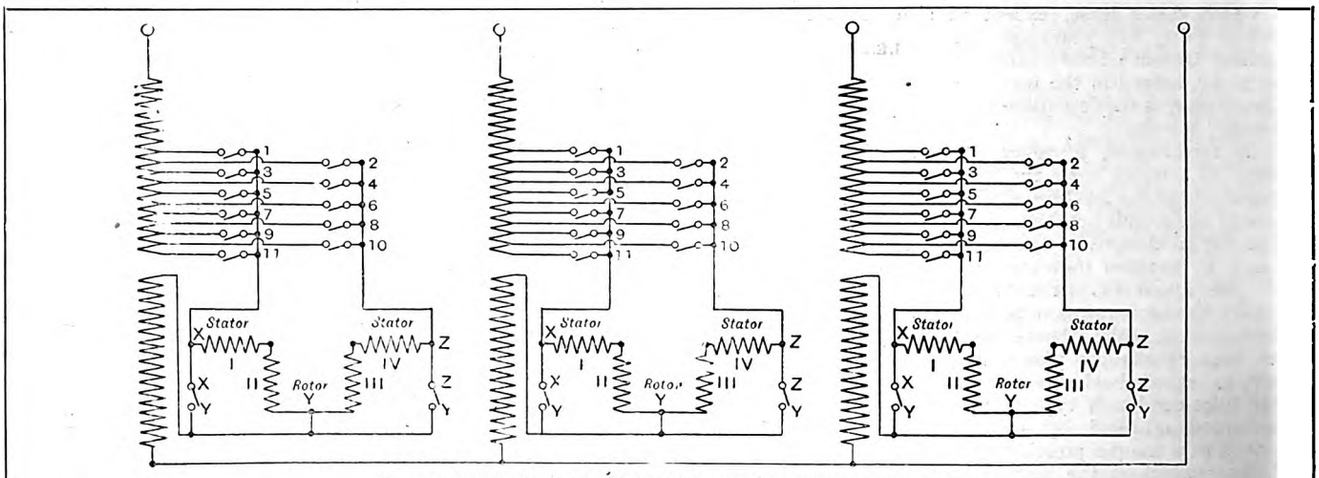


Diagram of connections of modified induction regulator tap changing members.

of the winding is wound in parallel sections, and the inherent reactance of the two windings usually provides the required reactance when changing to the next tapping.

(2) Tapped main winding with separate choke coil for carrying the load during the period of transition.

(3) Tapped main winding with a modified induction regulator for the transition. This method gives a gradual change from tapping to tapping, eliminating the sudden variation obtained with (1) and (2).

It will be extremely interesting to watch the development of the different systems, and to see if American operating experience is repeated in this country. The method most favoured in the States is system (2). System (3) proved to be too expensive, as a double wound induction regulator was used, and with high voltage units this necessitated stepdown transformers; quite a number of equipments of this type are operating very satisfactorily in the States.

In this country system (3) is being manufactured extensively by one company only—who hold patent rights for a method eliminating the stepdown transformers, and simplify the winding of the induction regulator. A number of the large units for the Central Electricity Board's schemes are being fitted with this type of gear, and four units are already operating on the North-Western "Grid."

In consequence of the "Grid" arrangement, the necessity for on-load voltage control is assuming such importance that it seems likely that in the near future, this gear will be a standard fitment to sub-station transformers. In the States there are certain operating companies who specify on-load control gear for all their units above a certain capacity.

An interesting development is being made by a German firm with a transformer having a movable core. The experiments that have been made with the first units have been satisfactory. This method also permits infinite variation between the limits.

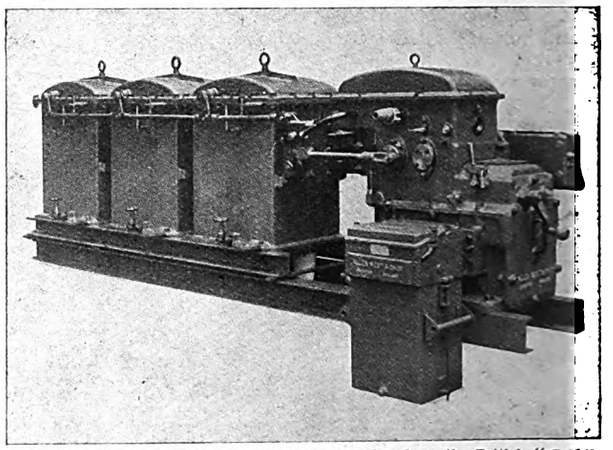
TRANSMISSION AND DISTRIBUTION.

By REGINALD O. KAPP, M.I.E.E.

DURING the year 53 consents* have been given by the Electricity Commissioners for the construction of transmission lines of major importance, apart from the consents for lines of minor importance. This figure is well in excess of that for preceding years, and is indicative of the increased activity in this field of engineering. Of these consents one half are for 33 kV lines and only 15% are for voltages below 33 kV, showing the tendency towards high transmission voltages. The remainder, about one third of the total consents, is for 66 kV and 132 kV transmission. Of the total consents about 64% are for overhead and 36% for underground lines, showing a marked tendency away from cables, and towards overhead transmission.

During the year the Electricity Commissioners' Grid Schemes for Mid-East and North-East England have been published, bringing the total number of schemes up to six, and covering all important districts except South-West England. For the first time in history 132 kV lines have been put into service in these islands. These form part of the Central Electricity Board's original transmission scheme in Scotland, where four lines are transmitting energy at this voltage. Three of them radiate from Dalmarnock generating station of Glasgow Corporation respectively to the Clydes Mill and Yoker stations of the Clyde Valley Co. and the Bonnybridge station of the Scottish Central Power Co. The fourth line in service interconnects Yoker with Greenock.

Manufacture has started during the year on oil-filled 66 kV and 132 kV cables for supplies in London. The latter are, apart from an experimental length in Italy, the first cables for this voltage to be manufactured in Europe. The year has seen marked increase in size and lowering of the cost and weight per kVA of transformers, and manufacture of 75 000 kVA three-phase transformers for 132 kV has been started. In spite of their large output these transformers are designed for road transport as well as for rail transport within the British loading gauge. They will each weigh approximately 147 tons complete, and 91 tons arranged for transport. Notable progress has been made in the design of gear for changing the voltage ratio of transformers under load, such gear being necessitated by the large voltage drops incurred when power



Another type of on-load tap changing gear employed on the British "Grid" system in 1929.

is transmitted over long distances by overhead lines. Similar progress must be recorded in the selective protection of transmission lines, both overhead and underground, to which many countries have contributed, but in which England appears now to play a leading part.

Less sensational than the very high voltage work, but of great importance, is the spade work done during the year towards facilitating rural electrification. Progress has been made in the standardisation of voltages and designs necessary to make supplies in thinly populated districts economically possible, and an intensively worked scheme has been adopted by Bedford Corporation for a district covering 100 square miles with 16 000 inhabitants and some 4 000 occupied dwellings. About 140 miles of 11 kV transmission line tapped by pole transformers varying in size from 5 to 50 kVA each are to be constructed in this district. Other municipalities have similar schemes under consideration.

* Since the time of writing this number has been increased.

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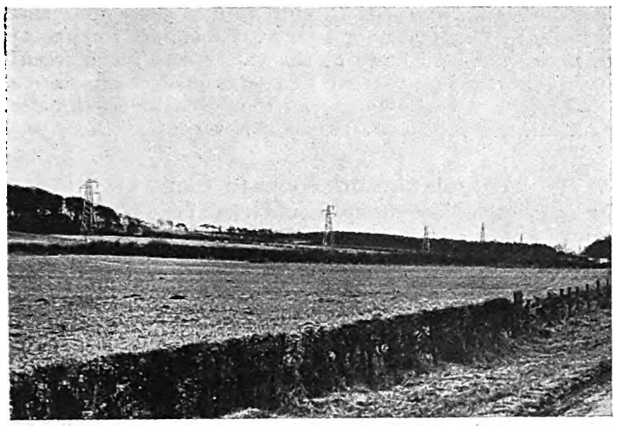
OVERHEAD POWER LINES.

By THEODORE RICH, A.M.I.E.E.

THE past year has been one of considerable activity for overhead lines. The absurd Press stunt on the subject of electricity costs in different areas has died down, and a clearer perspective is the result.



Portion of the "grid" single-circuit 132 000 V line between Yoker and Greenock.

The controversy regarding the "pylons" on the South Downs has done some harm to the overhead line movement, especially under a system by which an inspector of the Electricity Commission can act in a judicial capacity regarding the outcome of the policy of his own department, the undesirability of which system was pointed out repeatedly three years ago.

It is being grasped in many quarters that the problem of rural supplies is predominantly that of distribution, the cutting down of line costs; it is a pity that the cry of the interests of agriculture should be used as an excuse for overriding opposition to grid lines, even if misplaced, when those in authority well know that their influence in such matters is in most cases insignificant.

Some county councils still oppose overhead road crossings on the ground of danger, although the ratio of danger with them to cars or the public as compared to the public from over-speed cars, is infinitesimal; the matter becomes a *reductio ad absurdum.*

Concrete Poles.

The interest taken by Mr. Thomas regarding the use of home-made concrete posts for overhead line and telegraph work as an alternative to imported wood posts, shows that interest in problems relating to the development of home industry has to be shown, even by parties which have at times ignored such questions. Specifications demanding excessive resistance to torsion must tend to prevent the use of concrete for main transmission lines, although such use, with designs such as those to be seen in Italy, would tend to allay opposition on æsthetic grounds. The use at home of concrete for posts has now made a definite start, and for grid and other outdoor substation work its advantages are being recognised.

Regarding transmission at very high voltages, engineers at home seem to demand towers which will stand heavy torsion strains without material movement, and therefore pylons of

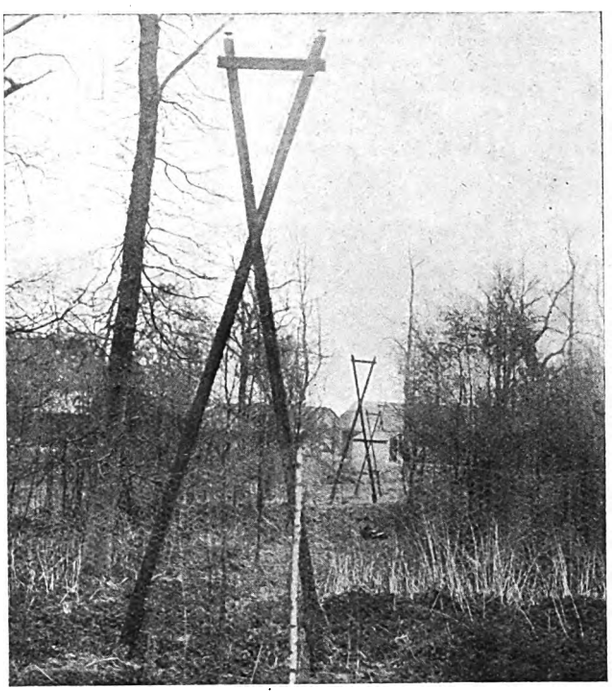
Another view on the Yoker-Greenock route, single-circuit 132 000 V line.

comparatively large base are used with heavy scantling. This tends to involve higher wayleave costs.

It is of interest that on the Continent many thousands of miles of line have been erected and run with success, with comparatively slender structures. In the case of a heavy shock, a material amount of flexibility reduces strains on fastenings and risks of line breakage. There is still a tendency to demand cross arms and pins of greater strength. Assuming a line breaks, then line fastenings will stand, thus making the line more expensive.

The development of bakelised wood cross arms abroad seems to confirm the views of Austin in the U.S.A. regarding the extra electric strains produced by grounded pins; the use of broad flange beam steel sections as posts for overhead lines or supports for railway conductors is of interest.

Regarding distribution lines, there is an increasing tendency



A novel "X"-pole line support used on an overhead line erected at Greater Felcourt during 1929.

towards the use of suspension insulators and jumpers at angles and terminals, a move in the right direction. The use of horn switches primarily as disconnecting links is increasing; the development of the Johnson and Phillips bomb fuse and switch is of interest.

H.T. Fuses.

It is being realised that for overhead line work apparatus must be simple, strong and weatherproof, and as cheap as possible consistent with such factors. The use of 11 000 V transmission is on the increase. Its flexibility, the result of its carrying capacity, is a great factor. It is now realised that simple apparatus can be adopted with it; h.t. fuses are now beginning to take the same place here regarding rural overhead lines as they do abroad.

The modification in regulations last year is a step in the right direction as tending to increase the operating radius of transformers.

The use of lightning dischargers has been abandoned to a large extent on both sides of the Atlantic, as being more risky than they are worth, although surge absorbers seem to be a more common-sense way of dealing with the problem. In France it is being realised that some areas are peculiarly liable to lightning troubles. In that country the question of the marking by lights of heavy transmission lines at night for the benefit of aircraft is receiving some attention.

WATER POWER PROJECTS.

By F. JOHNSTONE TAYLOR.

SO far as Great Britain is concerned any notable progress in water power must of necessity be confined to mountainous districts with a heavy annual rainfall. Full advantage has been taken of these natural conditions by the North Wales Power Co., who now operate plants aggregating several thousand horse power, of which the latest and most modern is that at Maentwrog. Under the jurisdiction of this company

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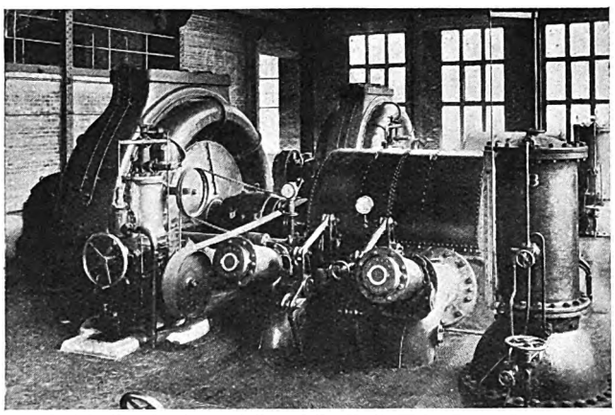
the power resources of this district have been well co-ordinated, and their interconnection with the steam station of the Mersey Power Co. at Runcorn is quite in accordance with modern ideas.

In Scotland the Lochaber scheme is a relatively ambitious undertaking where the power will be mainly utilised in the production of aluminium, but the natural conditions there may be regarded as almost ideal. That is to say the water for the most part is in lakes at considerable elevation above



Plant in the Maentwrog station of the North Wales Power Company.

the site of the power house, so that there is natural storage combined with a high working head. The principal works, therefore, apart from the power plant itself, lie in the shape of aqueducts to convey the water to the turbines, though in the present instance they involve a considerable amount of tunnelling. Yet, even then, such a scheme can be completed at a reasonable cost per kW installed, which is, in the majority of instances, a difficult matter with a low fall plant.

The *raison d'etre* for many such developments, such as those in Scandinavia, is the high cost of imported coal; then they are national undertakings, too. Similar conditions apply to some extent in the case of the much criticised Shannon scheme. It is the incidental works which become the heavy item, and principally because they must, apart from their being heavy works, be constructed to suit the ultimate capacity of the station, and a demand for this amount of power in the Free State is certainly not yet foreseen. If it cannot yet be regarded as a financially sound undertaking, it is certainly a well engineered one, but whether it will provide really cheap electricity without being subsidised by the taxpayer, remains to be seen. The turbines, built by the firms of Escher Wyss and J. M. Voith which develop 38 000 H.P. on a head of 27 ft. at 150 r.p.m. are of the vertical Francis type, as associated principally with American practice. While very efficient this is a relatively costly type of machine, and for low fall work European engineers are showing a preference for the propeller type.

While participating of the general features of the Francis, propeller type runners, those of the Lawaczeck or fixed blade class are certainly much simpler and cheaper. This is an important matter in itself, and when it is remembered that on variable falls—and low falls are prone to such variation—this type of turbine shows a better all round efficiency than the Francis, its value becomes evident. For "river" developments they are generally a very good proposition. Such schemes are comparatively rare in these islands, though the Lanarkshire Hydro Electric Co.'s plants at Bonnington and Stonebyres on the Clyde are worthy of mention.

These have falls of 189 ft at Bonnington and 97 ft. at Stonebyres, and the turbines, which are of the vertical Francis type, develop 4 000 H.P. and 7 000 H.P. respectively at a speed of 375 r.p.m. These works, which are orthodox in their general lay-out, have one or two interesting features, amongst which may be mentioned automatic tilting weirs for the control of the water.

Pelton Wheels.

High head plants of the class seen at Maentwrog are, as might be inferred, usually equipped with Pelton wheels, a comparatively simple type of turbine, which is compact and runs at high speed. Its efficiency is high, but the virtues of the high head Francis turbine must not be lost sight of. In one or two instances vertical shaft turbines of this class have been installed for very high heads, notably the 25 000 H.P. sets operating at 810 ft. head at the Kern River plant, California, and 17 500 H.P. sets recently installed by Messrs. Escher Wyss at Oslo, Norway, which work under no less than 950 ft. Such conditions call for rather special construction, such as cast steel casings, but the turbines show a high efficiency, usually higher than a Pelton under similar conditions, though the principal criterion in the case of a high power high head unit is one of cost, in which the Francis type shows up distinctly favourably, and when it is built with a horizontal shaft, preferably with an overhung runner, it combines compactness with simplicity. Turbines of this latter class were recently built by the English Electric Co—who incidentally were responsible for the Clyde plant—for the Sorocaba development, Brazil, and they develop 25 000 H.P. on a head of 650 ft. at 670 r.p.m.

Automatic and Remote Control.

In concluding, attention should also be directed to the progress which is being made, principally in America, with automatic and remotely controlled plants. When the available power from a whole watershed is being considered, there may be one or two instances where a few hundred H.P. could well be obtained from a subsidiary plant located some distance from the main station. Its value from a commercial standpoint may well turn upon the operating costs. It is then that automatic equipment and remote control at the main station proves of considerable value. The equipment, which is mainly electrical, has been virtually perfected of recent years, principally by the Westinghouse Co. of America and Messrs. Brown-Boveri and Escher Wyss in Europe. It comprises in the main an electrically operated gate system on the turbine, which is controlled by a float switch under the influence of the head water level, or is under the direct control of the operator at the main station as the case may be. Then with a special arrangement of synchronising equipment is combined a series of relays and automatic cut-outs. These come into operation if any abnormal condition such as a hot bearing, failure of excitation or loss of pressure in the governing system should become evident in the automatic station. They shut down the turbine, and in this condition it remains until it is visited, inspected, put right, and the relays, etc., are re-set.

ELECTRO-FARMING.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

THE present position of electro-farming in Great Britain is that 56 electricity supply undertakings have over 2 500 farmer customers, while some 600 other farmers have installed their own generating plants. It is to be regretted, however, that this means that this country has more farms and country residences out of reach of public mains than any other in Europe!

Nevertheless, supply undertakings on the whole are progressing to a more complete understanding of the agricultural problem. A number of undertakings now employ special agricultural representatives, and the Newcastle Electric Supply Co. has opened a special department to deal with the electrification of the rural areas, one of the first activities of which has been the display of electro-farming equipment at the North East Coast Exhibition where also the E.D.A. "Country Currents" cinema film proved a popular attraction.

Following the now regular practice, the Harrogate Electricity Department arranged for the provision of an electricity supply at the 1929 show of the Royal Agricultural Society of England, and themselves demonstrated the applications of electricity to agriculture on their stand. The South Wales Power Co. has done similar demonstration work at a number of agricultural shows from the highly efficient platform of a well-equipped demonstration van, which is to enliven the South Wales countryside by lecture tours this winter.

A Special Order was granted to a private enterprise in April last (subject to confirmation by Parliament) for the rural electrification of 1 249 square miles in Lincolnshire. This scheme was promoted, not only as a commercial enterprise, but also to demonstrate the great possibilities of electrifying the countryside. An extension of this Special Order to cover an additional 584 square miles in Leicestershire, Rutlandshire, Northamptonshire and the Soke of Peterborough is the object of a second application now before the Electricity Commissioners, as the total will make a more economic rural area. This has been followed by the focussing of attention on the Government's rural electrification experimental area in Bedfordshire, upon which work is expected to commence some time next year.

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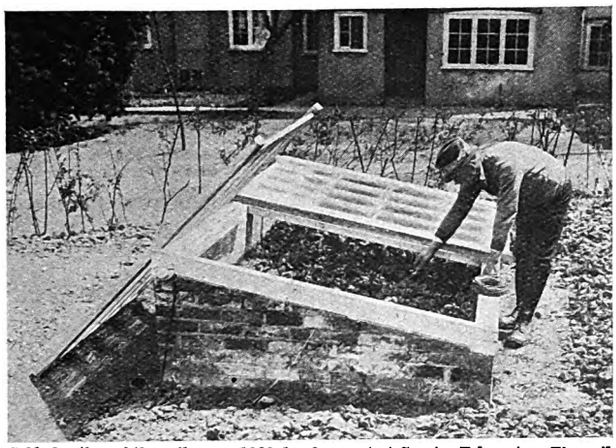
The Report of the Conference on Electricity Supply in Rural Areas, which was convened in 1928 by the Electricity Commission, is still in extensive use as a reference book. A further meeting of this Conference was held this summer, and another session will be held early next year when further data will be available to be put before the members of the Conference. Another activity of the Electricity Commissioners, closely connected with rural electrification, is their issue of suggestions for a standard wayleave agreement form, a subject which has also been gone into extensively and thoroughly by the Overhead Lines Association, who believe the form suggested by the Commissioners to be unduly compl-i cated and drawn up without proper regard to the best interests of tenants or of the undertakers. During the year the Electricity Commission has also appointed Committees for looking into tariffs, assisted wiring and hire purchase of apparatus, particularly with regard to facilitating supplies in rural areas.

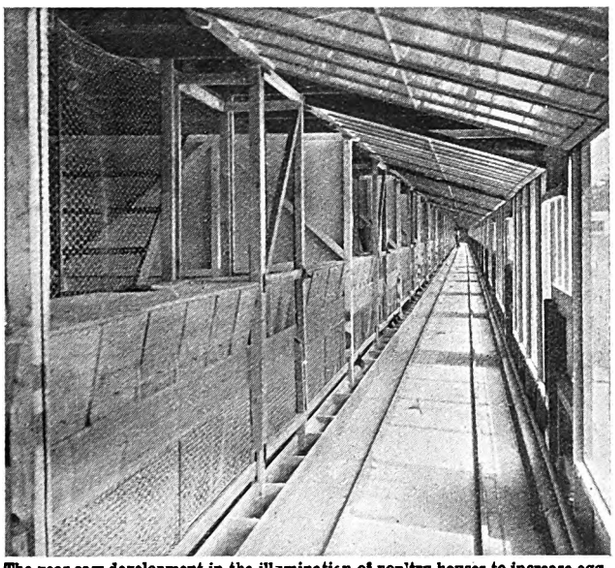


Cable heating of the soil was a 1929 development at Greater Felcourt. The coil on the side of the frame is placed there to show the type of cable which is buried beneath the soil of the frame.

The manufacturing tendencies of the year have been towards compactness and simplification in design, as witness the three different kinds of portable milking sheds on view at the Royal Show. One was fitted with dynamos for lighting and electric refrigerators for milk cooling.

An impetus is to be given to electric ploughing by the inclusion in the 1930 tests of the Royal Agricultural Society of electric ploughs at their tractor trials. Two electric ploughs were constructed in this country during the past year.

Unusual applications of electricity to agricultural operations have cropped up; for instance, much interest is being taken in the applications of ultra-violet rays to stock, particularly race-horses; keen growers of orchids have installed electric lighting in their hothouses, and widely displayed interest in soil heating for market garden frames, and the employment of so-called earth current apparatus has been a noticeable feature of the year.



The year saw development in the illumination of poultry houses to increase egg production. The pens shown here are electrically lighted, and food, etc., is brought to the pens by a battery-driven train.

TELEPHONY.

By P. E. ERIKSON, M.I.E.E.

IN the following brief survey, it has not been possible to give precise figures in every case, as at the time of going to press such figures are not available. The details given, however, are based upon the progress made to date, and such additions as are confidently expected.

National Development.—The number of subscribers' stations owned and maintained by the British Post Office at the beginning of the year was 1 727 680, and at the end of six months a net addition of over 59 000 telephones had been made. Figures to hand show that over 125 000 subscribers' stations (net) will be added during the year.

To provide for these subscribers' stations, and the resulting increase in traffic, a vast quantity of line material and exchange equipment has been installed over the same period. The line material is mostly underground, and includes over 2 260 miles of new subscribers' loop and junction cables, about 450 miles of new long distance underground cables and about 150 miles of submarine cable. These represent upwards of 516 000, 75 000 and 1 500 miles of conductors respectively. The telephone exchange equipment includes extensions to existing manual and automatic exchanges amounting to provision for, say, 10 000 additional lines, and the installation of approximately 30 new manual exchanges and 40 new automatic exchanges. The new manual exchanges provide for the handling of about 25 000 lines, whilst the new automatic exchanges provide for approximately 100 000 lines.

One of the new hand sets introduced in 1929 as an alternative to the pedestal type. The set illustrated is the "Neophone": for use with separate bell set.

The rate of progress indicated by the foregoing is such that one new public exchange, and about 1 000 new telephones are being installed for each working day throughout the year. The latter figure includes replacements.

In the London area conversion to automatic working has progressed satisfactorily, 15 of the foregoing new automatic exchanges being completed in this area alone during1929.

Of the 12 next largest towns in Great Britain, 5 have now been completely converted, and 4 more are well under way.

An Important Development.

An important development planned during 1928, and put into operation during 1929, is the installation of rural automatic exchanges. Some 90 exchanges have been installed, thus providing day and night service to outlying subscribers who could otherwise have had either no service at all, or only limited day working. Rural automatic exchanges are being installed when a minimum of eight subscribers is forthcoming.

The amplification and extension of the underground long distance network has been carried forward to meet traffic demands, the most outstanding feature during this year being the linking up of the Isle of Man with both England and Ireland by means of a submarine cable.

International connections have been extended, as far as the development on the Continent would permit. Many new districts have been added in countries to which communication was already established, particularly in Italy, where a recent installation of a carrier system provides three additional telephone channels over an existing open wire line, and has furnished the necessary circuits to make this possible. Both Poland and Finland have been brought into communication during the year. It is now possible to establish communication from any telephone in this country to nearly 90% of the telephone stations of the world.

Development in Design.—An outstanding example of design

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development during the year is the introduction of the new hand set as an alternative to the familiar pedestal pattern telephone. The new instrument is largely the result of modern research, particularly in the field of speech transmission, which has made rapid strides during the last few years. Hand set telephones have been in use on the Continent for many years, but the transmission characteristics of these have been markedly inferior to those of the pedestal type, whilst the new hand set has superior characteristics.

Research work by the British Post Office and the leading manufacturers has been very active, notably in the study of speech transmission using the Transmission Reference Standard, presented by the American Telephone and Telegraph Co. to the Comité Consultatif International des Communications Téléphoniques à Grande Distance, and installed in Paris. Much work has also been done in an endeavour to perfect telephone channels over submarine cables using a carrier wave above the voice frequencies, particularly with a view to an increase of communications over the various submarine cables between this country and the Continent.

Ship-to-Shore Experiments.

Ship-to-shore experiments by radio telephony were carried out with the "Berengaria" when on her way to England, and, at the time of the experiments, about 1 000 miles out from New York. Successful two-way conversations were established by engineers of the International Telephone and Telegraph Corporation, and we can confidently look forward to the possibility of the international long distance network being extended to liners at sea throughout their voyage.

In his presidential address before the Institution of Electrical Engineers, Col. Sir Thomas Purves gave a demonstration of the important part which telephony can play in the linking up of large assemblies distributed throughout the country, and it would be fitting to mention this in conclusion, as indicative of a new field of usefulness to which the telephone network can be put. Upon this occasion the nine I.E.E. local centres were all in communication with London, so that the proceedings at any of the ten meetings could be heard by all the others. At the conclusion of the address, Manchester proposed and Glasgow seconded, the vote of thanks to the President.

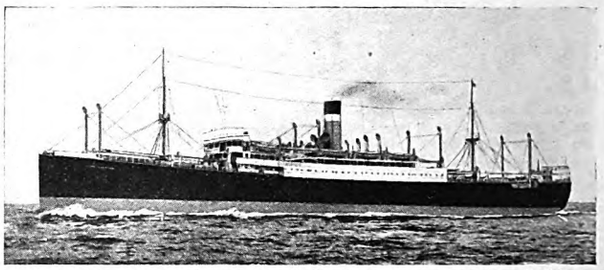
MARINE ELECTRICITY.

By A. C. HARDY, B.Sc., F.R.G.S., A.M.I.Mar.E.

A GREATER attention given to electric propulsion in this country than has ever been the case before, an improvement in the technique of auxiliary electrical machinery on board ship, a definite recognition of the possibilities of storage batteries for standby purposes and for use in conjunction with Diesel generators to ease peak loads, the placing in service of a large turbo-electric passenger liner, the placing of an order for two electric tankers and an electric cement carrier with Diesel-electric propulsion; these are events sufficiently important to justify the statement that the year 1929 has been a "banner" year for the marine side of the industry.

The "Viceroy of India" was the first big all-electric ship to be constructed in this country and she has a total power of about 17 000 H.P. on twin shafts. Her economy of operation has been well proved by the fact that she is able to maintain her scheduled speed from London to Bombay with complete ease, running part of the way on one of her two turbo-alternators. In view of her size, power and speed (some 16 knots in service and 17 knots when necessary) it might have been said with justification that the "Viceroy of India" was somewhat of a step in the dark. Almost a year's operation has proved that any criticism of this nature that might have been put forward was entirely unfounded. Not only has the "Viceroy of India" proved extremely successful in service, but also she has gone through what practically no other ship with an entirely new type of machinery could go through unless her owners were entirely satisfied with the reliability of their vessel's machinery. After one voyage in the London-Bombay mail service, she was immediately taken off this service and put on to a rigorous schedule of summer cruising with never more than 24 hours in port after each cruise, and with only one week at Tilbury between the termination of her last cruise and the beginning of her second voyage in a particularly arduous service.

This in itself, in addition to the fact that large electrically propelled passengers liners have been regularly and successfully operating between New Zealand and San Francisco *via* Panama, should be sufficient indication, even to the most pessimistic, that marine electricity has come, not only to stay, but within the next few years, considerably to develop.



The "City of Hong Kong," one of the first vessels to employ electric "supercharging."

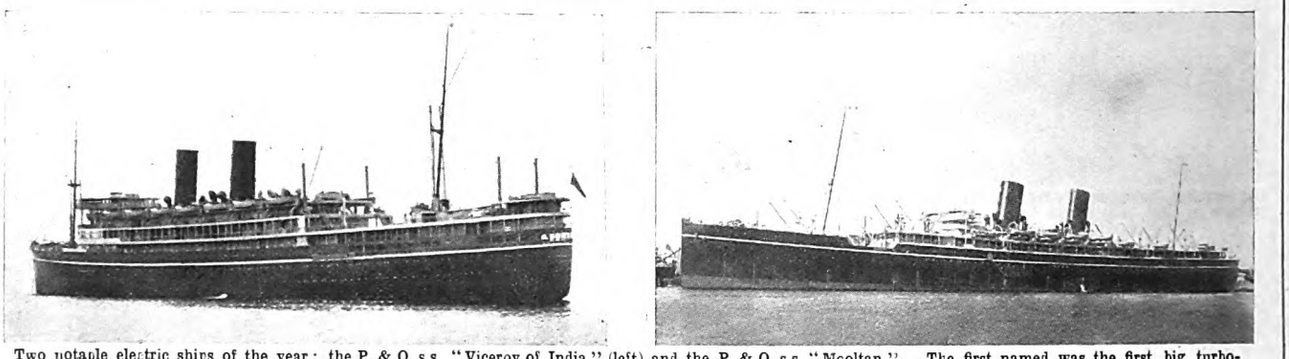
For it is not only in connection with main propulsion that development is taking place. We have got also to consider the myriad auxiliary duties for which its use is increasing on shipboard, in connection with Diesel engine generators where current can be generated and used for such a ridiculously low price per unit that it can be applied readily and quickly to almost every service that can be thought of on shipboard, from cooking to cable handling, from steering to sanitary pumps, from heating to haulage.

The storage battery is as auxiliary to the generating set as the generating set is to the power requirements of the ship. Several companies have been displaying considerable energy during the past 12 months in marketing to the marine industry, and it is now realised that the storage battery is not merely a means of getting standby power in emergencies, but a real live prime mover.

"Electric Supercharge."

One of the most constructive phases of development, too, has been electric "supercharge" or the use of an exhaust steam turbo-generator to boost the total shaft horsepower, and hence the mean speed, to a point of advantage, and at practically negligible cost in fuel consumption and a definite reduction in steam consumption.

Two ships, the passenger liners "City of Hong Kong" and "Mooltan" were converted to this type of propulsion this year by the Metropolitan-Vickers and the British Thomson-Houston Co.'s respectively, and are now in service. Other ships are in course of conversion, and the system may easily



Two notable electric ships of the year: the P. & O. s.s. "Viceroy of India" (left) and the P. & O. s.s. "Mooltan." The first named was the first big turbo-electric ship to be constructed in this country and the "Mooltan" is a recent conversion.

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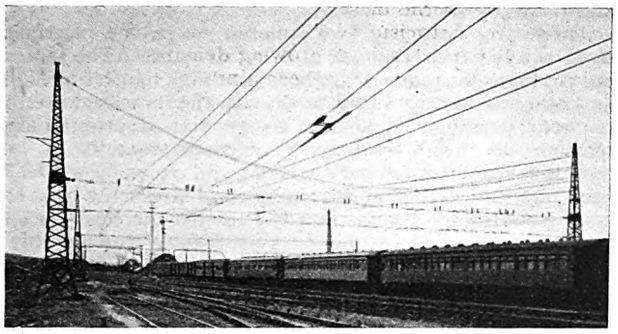
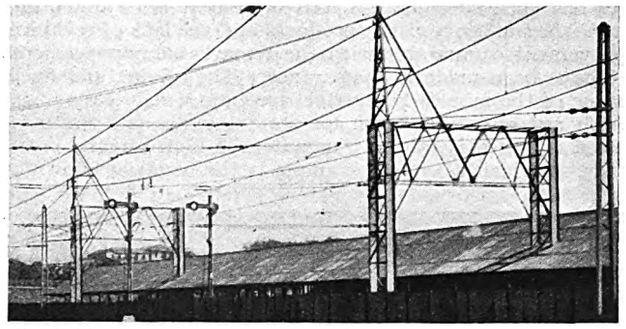




Two views of British overhead equipment supplied in 1929 for the electrification of the Great Indian Peninsula Railway.

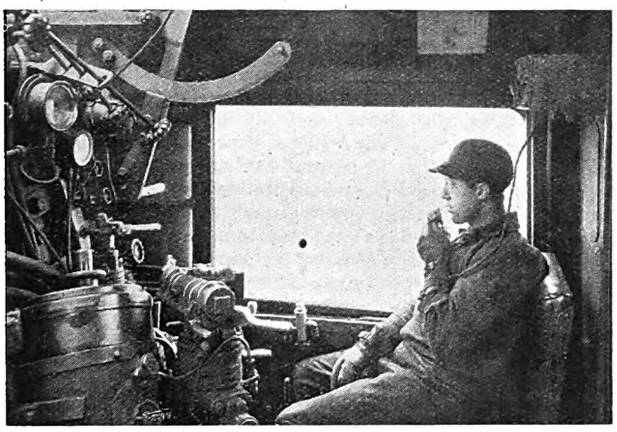
be regarded as one of the most important marine electrical developments of the year.

Finally, it is interesting to record a general awakening of interest on the part of many electrical firms of repute to the potentialities of the marine market.

RAILWAY ELECTRIFICATION.

By J. G. B. SAMS, A.M.Inst.M.E., M.Inst.Loco.E.

THIS has been a fairly progressive year for railway electrification. Perhaps the occurrence of most import with respect to the future is the appointment of a Government Committee under the chairmanship of Lord Weir, to examine the economic and other aspects of the electrification of the British railway systems, with particular reference to main lines; one would like to add: in the suburban area of Sir Ralph Wedgwood's own



Communication between the driver and guard by radio-telephony was a development introduced on the New York Central.

railway, which seems to be as far off electrification as ever, in spite of the increasing need.

Dealing with actual installations in hand, the most interesting is that of the Manchester, South Junction and Altrincham Railway (jointly owned by the L.M.S. and L.N.E. Railways), a short length of residential railway in Cheshire, whose conversion to 1 500 V d.c. working, with overhead transmission was announced in April; at the time of writing, completion is expected about September, 1930. The rolling-stock is to be of three or six-car trains in three-car units.

Balancing the above is the fact that the last a.c. overhead system train of the Southern Railway ran to Coulsdon on September 21st, all the Southern suburban lines being now 600 V d.c. third rail. It may be hoped that the Government Committee will include in its Report a pronouncement as to which system is to become standard, as it is certain that sooner or later we shall find that we cannot have both.

The Southern, surely the most progressive group of all, has the following extensions in hand: Sutton and Wimbledon, Hounslow and Windsor, Dartford and Gravesend and West Croydon and Wimbledon; the first is a new railway which was partially opened in September, the next two are short extensions, and the last is a complete branch; probably a reply to the Underground's extension to Morden. A really interesting announcement was made in September, that it was intended to convert the main line to Brighton and Worthing, together with the branch from Red Hill to Guildford, in response to the Government's remission of the Passenger Duty, the capitalised sum of which was to be expended on railway improvement.

Proposals for electrification under the Government assistance arrangement include the Wirral division of the L.M.S. and the extension of the London Underground from Finsbury Park to Cockfosters, and from Hammersmith to Northfields. Previous to this—off their own bat as it were—the L.M.S. had decided to extend their existing electrification from Barking to Dagenham; it is now said that this extension is to be continued, under the assistance arrangement, to Upminster. However, work on the former section does not yet seem to have been commenced. Looking at the question generally, an outstanding need is apparent for the immediate conversion of all suburban railways, as the steam engine has undoubtedly outlived its usefulness, and ought to be withdrawn.

INSULATING MATERIALS.

By A. R. DUNTON, A.M.I.E.E.

THERE is at the present time a pronounced feeling of unrest among insulation engineers due to a strong desire for super-insulation—some new material or combination of materials which would fulfil the essential requirements for a wide range of applications, but chiefly for high voltage work in air, such as transformer and switchgear bushings and the slot conductors of large generators.

Despite constant efforts for improvement, the insulating materials for such work have shown no radical improvement for some time. With the materials available the insulation of alternator slot conductors has been reduced to a fine art, in which the use of mica predominates, but there remains a need for a much better bonder to maintain the close adhesion of the mica laminæ between themselves, and to the conductors, after prolonged periods of severe service conditions. The most important advance in this work is probably the use of superfine woven asbestos applied to the conductors in conjunction with synthetic resin, forming a rigid, heat-resisting base over which the usual mica wrap is applied by pressure and heat.

If it were possible to proceed a stage further, and substitute for the varnish-bonded mica wrap a cell consisting of a material of great electric strength, and unaffected by high temperatures, a striking development would be achieved. An interesting material which constitutes an attempt to meet this need is a mica lead-borate compound now manufactured in Germany after original trial development in this country, and known as Micalex. Unfortunately, the material as at present available apparently requires a moulding temperature of about 400 deg. C. This makes its use very difficult, but, on the other hand, tends to give an insulation capable of service at temperatures far in excess of those at present permitted. The test results on the material are very interesting, and suggest that the problem of the application of some such material is worth serious study.

Use of Oxide Films.

Another material deserving consideration is the oxide film produced on aluminium by suitable processes. Although the actual oxide film may be only half a mil in thickness it seems quite capable of withstanding more than 100 V. Formed as an insulating film on aluminium conductors, or applied as a ribbon or strip of oxidised aluminium between conductors of copper, such insulation has met with a fair degree of success for separating the turns of field coils. A very important feature of aluminium oxide insulation is its excellent heat conductivity, which approaches that of metals.

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In synthetic resin products, both laminated and moulded, there has been considerable activity, but it is disappointing to note the similarity of the products and the lack of technical improvement comparable with the remarkable improvements that have been made in appearance. The colours and finish of some of the moulded materials are exquisite.

With regard to insulation for service under oil, the most marked advance is in the production of high quality press-boards, of which a typical example is the material known as

A new type of electric run-about for invalids introduced in 1929.

Elephantide. The remarkable development of this material, brought about by research and the scientific selection of materials, has recently been described in THE ELECTRICIAN. Once despised, it has now acquired remarkable electric strength and ageing properties, and occupies a position of great importance in high voltage transformer construction.

In conductor insulation for oil-immersed work the most notable advance is in paper, another development which has been recently described in these columns. It is now possible to obtain wires down to 0·0048 in. diameter with paper insulation even less in radial thickness than d.c.c. Another feature of improvement is the fact that such fine wires can be bent double without revealing the copper conductor through failure of the insulation.

Compounds and Filling Mediums.

With the now extensive use of iron-clad switchgear the question of compounds and filling mediums assumes considerable im ortance. Refinements in manufacture of these materials are now producing more consistent results, but difficult problems still face the design engineer who has to provide for extremes of temperature, not only in service but also in shipment to site. If a compound is too soft it may flow too readily at high temperatures; if it is too hard it may crack or pull away at low temperatures. Oil is used as a filler in some instances, but plant involving its use has to be specially constructed to prevent leakage. This extra difficulty is compensated for to some extent by the fact that oil has a less steep temperature-voltage curve than most compounds. The influence of temperature on the electric strength of most filling compounds is more serious than is usually appreciated.

For the insulation of busbars and contact carrying mechanisms there seems a possibility of developing some of the new cellulose acetate products made in the form of films, sheets or tubes. The electric strength of some of these materials is excellent, but unfortunately the softening point is rather low, usually about 70 to 80 deg. C. There are, however, a number of these products now being manufactured, amongst which should be found some material capable of improvement so as to have a melting point not lower than 90 deg. C., which is about the minimum permissible for service.

STORAGE BATTERIES.

By L. W. de GRAVE.

THE year 1929 has not shown any startling developments in storage batteries, nor further activities in comparatively recent innovations.

The tendency towards the home manufacture of previously imported batteries is a step in the right direction, and should result in economy to the consumer; if not in price, at all events, in service.

The demand for wireless batteries is still well marked, the discarding of the multiple cell container being perhaps a foregone conclusion. Whilst the reduction in consumption due to greater efficiency in radio valves has created a demand for miniature cells, the demand for super cells has also increased, and shows signs of still further growth for power station and submarine use.

There are, however, two spheres where the intermediate sized cell is experiencing a growing demand. The motor car industry has for many years been a prolific market for lighting and starting batteries, but now, with the increased use of the roads for passenger traffic and the general adoption of electric starting on buses, a largely increased capacity of cell is required, reaching a figure which until recently would have been considered enormous; the general size being now 180 to 200 Ah with a tendency towards a further increase, for on the long distance vehicles doing return journeys, even this size battery requires a spare.

In railway train lighting an increased demand has been felt, as companies are converting their old gas-lighted stock, more restaurant cars are being put into service, and as many of these are being equipped with electric cookers, a considerably larger cell is required, 400 Ah not being an excessive unit for this work.

The demand for traction cells for road work is increasing slowly due to the fact that many potential users await a radical reduction in weight. Steps in that direction are represented by the thin lead plate and the improved Iron-Nickel-Cadmium cells.

The use of batteries for haulage work, such as locomotives for shunting and yard work, has increased at quite a reasonable pace. Train and vehicle lighting, once considered the perquisite of the lead cell, is now challenged on equal terms by the Nickel-Iron and Iron-Nickel-Cadmium batteries. The latter especially has reduced size below that of the lead cell, with a further reduction in weight, and there is no doubt that the inherent strength and capacity-retaining qualities of this type of cell will eventually be strongly competitive with the lead cell.

ELECTRIC BATTERY VEHICLES.

By RAYMOND J. MITCHELL.

IN spite of the almost complete apathy of the electrical engineer—and in particular the station engineer—towards electric vehicles, the type continues to receive painstaking study by a few persevering firms, and progress in design, scope of application and performance can therefore be recorded. It is—to put the case mildly—surprising that a machine which is potentially one of the most important load builders that has ever presented itself to the attention of the station engineer should be so studiously ignored by him. And that, in some cases, American petrol vans should be employed where British-built electrics could be used for general service utility in connection with central station transport duties, is not merely a reflection on the business acumen of those permitting such misuse of public capital, but is also a proof of sheer laziness on the part of many responsible engineers who ought to be better informed in regard to the possible applications of

A 1929 model one-ton electric vehicle in use for suburban milk delivery.

electric vehicles in their own service, and in that of their numerous customers who employ transport equipment operating in city areas.

A one-ton electric van will consume anything up to 150 kWh per week if kept busy on delivery work. This energy is all taken in dead off-peak night periods, and could be sold

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justifiably at a fraction over coal cost. A fleet of 1 000 vehicles in a city of 200 000 population would require 20 000 kWh per night on a moderate basis of calculation: surely a load worth making efforts to cultivate, even though, admittedly, considerable effort would be required to overtake the lead which the push and energy of the petrol interests have gained for them in the field of road transport.

No thoughtful engineer who will ascertain the facts about electrics can gainsay that their extensive use in city areas would solve the problem of horse obstruction, quieten the traffic,

A two-ton low loader for refuse collection, showing operation of the patented anti-dust flaps.

abolish fumes, increase street safety, speed up the traffic flow, and very measurably improve the load factor of the supply system, without increasing appreciably the capital costs on mains or plant.

The outstanding event in the British electric vehicle industry for the year 1929 is the progress in developing the light electric van. These machines are already in use for bread and milk delivery, ideal applications where super cleanliness is vitally important, and easily provided by battery driven vehicles. Even the Post Office has at last decided to try out electrics, and may be expected, one hopes, not to use so many Ford vans in future for jobs which years ago could have been performed by battery traction.

In the following notes are described a number of original and progressive designs of electric vehicles which have been produced during the past year.

THE ELECTRICAR ONE-TON ELECTRIC VAN.—This vehicle incorporates the most advanced practice of automobile design in regard to layout, suspension, steering and braking, whilst being in no sense merely an adaptation of petrol vehicle design. The frame is a pressed steel structure, amply cross membered, and downswept in front to facilitate the driver's entrance and exit—a very important point on delivery work where stops are frequent and time is vital. Transmission is by worm gear via cardan shaft from a duct ventilated ball bearing series-wound traction motor possessing generous overload capacity to deal with hill climbing. Bishop cam and roller steering gear, compensated internal twin brakes, disc wheels, oversize pneumatic tyres and a drum controller of extreme simplicity ensure that the chassis is as nearly driver-proof as any road vehicle could be. The battery is carried in a handsome looking bonnet provided with an easily removable lid. Either 25 cell or 40 cell arrangements are standardised, depending on the nature of the service required, speed, number of stops, and mileage. For example, with an equipment of 25 cells D.P. type K.C. 15, a mileage of 47 with half load may be run without stops, or 28 miles with 160 stops, the speed being from 12 to 13 m.p.h. *average*. This is more than twice the speed of a horse on similar duty, and twice the effective daily mileage which it maintains. A weight of only 35·5 cwt. for the complete van-bodied vehicle enables the tax of £6 to be available. Insurance of this type costs only £7 per annum.

Municipal Equipment.

THE ELECTRICAR TWO AND THREE-TON LOW-LOADER.—This is a specially designed vehicle for municipal use in refuse collection. The general layout will be apparent from the illustration above. In these vehicles the frame has reinforced ash side members with tubular steel cross members. Worm transmission is employed, with dual rear brakes. Battery location is provided in panniers each side of the frame members. An oil immersed drum-type controller gives three forward and reverse speeds. A very simple twin screw tipping gear is provided to discharge the contents of the steel body at the dump. This gear is electrically operated, and provided with automatic stop gear at each end of the screw travel. The most interesting design feature of the vehicle is the dust-preventing automatic flap which opens when a bin is being emptied into the body, and shuts automatically when the loader's foot is removed from a stirrup bar. A speed of 12 m.p.h. when free running is maintained by a battery equipment varying according to service required.

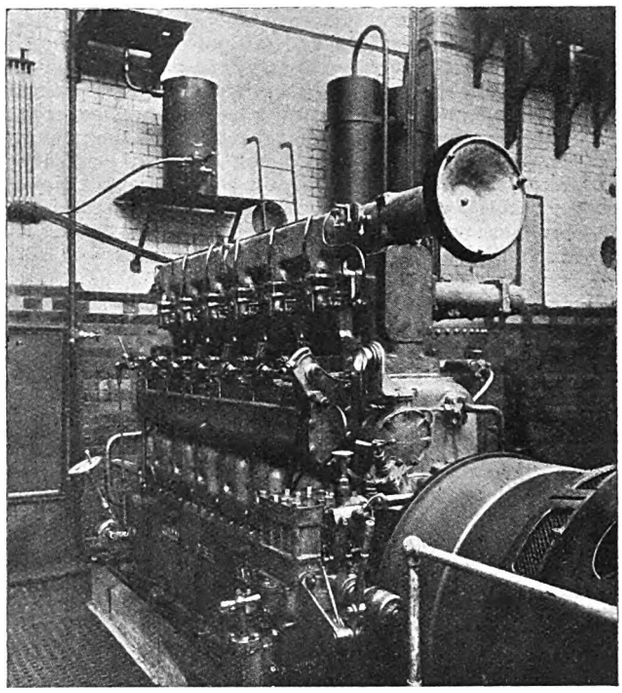
THE MURPHY-STANLEY INVALIDS' ELECTRIC RUNABOUT.—In this little car a successful attempt has been made to give the invalid a small car which will go anywhere where there is a road, and which will run at a safe yet useful speed for a considerable mileage. A tubular frame supports a very comfortable seat hung on cee springs; also a crate to contain the batteries. The rear axle is a miniature automobile worm driven affair, totally enclosed and driven by a series motor positively aligned with the worm tail shaft. All bearings are of the ball type. Three brakes are provided, one being electric in two stages for emergency. The tiller steering handle also controls the drum-type speed regulator and electric braking. Weight has been cut down to an absolute minimum, being about 400 lb. for the complete car fully equipped. A speed of 8 m.p.h. is standard, but a higher speed can be given if required. Mileage per charge varies from 40 to 75, according to battery equipment. Gradients up to 1 in 3 can be climbed with perfect certainty and safety. A voltmeter is provided, also side and rear lamps. The tax of these little vehicles is only five shillings per annum and the first cost less than £100 complete. A journey of 50 miles costs not above 6d., at 1d. per unit for charging energy.

It will be agreed that the evidence adduced shows that the electric vehicle is still making gallant efforts to obtain a real place in the sun, and the writer is confident that eventually that place will be a very prominent one.

DIESEL ENGINE PLANT.

By GEOFFREY PORTER, A.M.Inst.C.E.

IN a short summary of the progress made during 1929 in the use of the Diesel engine in power stations nothing more than a brief generalisation can be attempted. It is proposed to comment very shortly upon: (1) The effect of legislation; (2) the last return of the Electricity Commission; and (3) some recent developments in Diesel engine land-type practice.



A Brotherhood-Ricardo high-speed Diesel engine, 300 b.h.p., 200 kW. It is of the four-stroke cycle airless injection sleeve valve type, and runs at 750-900 r.p.m.

In this country very little additional Diesel engined generating plant has been put into the stations of authorised undertakers. Except in a few areas where a bulk supply for recently created or normal additional requirements is not available or in sight, new Diesel engines have not been purchased. Unfortunately, the difficulties encountered by the Central Electricity Board and others have proved to be more formidable than

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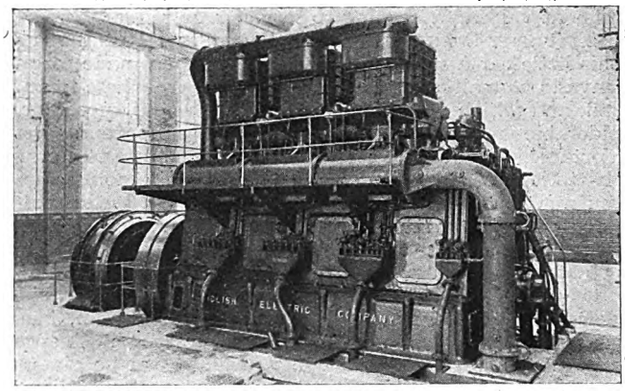
was anticipated, with the result that contractual obligations entered into with some local authorities have not been fulfilled in time to meet urgent requirements. The unwisdom of refusing sanction to short term loans for a bare sufficiency of added generating plant has become manifest. Local restrictions of supply have become imperative in some cases.



An English electric 1125 b.h.p. 750 kW opposed piston type two-stroke cycle Diesel engine, at 250 r.p.m.

Apart from difficulties of this kind, authorities employing the Diesel engine view with concern the prices demanded for bulk supplies, especially when a power company is the source. In different localities prices have ranged from about 35s. to 110s. per kW (the lower figure being an exception), plus a running charge varying between 0·2d. and 0·4d. per kWh. These charges have been supplemented by a line rental charge amounting to thousands of pounds per annum, with the further obligation of providing for the bulk supplier a line load factor of 50% and upwards.

When purchasing Diesel-engined generators an authority does not incur an annual capital charge much, if at all, exceeding 25s. per kW for plant alone. Although the comparable generating costs will exceed the amount of the running charge in the bulk supply contract, the difference will be overtaken by the cumulative effect of the high kW charge and the line rental. It does not comfort the Diesel engine user to tell him that the benefit anticipated is national rather than local. His estimate of the situation is local, and cannot be otherwise. It is to be presumed that the statutory oil-engined stations have now reached their maximum development as generating stations, and their future must therefore depend upon the terms on which they will be able to purchase energy from outside sources. Not the least important of the clauses of a bulk supply agreement will be that dealing with the payment of the kW charge. Unless a reasonable degree of elasticity is safeguarded, this charge may readily have a crippling effect upon the business of the purchasing supply authority. This remark applies, of course, to any purchasing authority, irrespective of the type of the existing plant.

Number of Oil Engine Stations.

The Electricity Commission's Annual Return has received editorial and other comment of a general character in the technical Press. It is not unnatural that the steam stations which furnish 95% of the aggregate output should receive 99% of attention. Of the gross total the oil engine stations generated an insignificant fraction, 0·68%. But the number of these stations was not an unimportant fraction ; it amounted to 24·3% of the whole number. Small as the individual and collective output of these stations may have been, they have shown an increased output of 61·6% since 1926. There was a small setback in output of 4·7% in 1928, but that check was followed in the year under review by an advance of 17·6%. The steam stations, it may be noted, increased their output by only 9·2% in 1928–29.

It is at least clear that the smaller undertakings where the Diesel engine is used, are by no means inactive in advancing their businesses. If left to work out their own salvation they would undoubtedly fulfil all the requirements of their local districts perfectly satisfactorily.

It is also interesting to observe that no fewer than 165 steam stations contributed no more than 4·1% to steam stations' aggregate output. In very many of these the work could have been done more easily and more economically had the Diesel engine displaced the steam equipment. It is at least arguable that, but for the 1926 Act, many of them would have abandoned steam in favour of oil as the readiest means of improving their economic efficiency.

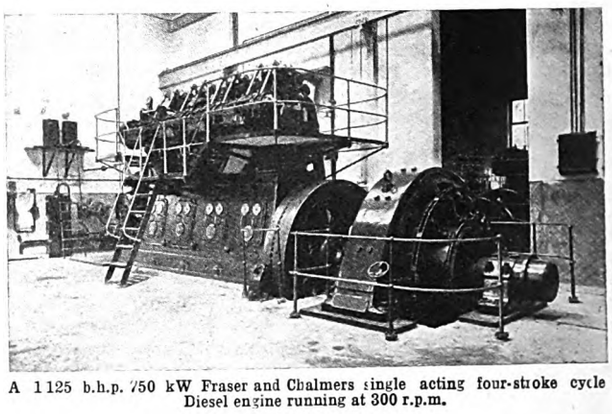
Of the new Diesel engined generating sets purchased by local supply authorities this year in this country three are of particular interest, as they represent the progress made by British manufacturers of land-type engines in the development of larger capacities. In comparison with foreign oil engine manufacturers they have still a long way to go from the point of view of size. One of the units is an 8-cylinder, opposed piston type, 2-stroke cycle Diesel engine, direct coupled to an alternator of about 1 000 kW operating in parallel with a 500 kW alternator driven by a smaller engine of the same type, though of older construction. The new engine presents an exceedingly attractive appearance, and, what is more to the point, has a high thermal efficiency, the full load fuel consumption being of the order of 0·59 lb. per kWh at full load (based upon a normal, commercial quality of fuel oil).

The equipment of a second station already containing four 500 kW Diesel-alternators and a pair of 100 kW pre-war Diesel sets, has been supplemented by an alternator of about 1 250 kW capacity, driven by a six-cylinder, Nobel type, 2-stroke cycle, single acting, Diesel engine. This engine is a modification of the 1 100 B.H.P. Nobel engine supplied to the Worthing Corporation just three years ago, and differs from it by the omission of cross-heads, and the drive of the scavenging air pumps and air compressors being derived directly from the crankshaft. The engine is not unlike the Bürgerhout engine in design. The performance is said to be good, and its future career will be followed with interest.

Adoption of Super-charging.

A third example is distinguished by the adoption of super-charging, it is believed for the first time in a British land-type engine. By this means the normal full load output may be increased by 33% on occasion without over-stressing the engine parts, a feature that is valuable for meeting peak loads and sudden emergencies. Applications of the supercharging principle are becoming common in marine practice, but for land purposes the advantage has not been so readily visualised, nor so easily adopted owing to the comparatively limited overload capacity of electric generators, at any rate when manufactured to B.E.S.A. specification.

In Germany and Switzerland the supercharging principle is finding a good deal of favour. One firm alone is reported to have on order more than 50 000 B.H.P. of supercharged Diesel engines. Such an engine, of 3 000 B.H.P. direct-coupled to an alternator of about 2 000 kW, has been supplied to the central station of a city in Spain. The continental manufacturers of the Diesel engine show a decided tendency towards a general adoption of the airless injection method of fuel supply to their



A 1125 b.h.p. 750 kW Fraser and Chalmers single acting four-stroke cycle Diesel engine running at 300 r.p.m.

engines, and are also very busy in the manufacture of the 2-stroke cycle engine.

The largest single order obtained during the year comprises a complete power station for an Australian industrial concern. There will be six Diesel engines of 3 000 B.H.P. apiece, direct coupled to alternators of about 2 000 kW in each case, and four 1 100 B.H.P. Diesel engines coupled individually to air compressors. The compressor engines have been allotted to an English firm of long standing and great experience. This station is believed to be the largest Diesel generating station in the British Empire (though not in the world), and is a significant instance of the trend of opinion at the present time.

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Finally, the genuine high-speed Diesel engine of small dimensions and light weight is finding a foothold in electricity supply practice. The experience gained in the operation of the 300 B.H.P. set in the Worthing power station has been incorporated in a modified design, of which two examples have been recently put to work in private industrial establishments. The convenience, economy and excellence of this design cannot fail to commend it, and one may prophesy its wide adoption within the next few years. Unhappily, it will not be a feature of the electricity supply industry, but rather the means whereby the industrial user will generate his own energy at a price less than that at which he can purchase it.

METERS AND INSTRUMENTS.

By E. W. HILL, M.I.E.E.

IN view of the fact that the art of metering is now long past its period of infancy, it is not, perhaps, surprising that it should have settled down into a stage of stabilisation in which revolutionary changes are not to be anticipated, and are certainly not discernible, as far as ordinary electricity supply meters are concerned, within the annual period under review. More particularly does this apply to d.c. meters, the numbers of which being put into service are continually diminishing—if not absolutely, yet relatively—in comparison with the numbers of their a.c. rivals.

Generally, tendencies rather than achievements seem to be the characteristics of the situation, and these, as reflected from the files of the Patent Office, appear to be directed towards consolidating the advances of previous epochs, and to be concerned chiefly with the minutiæ of meter construction, to the end of removing some of the more recondite defects of performance, or providing more facile means of calibration adjustment.

The impulse towards designing the so-called "overload" meter—for a.c.—(i.e., one capable of sustaining two or more times its nominal current rating), although less feverish, has not yet entirely exhausted itself. The problem involved, however, is one really concerning the extension of the load range in a meter for which close accuracy is possible, conjointly with the formulation of a rational definition of a meter's full load capacity, which definition incidentally has yet to be framed.

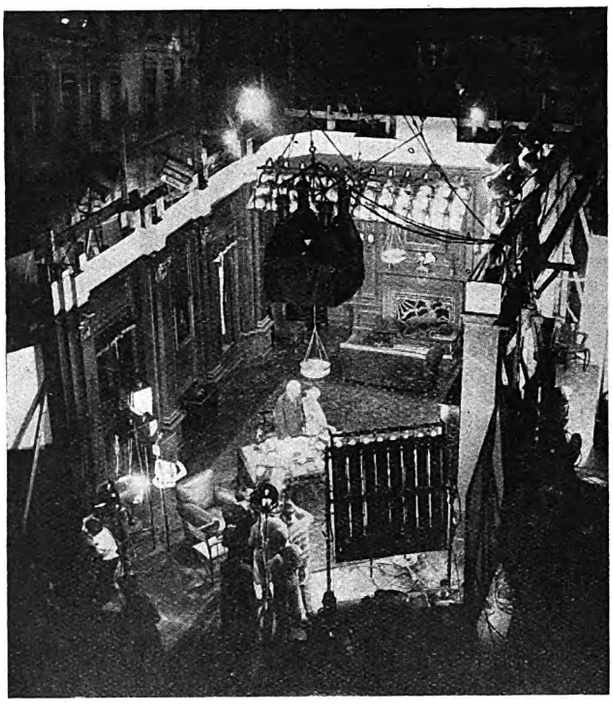
British Quality Meters.

The newly revised specification for meters, No. 37—1929, of the B.E.S.A. was published this year, and in addition to the removal of certain ambiguities and other blemishes from the previous edition, it is characterised principally by a fairly drastic narrowing of the range of accuracy tolerances, which condition of things will tend to set British meters in a quality class still more definitely above that of their Continental competitors. As a new feature, and somewhat belatedly, it also formulates, in an addendum, a complete series of standard terminal arrangements; with what success in securing adherence, however, remains to be seen.

The endeavours to stimulate consumption of electricity by the medium of multi-part tariffs have their inevitable repercussion in attempts to devise prepayment meters which shall exact "fixed charge" payments with, at one and the same time, the maximum certainty of securing all that is due, and the minimum financial inconvenience to the consumer. Much controversy has been excited on this account, and a number of prepayment devices have been developed for collecting fixed charges, either in lump sums, or in distributed payments; but a final, agreed, solution of the problem now depends less upon technical advances in prepayment meter construction than upon the possibility of arriving at uniformity of procedure among supply undertakings in respect of the basis upon which fixed charges are to be assessed and the way in which prepayments for them are to be demanded.

Apart from these particular schemes, a great deal is being done to encourage multi-part tariffs, especially in the not inconsiderable field of late shop-window lighting, by the use of time-switches of new and highly ingenious kinds, employed sometimes in conjunction with special purpose meters.

The domain in which the greatest development activity is being exhibited is that in which master metering on bulk supplies is provided for effecting on one integrating dial and on one maximum demand indicator dial, the algebraic sum of the energy registrations, and of the maximum demand indications respectively of groups of subsidiary meters, some of them perhaps located at long distances from their nearest neighbours. Much extremely interesting pioneer work is being done in this field for the several grid schemes now being installed, and it is to be anticipated that full details (which are not at present available) will be published in due course.



The year has seen developments in electric lighting applications in film studios, the one depicted being that at Elstree.

Attempts are being made—and success is claimed for them—to obviate the difficulty and expense involved in installing potential transformers on very high voltage systems, by using instead the power transformers connected thereto, and employing the artifice of injecting into the derived low tension circuits provided for energising meters, etc., voltages which simulate and compensate for the primary voltage drops occasioned by the load in the power transformers.

Recent Developments.

Among other interesting recent developments in instrument work there are improvements in a.c. relay construction, in protective gear, in current transformer design for reducing low load errors, and in testing methods for instrument transformers.

In conclusion, it may be hoped that the present steady adherence to the utilisation of known principles for achieving greater perfection in performance in meters and instruments will not necessarily preclude the possibility of early and epoch-making departures from established practice.

ELECTRIC LAMPS.

By W. J. JONES, A.M.I.E.E.

IN the paper presented at the International Illumination Congress last year, frequent reference was made to the need of standardisation, and instructive data were presented illustrating the numerous varieties and types of incandescent electric lamps, and the number of different voltages in Europe. In Great Britain some progress towards simplification has already been made, and it is hoped that this will continue, with benefit both to the quality and to the cost of lamps.

During the present lighting season, special efforts have been made to bring home to the public the advantages of the pearl internally frosted lamp and the opal lamp. It is urged that in all installations where lamps are exposed to view, the substitution of pearl or opal lamps for clear ones would do much to diminish glare and promote better diffusion of light.

Moreover, the more general adoption of such lamps would doubtless assist standardisation, and would be favourable to more efficient production. It has, for instance, been computed that by concentrating on the production of these lamps it would be possible to diminish some 60 or 70 existing types to less than one dozen.

The comparative effects of lamps with clear and internally

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frosted bulbs on the light distribution and appearance of fittings (particularly for domestic purposes) is generally very favourable to the latter.

A feature during the past year has been the progress made in the manufacture of lamps of very high capacity. Incandescent electric lamps, consuming 3 to 4 kW, are now widely used for lighthouse work, and some of 10 kW, and even higher capacity, have been developed for the lighting of aerodromes.

A new field for the use of such lamps is presented by the film-making industry, where, owing largely to the introduction of panchromatic films, and to the necessity for a noiseless source of light in making " talkie " films, incandescent lamps have recently been in great demand. The use of high candle-power incandescent lamps in studios presents numerous interesting problems, and has resulted in the production of many special devices. In some Continental cities there are instances of single lamps of exceptionally high candle-power being applied to public lighting, e.g., on posts 60 ft. high or more, in large public squares.

ELECTRICAL CONTRACTING.

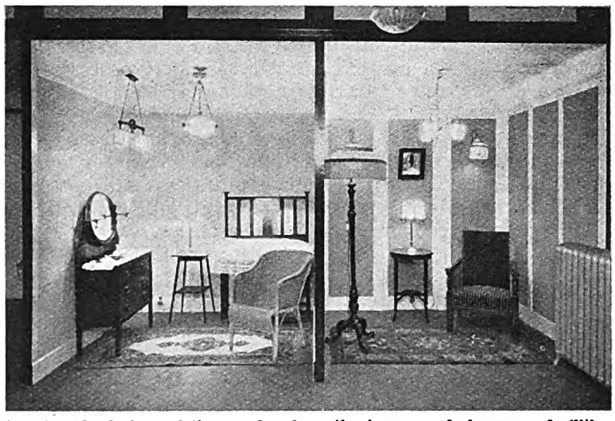
By E. H. FREEMAN, M.I.E.E.

THE wiring and installation section of the electrical industry can look back on the past year with satisfaction. Business has been good in almost all parts of the country; labour troubles have been practically negligible, and there have been no other difficulties of a serious kind.

The year has, however, not been entirely uneventful. Although no startling developments in wiring practice have taken place, attention has been given to many questions that affect the safety and convenience of electrical installations.

Of these the most prominent is that of earthing or insulating apparatus. The subject has been debated on many occasions, including informal meetings of the Institution of Electrical Engineers. The supporters of each point of view have tried to convince their opponents, but so far without success. On the one hand the impossibility of obtaining all-insulated apparatus has proved the necessity of earthing quite conclusively to the advocates of earthing. On the other hand, the fact that manufacturers make little or no attempt to enable earthing to be carried out, and the consequent difficulty of ensuring effective earthing makes the supporters of all-insulated systems sure that their principles are right. The matter is likely to form the subject of many more discussions before uniformity is reached.

The lack of more satisfactory co-operation between supply

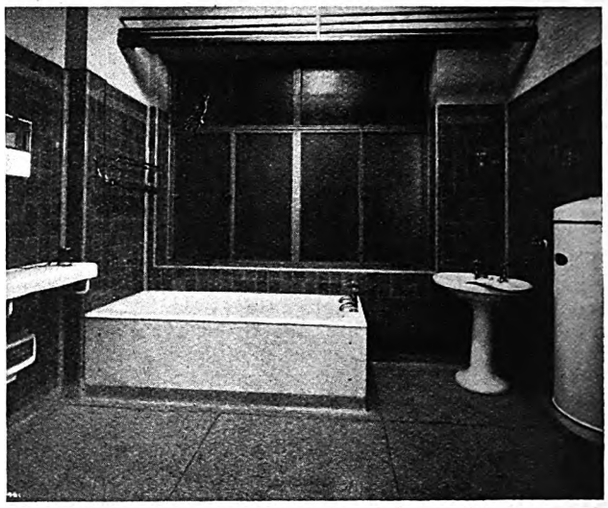


A noticeable feature of the year has been the increase of showroom facilities provided by electrical contractors, some of the new showrooms being based on the model E.L.M.A. system shown above.

authorities and contractors is an occasional cause of trouble. Tariffs in many areas are too high to attract consumers, except for the bare lighting requirements of the smaller houses, and some districts even definitely discourage heating and cooking loads. The addition of an appreciable demand for cooking would overload the mains now existing, and fresh capital outlay would be undesirable. Such conditions generally occur where there are rights to purchase undertakings at unfair terms to the existing suppliers, but that they should exist at all is deplorable.

Another constant source of trouble is the many complicated systems of tariffs. No two authorities seem to adopt the same system, and the need for explanation of alternative tariffs is a frequent difficulty for the contractor trying to persuade a prospective consumer to adopt electric cooking and heating. It would be a great incentive to the obtaining of this extra load if all tariffs could be simplified and standardised, and particularly if they could be reduced to a basis that could be understood by the ordinary layman.

The comparative failure up to date of the development of



Progress has been made in 1929 in developing the use of electricity for water heating, and all-electric bathrooms are included in many new houses.

electricity supply in outlying districts is also a source of complaint from the country user. This is probably due to the politicians rather than to the Electricity Commissioners, but the prospects held out a year or two ago of rapid rural development and the comparative failure to give results have led to many bitter criticisms from prospective customers on the outskirts of urban areas.

On the whole, however, the electrical contracting industry has not much cause for grumbling. Business has been generally good during the last year, and fresh opportunities for business are opening out in many directions. The prospects for the future are also good, and there is so large a field for development that contractors can anticipate satisfactory business for some time to come.

ELECTRIC WATER HEATING.

By H. AMBROSE CARNEY.

DURING the past twelve months there has been a greatly increased interest on the part of supply authorities in the development of the electric water heating load. The general publicity of manufacturers, and especially the national advertising campaign of one firm, together with the efforts of the E.D.A. in April last, have served to direct attention to the excellent results already obtained by those enterprising authorities who first took up electric water heating on correct lines. These results have shown conclusively that not only does the general public want efficient electric water heating equipment, but that the demand is a very valuable one owing to its effect on the load curve.

Experience has shown that to ensure rapid development an attractive hire scheme is of first importance. A relatively high price per unit will be paid cheerfully if the hire charge is attractive, while a cheap unit price with an inflated hire rate will discourage progress.

Supply undertakings have shown a gratifying recognition of the fact that, for hiring out purposes, only the best is good enough. Provided the equipment is sound electrically and mechanically there is no difficulty in recovering the capital cost, with interest, over a period of seven to fifteen years, and with practically no cost for maintenance.

One of the points which has become generally recognised is the superior earning capacity of the electric water heater as compared to the electric cooker. Assuming 100 kW of plant available, the output per annum, if reserved exclusively for electric cooker supply, would approximate to 100 000 kWh. If used for water heating only, the consumption would be 250 000 kWh.

Not only is this great increase in consumption obtained, but the nature of the demand for hot water is such that quite 75% of the plant capacity is released during peak hours, thereby effecting a further important saving.

The capital expenditure on current-consuming equipment for hiring out is incurred solely to sell more electricity. An

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outlay of £1 000 on electric cookers will increase the annual sale by approximately 100 000 kWh, but the same expenditure will purchase efficient electric water heaters which will add over 200 000 kWh per annum to the output—and without the attention of a maintenance department. Adding the latter expense to the cost of the cookers would make the expenditure approximately £1 000 per 50 000 to 75 000 kWh per annum. Regarded from a nett revenue standpoint, therefore, the expenditure on water heaters is likely to be from two-and-a-half to four times as productive.

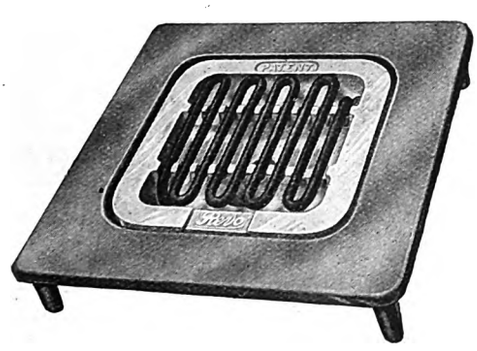
Another welcome sign is the general appreciation of quality in electric water heaters. Bitter experience has at last convinced supply authorities and users that cheap production, with thin sheet tanks, soldered or brazed and roughly tinned, will not stand up to the work. One does not find such flimsy construction in ordinary hot water systems—their defects were found out years ago by hot water engineers! The more one considers the problem, the more one realises that the standard of construction must be maintained, and even improved upon, where electricity is employed as the source of heat. Sound mechanical construction with a liberal—but efficient—use of highest grade raw material necessarily costs more, but the money paid for the "cheap" product is too often but the initial payment of a much heavier total expenditure which in the end will succeed only in discouraging consumers.

The third gratifying mark of progress is the recognition that the correct application of electric water heaters is a most important matter, and one which calls for long specialised experience. The successful development of the water heating load is determined by the skill with which the first 100 heaters are installed. If these are of sound design, and properly fitted, the results will bring further consumers without effort. If the installations are bad, the cause of water heating will be set back as it was in the past, when immersion elements attached to unlagged tanks afforded the only means by which the electrical industry could express itself in water heating.

ELECTRIC COOKERS.

By STANLEY F. BICKELL, A.M.I.E.E.

THE year 1929 may be considered as the beginning of the age of reliability in the electric cooker world. Prior to this the cooker industry was undoubtedly supported by the loyalty of supply engineers to the cause of electricity, and to the demand of a certain section of the community for novelty. Maintenance charges in the early days would surely have turned an economist grey, for 20s. to 30s. per year service costs per cooker were far from uncommon. These charges were



The high-speed transformer-operated boiling plate.

due primarily to the imperfections of boiling plates, and secondarily to weaknesses of wiring and connections.

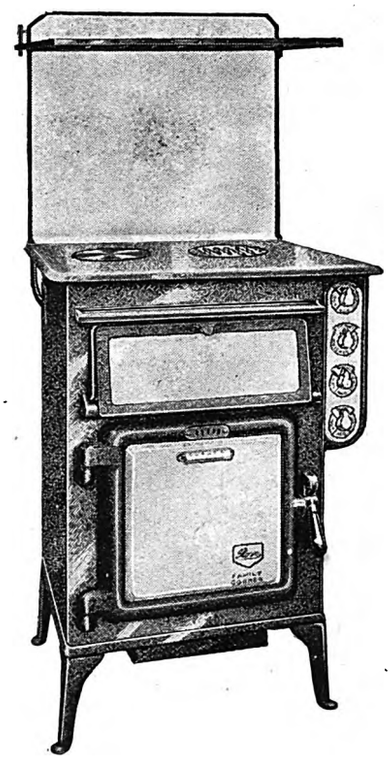
The change has been rapid and decisive. Opinions have become more or less consolidated in favour of the enclosed type of plate, and, with the advent of the cement-filled pattern, reliability of the order of 98% over 2 years' service is the rule rather than the exception.

The removal of the wiring from the lagging material and the substitution of Steatite insulation for mica, together with the standardisation of lock nuts and copper of sufficient cross section has practically eliminated entirely all failures of wiring.

Switches have improved in reliability, although their design is too reminiscent of the old days of surface mounting. A dust-proof rotary switch designed especially for recessed mounting on an electric cooker has still to be evolved.

General durability has received its share of attention, and the vitreous enamelling of *all* sheet metal portions is now the rule with the large manufacturers. This is a tremendous step forward, and enables the supply engineer to hire cookers with some assurance of seeing a return for his capital outlay before the appliance crumbles with rust, as has frequently occurred in the past, during a period of only two or three years.

The vitreous enamelling of the hobs of cookers is, of course, a feature which appeals mostly to the user of the stove, and in this connection the new single coal-mottled enamel has been almost generally adopted on account of its hard wearing and non-chipping properties. There is a strong tendency amongst supply engineers to purchase all-vitreous enamelled cookers as illustrated on this page, and in the not distant future this finish is likely to become standard practice. A cooker so finished is readily and cheaply renovated for rehire purposes to another consumer, and maintenance costs are thereby greatly reduced.



The use of vitreous enamel finishes for cookers has increased in 1929.

The grilling space between the hob and the oven has been made to function as a useful hot cupboard by the fitting of a drop door, although this very obviously desirable change has been slow in coming. The three-heat grill also is an attribute which has only recently become general, although it is a necessary adjunct to the hot cupboard.

In the matter of ovens there is very little standardisation amongst manufacturers. This is due largely to the necessity of following precedent, and to the variation in the class of cooking throughout the country. Whilst side heating alone has given place to side and bottom, there is still controversy concerning the relative merits of this and the top and bottom method. The former undoubtedly takes first place in general popularity, but the latter finds devotees who certainly cannot be overlooked. Whether the joint committee of the I.M.E.A. and B.E.A.M.A. will succeed in forcing a settlement remains to be seen. In the meantime a manufacturer is faced with the alternative of either making two distinct models or losing certain business to a competitor.

More attention has been given of late to the effective earthing of all metal portions of the cooker excepting the conductors, and this is greatly to be commended.

"Plug-in" Elements.

The question of "plug-in" elements is still flirted with, and it would seem that its adoption, which certainly would be desirable, is dependent upon the invention of a plug and socket connection which will provide a good contact continuously under the effect of considerable heat. The common split brass connection is useless for the purpose; it either loses its temper, overheats and open circuits, or it corrodes in the course of time and renders the element practically immovable. The "plug-in" type of oven element undoubtedly improves the space factor of an oven and thereby increases its efficiency, besides avoiding undesirable crevices into which dirt and grease may percolate. It also renders possible a thorough scouring of the oven by the housewife.

In regard to "plug-in" boiling plates and grills, service costs are obviously reduced when the infrequent need of replacement arises; but it all hinges upon the evolution of a suitable plug and socket contact before these advantages may be enjoyed.

The transformer-operated low-voltage boiling plate, as

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illustrated on page 799, is growing steadily in popularity, its greatest attribute being freedom from failure arising from damage to the resistor, and to the rapidity with which it will heat small quantities of liquid.

The fact that cheap, common utensils give the best results weigh heavily in its favour.

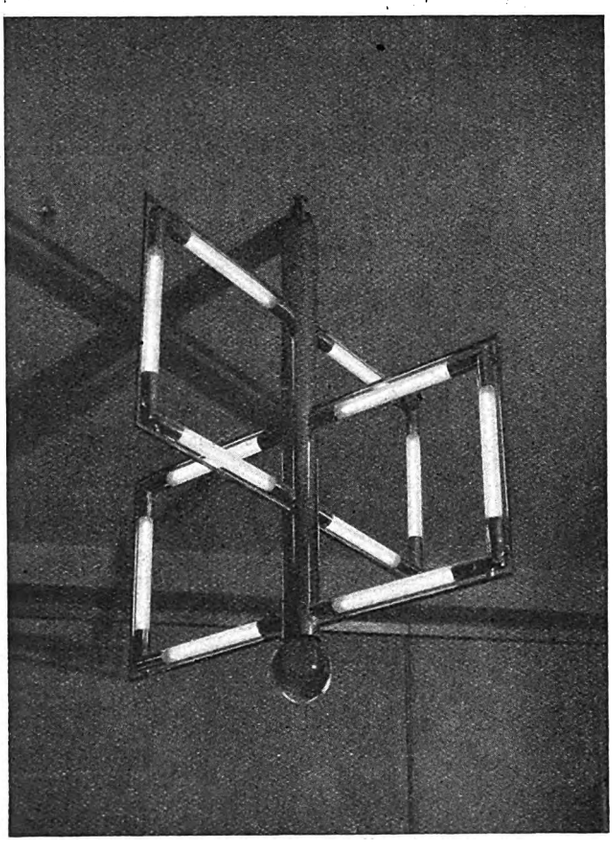
In reviewing recent developments it is interesting and gratifying to note how little the design of electric cookers in this country has been influenced by foreign or competitive practice. English cookers to-day have an efficiency and reliability second to none in the world, and have fitted themselves for inclusion in the big future for domestic electrical appliances which is pending.

LIGHTING DESIGN.

By A. B. READ, A.R.C.A.

MODERN design has evolved in two distinct ways in England, and this fact is vital to an understanding of its manifestation to-day.

To many, the Paris Exhibition of 1925 was the beginning of a development of modern design in these islands, and with its sudden break away from recognised forms and traditions



A pendant of extreme modern design, by Adnet. It is composed of striplite lamps, with highly polished silver-plated metalwork.

has not only drawn attention to itself, but has created fresh standards and values in design and decoration.

In many cases designers and firms immersed in tradition have realised that, as there seems to be a demand for modern treatments, they must look into the matter, and after a hurried study of illustrations of contemporary Continental work have felt fully capable of offering a satisfactory solution to any inquiry they may have for modern work; in fact they feel that the whole thing is much simpler than designing period interiors and fittings. With no breadth of vision and perspective, they fail to see that the whole spirit of modern design is creation, and not a reshuffling of ideas culled from various sources.

Sound Principles.

Side by side with this superficial movement has grown up a school of design based on sound principles of simplicity, sense and suitability for purpose, quite distinct from the mushroom growth of the imported Continental variety. For years past there have been architects, decorators, furniture makers, printers and craftsmen of all kinds who felt that there could be beauty in sane honest design; not imitative, but creative, and meaning for them, not a fashionable pursuit, but a faith and standard of life.

These two movements must be fully realised if we are to cultivate a standard of criticism of design to-day, especially in matters of illumination, as the design of lighting fittings has changed more than anything else in the last few years.

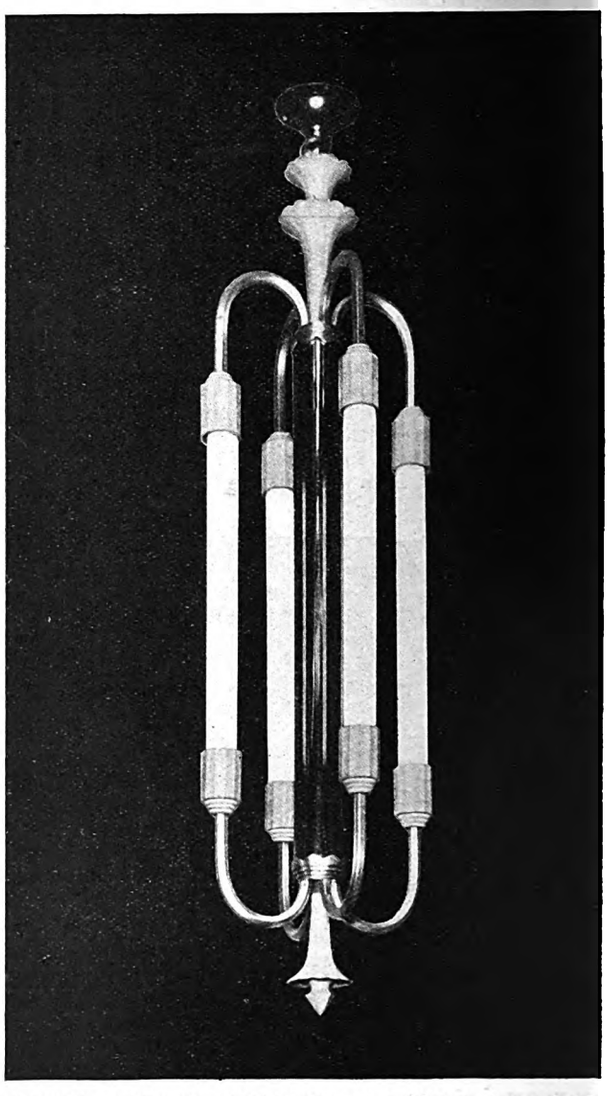
We must learn to differentiate between the work of sincere designers who are thoroughly conversant with modern tendencies on the Continent and elsewhere, and believe in what they are doing, and the other designers who regard the modern movement as merely a passing craze, and whose work fully expresses their incompetence and insincerity.

No Passing Craze.

That this reaction against reproductive forms is a passing craze is a fallacy, for we are only yet on the fringe of a world-wide change in outlook that will eventually convince us of the beauty of truth and sincerity in design for any purpose.

It would be stupid to suppose that modern design, as exemplified in lighting fittings illustrated in this article, will remain as it is, and that the last word has been said. Changes are normal and healthy, but we can assure ourselves that whatever setbacks this modern movement may have, it must go forward; it cannot go back.

Lighting fittings have evolved their own forms and cannot again revert to the shapes and characteristics of other illuminants. It would be just as unlikely that motor cars should



A Troughton and Youngf our-light tubular pendant with black mirror centre tube and with silver-plated metal arms and green bronze caps.

be designed like hansom cabs, or electric liners like eighteenth century frigates.

Whereas three and two years ago lighting fittings took rectangular and angular forms, so the most recent characteristic of design in 1929 is the tubular form. Satisfactory and sincere in design, these tubular forms are a normal develop-

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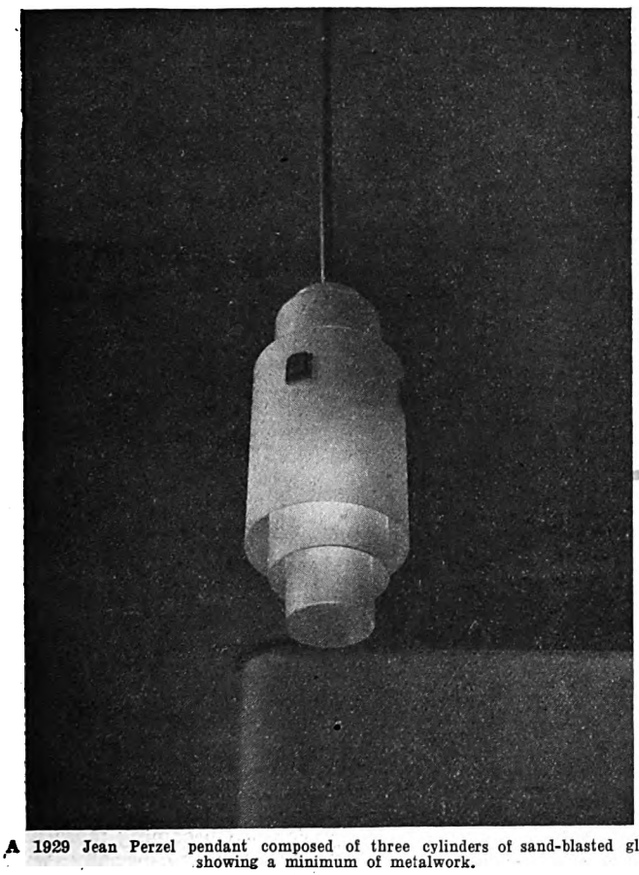
ment of the use of tubular and "striplite" lamps, and there is obvious beauty of line in these designs.

The greatest use has been made of this form of lighting in Germany, where fittings of one tube, long lines of tube and groupings of tubular shapes, have been employed with, in some instances, outstanding success. Double ended "striplite" lamps of large diameter and satined surface are common in Germany, and these, used frankly, without any glass surround, produce a pleasing effect, and can be mounted cheaply.

The charm of these fittings will appeal most to those who have an appreciation for abstract form as distinct from form which is derived from, or resembles, some natural shape. Obviously the person who feels that an electric light fitting should be made to look like a flower could not live with fittings of such a simple and direct design. However, the general public are becoming accustomed to abstraction as exemplified by modern cinematograph practice, stage decoration and



A 1929 Jean Perzel pendant composed of three cylinders of sand-blasted glass showing a minimum of metalwork.

architecture, and are attracted more and more by simple, straightforward design.

Should some new method of producing light be invented, the design of fittings would outwardly express the form of the light source. For example, neon lighting might be introduced as a method of lighting interiors; in fact it has been used abroad for this purpose, and naturally this would entirely change the characteristics of lighting fittings design.

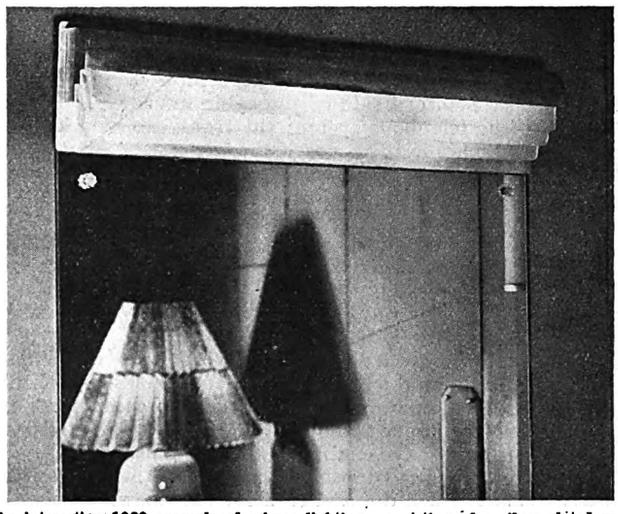
As at the present time "striplite" lamps are obtainable in various wattages, the best possible use should be made of these, and fittings designed embodying them and making their long straight lines of light of decorative value.

The use of light as decoration has scarcely been realised, and surely there is an opportunity for decorators and architects to dispense with a great deal of surface treatment, and decorate rooms and buildings with light.

After all, rooms are not decorated to last for a lifetime, and the money spent on re-decoration might easily be used for effective decorative lighting, which could also be changed at the end of, say, ten years.

Lighting from large surfaces and panels has been used fairly extensively during the year, but generally speaking a good deal of interest is lost by dispensing with a fitting, which is obviously the source of light, and which gives a definite interest to an interior.

Evenness of illumination is not necessarily our object, and indirect lighting and lighting from "laylights" and large surfaces often fails to achieve the charm and intimacy given to a room by pleasantly designed lighting fittings.



An interesting 1929 example of mirror lighting, consisting of a silver-plated metal cover and three suspended flashed opal glasses. By Troughton and Young.

We may be certain that in all decorative schemes of note that may be carried out in 1930, the lighting will play a more and more important part.

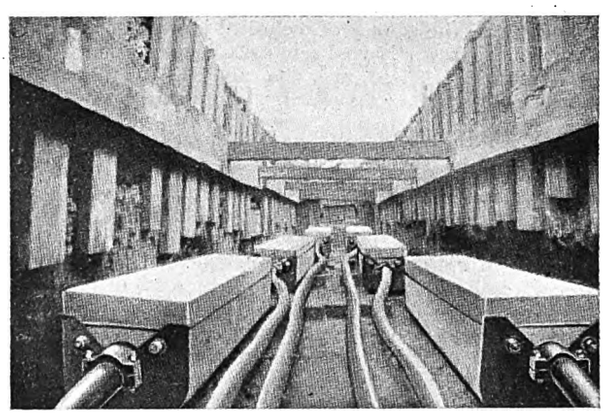
ELECTRIC CABLES.

By LLEWELYN B. ATKINSON, M.I.E.E.

THE Editor of THE ELECTRICIAN has asked me to write a few words as to the progress of the electric cable industry in 1929, and the outlook for the future. There has been in 1929 no special feature calling for comment, either technically or commercially. The growth of electrical distribution is continuing at about the normal rate of the last few years, that is, about 15% per annum, and as this means a larger addition each year, so the total output of distributing networks and of installations increases.

This year a good deal of the work has been concentrated on the Central Board's overhead line programme. The position dealing with the connecting lines between generating stations has not, so far, led to any great effect in new regional output, with its accompanying cabling and internal wiring requirements. These may be expected to follow.

The use of cables for 33 000 V and over is extending, and the Central Board is laying about eight miles of oil pressure fed cables at 132 000 V in connection with the London supply. This is stated to be experimental. The original idea of this (Emanueli) cable which was to have a complete circulation of oil, has been modified to the point of keeping the space inside the lead sheath and the dielectric filled with oil during the



Joint bay, showing six joints constructed on 66 000 V oil-filled cables.

expansions due to heat, and subsequent contraction during cooling.

In smaller cables and wires for house-wiring, the tendency to the use of special wiring systems has continued. These systems in effect mean that a good deal of what used to be work done by the wireman on the job is being done in the factory, with an advantage in the cost of installation. Unfortunately a great deal of low grade wire in small sizes is being

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used, and large quantities of thinly insulated flexible cord nominally intended for wireless apparatus, is, either in ignorance or culpable dishonesty, being used for lamps and portable apparatus. Neither the supply authorities nor the fire insurance companies seem capable of handling the situation. Presently will come a crop of accidents, and then the authorities named will be surprised at Government " interference."

The least satisfactory side of the cable industry is in the extension of the telephone system, the trunk cable work being almost at a standstill. The Post Office cannot be blamed for not laying trunk lines when those in existence are not fully loaded, but this raises the whole question of whether a department of a Government Department is the most suitable form for an organisation which has a service to sell. In the opinion of many, both inside and outside of the electrical industry, a more up-to-date form of organisation is necessary. The scope for expansion to bring the telephone usage up to the level of other countries is remarkable.

Export cable trade has held up well. The companies interested in cable production have, on the whole, done fairly well. Profits are lower on the turnover, for competition is very keen, but the larger turnover and improvements in some productive methods have enabled this to be met.

The prospects for 1930 depend naturally very much on what industry generally will do, and that has a somewhat obscure outlook. But apart from psychological factors, which count for much, the world is gradually recovering from the war and the uncertainties of ten years' peace, a good deal of rubbish has been cleared away, and we may look forward with confidence to 1930.

TECHNICAL ADVERTISING.

By J. S. SIMMONS.

A CAREFUL study of technical journal advertising for the year which is just ending leads one to the definite conclusion that, generally, technical advertising in Great Britain is better than it has ever been, both from a theoretical and practical advertising viewpoint.

To carry this survey back further, say, for the last ten years, one is forced to the conclusion that no specific advertising has made greater advances than electrical technical advertising.

But there is, as there always will be, much room for improvement. There are advertisements appearing which are fundamentally bad, possess no psychological human interest, and can achieve no success. Unless the value of the space is apportioned to the cost per square inch, the full value of black and white—of the space which the illustration takes, of the space the text matter occupies, of the white space itself left unfilled—will not be realised.

At present there has not been any introduction into technical advertising of the Americanised freak copy which has found its way into " periodical " advertising in this country. This " freak " copy will not last. In America, I believe, they have already seen the futility of it, and are turning back to the more solid advertising; the few who have adopted it in this country will follow suit.

To return to the gallery of technical journal advertising, let us see what classes have been conspicuous during the last twelve months. These may be divided roughly into the following :—Pictorial; goodwill; humorous; testimonial; instructional; educational; propagandist. Each of these has its own particular part to play, and each type in its place is supreme. Yet who shall say which is most effective? Experience must be our guide.

Perhaps the most " popular " form of advertisement has been the pictorial. Yet it is to this particular class that constructive criticism can be most easily levelled. Many advertisements which have appeared are reproductions of photographs or drawings. Such an advertisement loses much of its effectiveness when the photograph has been the work of a quasi-amateur, or the artist has been stinted in the time he has been allowed to spend on his picture. An artist is human, and if he is given a job to do at a definite cost he will cut his cloth to suit; but know your man and give him *carte blanche*, and it will pay in the added power brought to the advertisement.

Oil for the Machinery.

Goodwill advertisements come second, and the only criticism is that sometimes these are reproduced without any definite linking up with the main campaign. Goodwill advertising is but the oil for the advertising machinery—the gears and bearings being the instructional, educational and propagandist advertisements which " put over " the selling talk.

One or two highly successful humorous advertisements have been seen in the technical press. This type is so rare that when such does appear it attracts a good deal of attention—but a funny " ad " must be cleverly funny; its humour must not be heavy or bilious, but just palatable so that it is digested and enjoyed. Humorous advertising is, without doubt, the most difficult type to undertake, yet one of the most successful, and has more endurance than many other forms.

Testimonial advertising has been to the fore a good deal, but, here again, unless there is constant alteration of " copy " one is apt to look on the repetition with a quizzical regard. A reproduction of the actual testimonial should be used in the advertisement, otherwise a " fake " may be suggested.

Finally, we come to the instructional, educational and propa-

An example of humorous technical advertising in 1929.

gandist forms of advertising, which are becoming more and more popular with technical advertisers, especially with electrical technical advertisers. Usually these take the form of series advertisements, either half or full page. Instructional advertising goes all out to impart to the user the way to get the most out of the product advertised, or the best way to handle it.

Educational advertising is something akin to instructional, but differs from it in that the aim is largely in the direction of the general public, more popularly designated " the consumer," who, in the case of technical journals, is the industrial user.

Lastly, there is the propagandist campaign the purpose of which is to further some set policy with a broader and deeper ideal at the back of it. For example, there is the recent campaign advocating looking to the future by the adoption of the 60 ampere service, installation, which has received such support that it has even been taken up in the editorial columns of certain electrical journals.

So much for a review of the receding year's efforts. What of the future? I believe that the technical advertising profession is getting into its ranks men who are able to raise the status of specialised advertising still higher. I believe that co-operation and collaboration between the advertiser and the journals will raise the status of the journals themselves. Already we see signs of progress in certain directions. The adoption of " colour advertisements," the willingness of the press to consider the suggestion made by the I.S.B.A. for the standardisation of page sizes, both show that the press and the advertiser find by working together how much can be achieved by common endeavour.

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SOME PERSONAL NOTES OF 1929.

Movements of Power Station, Tramways and Other Engineers—Manufacturing and Other Personalities—New Year and Birthday Honours Awards.

A NUMBER of interesting movements have taken place among well-known personalities in the electrical industry during the year, and among these may be mentioned the following :—

Power Station Engineers.

Mr. J. N. Waite, chief assistant engineer, Stoke-on-Trent, assumed duties as city electrical engineer at Hull.

Mr. J. W. Fawcett, electrical engineer to Holmfirth U.D.C., resigned to become resident engineer with the South East Yorkshire Power Co. He was succeeded by Mr. H. C. Spence, of the Yorkshire Electric Power Co.

Mr. Ralph Lomax resigned from the position of borough electrical engineer at Stockport.

Mr. S. E. Fedden, general manager and engineer of Sheffield electricity department, was appointed district engineer for the Mid-East England Electricity Scheme under the Central Electricity Board. He was succeeded by Mr. E. Morgan, of Wolverhampton.

Mr. F. Hayes resigned from the position of deputy engineer and station superintendent at Plymouth electricity works in consequence of ill-health.

Mr. S. M. Hill was appointed by Bristol Corporation, station superintendent at the Portishead power station.

Mr. William Beavis, manager of the Newhaven and Seaford Electricity Co.'s works at Newhaven, disappeared during the gales on December 8th. Fragments of the car in which he was travelling were found in such a position as to lead to the conclusion that he was blown into the sea.

Mr. G. Tough, electrical engineer and manager, is shortly retiring from the service of the Coventry Corporation after occupying the position since 1908.

Mr. H. F. G. Woods, borough electrical engineer and manager, Torquay, resigned to take up the general managership of the Exe Valley and East Devon Electricity Supply Companies. He was succeeded by Mr. G. J. Hollyer, borough electrical engineer of Loughborough.

The West Ham Undertaking.

Mr. F. W. Purse resigned his position as chief engineer and manager of the West Ham electricity undertaking to become chief engineer of the London and Home Counties Joint Electricity Authority. He was succeeded by Mr. J. W. J. Townley, chief electrical engineer of the L.C.C. tramways department.

Mr. A. J. Waring, borough electrical engineer, Newark, was appointed borough electrical engineer to Felixstowe B.C. He was succeeded by Mr. R. E. Livesley, chief electrical assistant to Aylesbury Corporation.

Mr. H. McNaul, electrical engineer to Gelligaer U.D.C., resigned to take up a position in the Midlands.

Mr. J. B. Hood, of the South Shields electricity department, was appointed electrical engineer to Richmond Corporation in succession to Mr. W. L. Wickwar, who accepted an appointment at Bingley.

Mr. Wm. Arden Royle was appointed engineer and manager of the Blackburn undertaking in succession to Mr. P. P. Wheelwright.

Mr. W. Holmes resigned his position of electrical engineer to Barking U.D.C. on account of ill-health, and Mr. W. E. Kidner was promoted to fill the vacancy.

Mr. R. A. Chattock, city electrical engineer, Birmingham, is due to retire under the age limit at the end of the year and Mr. F. Forrest, chief assistant electrical engineer, will succeed him. The title of Mr. E. J. Jennings has been changed to secretary and commercial manager, the chief electrical engineer being responsible for the engineering side of the department.

Mr. S. E. Monkhouse was appointed chief assistant to the general manager of the Newcastle-upon-Tyne Electric Supply Co., Ltd., and Mr. H. E. Woodward technical assistant.

Mr. J. H. Parker, borough electrical engineer and transport manager of West Hartlepool, was recommended for appointment as electrical engineer in the L.C.C. tramways department, in succession to Mr. J. W. J. Townley.

Tramway and Transport.

There were also many changes among tramway and transport managers and engineers, past issues of THE ELECTRICIAN showing that :—

Mr. R. L. Horsfield, late manager of Cardiff tramways, took over the management of Leeds tramways and omnibuses department.

Mr. D. E. Bell, manager of St. Helen's Corporation tramways, was appointed to succeed Mr. F. J. Chapple as manager of the Yorkshire (Woollen District) Electric Tramways, Ltd., Mr. Chapple having resigned to take up an appointment at Harrogate.

Mr. W. Forbes, general manager and engineer, Aberdeen tramways, was appointed manager of Cardiff Corporation tramways.

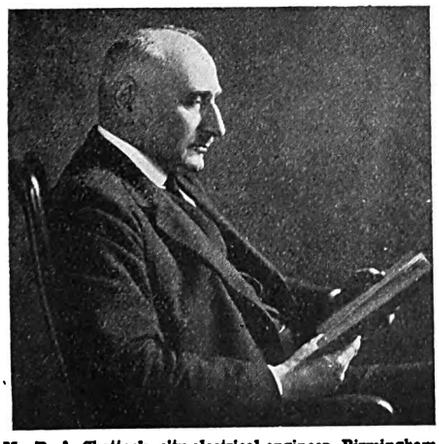
Mr. F. A. Fitzpayne succeeded Mr. R. Stuart Pilcher as transport manager of Edinburgh Corporation tramways, following Mr. Stuart Pilcher's appointment to a similar position at Manchester.

Mr. J. Aldworth retired after 30 years' service as manager of Nottingham Corporation tramways. Mr. G. W. Marks, of Chesterfield, succeeded him.

Mr. Frank Buckley, general manager of Bury tramways department, was appointed to a like position at Norwich.

Mr. R. A. Fearnley became manager of Southend Corporation tramways, resigning the managership of Keighley Corporation tramway department.

Mr. H. P. Stokes, engineer and manager of Plymouth tramways department, resigned in order to join the British United



Mr. R. A. Chattock, city electrical engineer, Birmingham, who is due to retire at the end of the year. Mr. F. Forrest was appointed his successor.

Mr. F. W. Purse resigned his position as chief engineer and manager of the West Ham undertaking to become chief engineer of the London Joint Authority.

Mr. J. H. Parker, who was, during the year, recommended for appointment as chief electrical engineer of the L.C.C. Tramways.

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Automobile Services, Ltd. He was succeeded by Capt. C. Jackson, manager at Oldham.

Mr. H. W. Laing, of Lytham St. Annes tramways department, resigned after 23 years' continuous service as general manager.

In the Manufacturing World.

On the manufacturing side of the industry a number of personal changes were also recorded, as for instance :—

Mr. R. Dumas, works manager at Rugby for the British Thomson-Houston Co., Ltd., retired from that position after 21 years. Mr. R. C. Clinken, chief of the engineering laboratory, also retired, Mr. H. W. Warren succeeding him.

Mr. D. A. S. Porteous was appointed works manager of the Enfield Cable Works, Ltd.

Capt. P. Dunsheath was appointed research and technical manager of the Holborn office of W. T. Henley's Telegraph Works Co., Ltd.

Sir Felix Pole became chairman of Associated Electrical Industries, Ltd.

Mr. W. H. Peak resigned his appointments as managing director of the Marconiphone Co., Ltd., the Sterling Telephone and Electric Co., Ltd., and the Relay Automatic Telephone Co., Ltd. Messrs. B. B. Johnson and Major W. Burningham White were appointed joint managing directors.

Mr. S. R. Mullard relinquished his position as managing director of the Mullard Wireless Service and Radio Valve Companies.

Mr. M. J. Railing became joint managing director of the General Electric Co., Ltd.

Mr. H. Wynne Roberts, sales manager, and Mr. F. Winstanley, manager of the illuminating and domestic appliances departments of the General Electric Co., Ltd., were appointed directors.

Mr. Bernard D. F. Dudley Docker and Sir Edmund Wyldbore-Smith resigned from the Board of Associated Electrical Industries, Ltd.

Mr. T. R. Martin resigned his position as joint managing director of J. H. Tucker and Co., Ltd.

There were many personal items of interest throughout the year, which were neither strictly engineering nor manufacturing, but which nevertheless warrant their remembrance. Among these it will be remembered that :—

Mr. W. J. Jones was appointed manager of the E.L.M.A. Lighting Service Bureau, in succession to Mr. W. E. Bush.

Mr. J. T. Mould was elected chairman of the R.M.A. and Mr. R. B. Weaver vice-chairman.

Dr. C. E. Guillaume was awarded the 1928 Duddell Memorial Medal of the Physical Society.

Mr. W. J. Jones, who succeeded Mr. W. E. Bush as manager of the E.L.M.A. Lighting Service Bureau.

Sir Basil P. Blackett was appointed chairman and the Earl of Clarendon a director of the Imperial Communications Co.

Signor Guido Semenza was awarded the 8th Faraday Medal of the Institution of Electrical Engineers.

Miss B. J. Lanfear resigned the secretaryship of the I.M.E.A. after occupying the position nine years, and Mr. J. W. Simpson, formerly town clerk of Thornaby-on-Tees, succeeded her.

Ald. and Mrs. H. J. Galliers celebrated their silver wedding. Ald. Galliers was, during the year, Mayor of Brighton, and is believed to be the first electrical contractor to become a mayor.

Mr. T. A. Edison attained his 82nd birthday this year.

Mr. Owen Young, chairman of the General Electric Co. of New York, was chairman of the Expert Committee on Reparations which sat in Paris.

Mr. Allen Bertram Field was awarded the first Lamme Medal of the American Institute of Electrical Engineers.

Sir John R. Brooke became an Electricity Commissioner, and on his resigning the position of secretary to the Central Electricity Board, Mr. R. H. Fox was appointed his successor.

Sir James Devonshire resigned from the position of chairman and managing director of the North Metropolitan Electric Power Supply Co., having reached the age limit.

Prof. E. V. Appleton was awarded the Morris Liebmann Memorial Prize for 1929 by the American Institute of Radio Engineers.

Mr. James C. Besly succeeded the late Mr. C. W. Schaefer as electrician-in-chief to the Eastern Telegraph Co., Ltd.

Mr. A. P. M. Fleming was, during the year, appointed hon. secretary for England for the American Institute of Electrical Engineers.

Mr. T. Trimwell resigned from the position of solicitor and secretary of the National Register of Electrical Installation Contractors and was succeeded by Mr. A. Montgomery.

The Kelvin Medal of the Institute of Civil Engineers was awarded to Mr. Andre Blondel.

Mr. E. S. Evans, district engineer of the E.L.M.A. Lighting Service Bureau for the North-East Coast, resigned in order to take up an appointment in South Africa.

Prof. D. W. Richardson was awarded the 1928 Nobel Prize for Physics.

Sir William McLintock, who took a prominent part in the cable and wireless merger, was engaged to advise the Government in the London traffic problem.

Dr. Yasujiro Niwa, chief engineer of the Nippon Electric Co., Ltd., was awarded the Asano Prize of the Institute of Electrical Engineers of Japan.

Dr. W. E. Sumpner, principal and head of the physics department of Birmingham Central Technical College, is retiring at the end of the present year. He has held the position of principal for 35 years.

Mr. F. E. Smith, F.R.S., Director of Scientific Research at the Admiralty, was appointed Secretary to the Committee of the Privy Council for Scientific and Industrial Research on the resignation of Mr. H. T. Tizard, F.R.S.

Messrs. Owen Young, Gerard Swope, Clarke Mirior, Arthur Baldwin and J. Edmonds, were elected directors of the Allgemeine Elektricitäts Gesellschaft, of Berlin.

Sir Austen Chamberlain and Sir Laming Worthington-Evans accepted invitations to join the board of the Greater London and Counties Trust, Ltd., which controls a number of electricity undertakings in the South of England.

Honours List.

The official list of New Year Honours issued on February 28th, the publication having been delayed two months by the illness of the King, contained the following :—KNIGHTS : Prof. J. A. Fleming, F.R.S., Emeritus Professor of Electrical Engineering, University College, London ; Lt.-Col. C. B. Levita, chairman of London County Council ; Col. T. F. Purves, engineer-in-chief, Post Office. ORDER OF ST. MICHAEL AND ST. GEORGE : Mr. M. F. Headlam, chairman, Pacific Cable Board. KNIGHTS BATCHELOR : Mr. G. A. Julius, chairman of the Council for Scientific and Industrial Research, Commonwealth of Australia. ORDER OF THE BRITISH EMPIRE : Sir W. S. McCormick, F.R.S., chairman of the Advisory Council of the Department of Scientific and Industrial Research ; Major J. A. Sadd, Mr. P. A. Theis, assistant secretary, Pacific Cable Board ; Mr. J. A. B. Jones, assistant electrical engineer, Sudan Government Railways and Steamers ; ORDER OF THE INDIAN EMPIRE : Mr. E. E. Gunter, director, Persian Gulf Telegraphs, Indo-European Telegraph Department (retired).

Amongst the Honours conferred by the King on the occasion of his 64th birthday were the following :—KNIGHTS : Mr. William Jarratt, Comptroller-General of the Patent Office : Mr. R. T. Nugent, director of the Federation of British Industries ; Mr. Chandrasekhara Venkata Raman, Professor of Physics, Calcutta University. ORDER OF THE BRITISH EMPIRE : Capt. Richard A. H. Lewin, instructor, School of Electric Lighting, Gosport ; Mr. A. C. Hayes Statham, assistant engineer, Wireless, Indian Imperial Posts and Telegraphs Service. COMPANION OF THE IMPERIAL SERVICE ORDER : Mr. A. L. de Lattre, assistant engineer-in-chief, General Post Office.

Photographs of some of the personalities mentioned in these notes are reproduced on the opposite page. Other personal paragraphs, but dealing with happenings of more recent date, appear on page 834.

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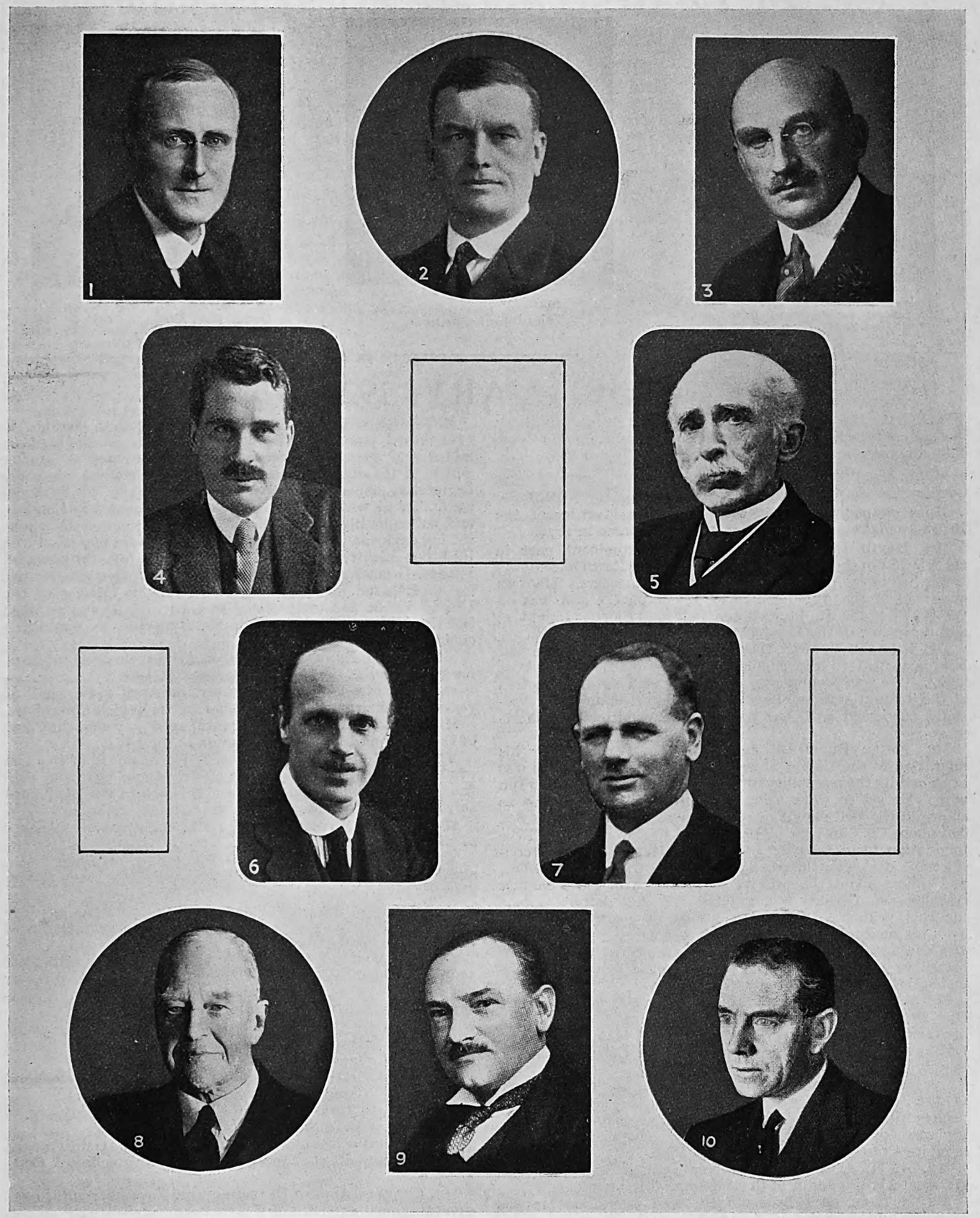

SOME PERSONALITIES OF 1929.

(1) *Mr. E. H. E. Woodward, technical assistant to the general manager, Newcastle-upon-Tyne E.S. Co., Ltd.* (2) *Mr. F. Forrest, who will succeed Mr. R. A. Chattock as city electrical engineer, Birmingham.* (3) *Mr. M. J. Railing, joint managing director of the General Electric Co., Ltd.* (4) *Sir B. P. Blackett, chairman Imperial Communications Co.* (5) *Sir John Ambrose Fleming, whose name appeared in the New Year Honours List.* (6) *Sir John Brooke, who joined the Electricity Commission during the year.* (7) *Mr. S. E. Fedden, district engineer for the Mid-East England Electricity Scheme.* (8) *Mr. T. Trimnell, who relinquished the secretaryship of the National Register of Electrical Installation Contractors.* (9) *Mr. S. E. Monkhouse, chief assistant to the general manager, Newcastle-upon-Tyne E.S. Co.* (10) *Mr. R. H. Fox, secretary to the Central Electricity Board.*

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Signor G. Semenza, past President of the International Electrotechnical Commission, who died on Nov. 7th, aged 61 years.

The late Mr. A. H. Allen, technical editor of the "Electrical Review."

Sir J. M. Gatti, managing director of the Charing Cross Electricity Supply Co., Ltd., and past President E.D.A., who died Sept. 14th.

OBITUARY, 1929.

DURING the year under review the electrical industry suffered the loss of many well-known engineers and others, chief among whom may be mentioned the following :—

MR. F. HARDING, aged 71 years, one time manager of Derby Corporation tramways.

MR. CHARLES BRUSH, aged 80 years, the inventor of the Brush arc light. He completed his first dynamo in 1876.

MR. DAVID FULTON. He played a prominent part in the transfer of the National telephones to the Post Office.

MR. ROBERT HENRY BENSON, aged 79 years. He was chairman of the Anglo-American Telegraph Co. and was on the board of the St. James's and Pall Mall Electric Light Co., and a director of the London Electric Supply Corporation.

DR. RICHARD VERNON HANSFORD, aged 41 years. He had been attached to the engineer-in-chief's office at the Post Office. He was prominently connected with the introduction of the Transatlantic wireless telephony service, and was especially concerned with the design of transmitters for short-wave work.

MR. EMILE BERLINER, aged 78 years. Soon after his migration to the United States from Germany in 1870 he was attracted by the possibility of transmitting speech by telegraph wire. He set to work using for a receiver an apparatus as shown in the Bell patent of 1876. In 1878 he joined the Bell Telephone Co. In 1881 he paid a visit to Europe and laid the foundation for a telephone factory in Hanover. After considerable discussion between Edison, the U.S. Patent Office, and others about the priority of invention of loose contact transmission, Berliner was granted complete letters patent for this principle. Other inventions of electrical interest were his molecularium and secondary battery. Berliner was also the first (1877) to discover that an electric contact connected to a membrane would act as a reproducing telephone instead of a Bell instrument.

Mr. STEPHEN PAGET LUKE, on January 1st, aged 83 years. One time deputy Director-General Indian Telegraphs, a director of the Telegraph Construction and Maintenance Co., Ltd., and for some years chairman of the Calcutta Electric Supply Corporation.

SIR HENRY TRUEMAN WOOD, secretary of the Royal Society of Arts, on January 7th. He had been associated with the Society since 1872, when he became editor of its "Journal." He was appointed secretary in 1879. He was one of the organisers of the Paris Exhibition in 1889.

MR. A. H. ALLEN, on February 13th, in his 57th year. He was technical editor of the "Electrical Review."

MR. F. HILL, on February 13th, aged 54 years. He was manager and engineer of Hammersmith (London) electricity department.

MR. W. R. SPAVEN, on March 1st, for 24 years manager of Portsmouth Corporation tramways.

SIR JOHN DENISON-PENDER, on March 6th, aged 73 years, chairman of the Eastern Telegraph Co., Ltd., and associated companies.

DR. PAUL DVORKOVITZ, on March 16th, aged 72 years. He was the originator of the system of low temperature carbonisation which bears his name.

MR. VALERE A FYNN, on March 20th, aged 58 years. He contributed largely to the development of the single-phase motor and to other inventions relating to motors, among which is the Fynn-Weichal motor. He obtained his early engineering experience with Brown, Boveri and Co., in Switzerland, and with Easton, Anderson and Goolden in London, and subsequently he established offices in London as a consulting engineer. His single-phase motors were manufactured by the Elektricitäts-Gesellschaft Alioth of Switzerland, France, Germany, Italy and Spain, and the General Electric Co. of England. In 1909 he transferred his interest to the United States, and from that year until 1921 he was retained by the Wagner Electric Manufacturing Co. as consulting engineer.

MR. ARTHUR ERNEST ANGOLD, on April 10th, aged 56 years, for 37 years with the General Electric Co., Ltd.

MR. WILLIAM WORBY BEAUMONT, on April 14th, aged 80 years, vice-chairman of the London Electric Vehicle Committee.

MR. G. D. MALCOLM, on April 29th, aged 39 years, chairman of the Meter and Instrument Section of the I.E.E.

MR. C. T. BRISCOE, on July 23rd. He was head of the firm of C. T. Briscoe and Son, Ltd., electrical engineers and contractors, Blackburn, and a former chairman of the Blackburn sub-Branch of the Electrical Contractors' Association.

MR. J. P. THOMPSON, on July 30th, engineer and manager of the Fife Electric Power Co.

MR. KARL AUER RITTER VON WELSBACH, on August 4th, aged 70 years. He invented, among other things, the osmium filament lamp, in 1897.

MR. WILLIAM SHARMAN TOPLIS, on August 25th, aged 52 years. He was largely responsible for the electrification of the Burma oilfields.

SIR JOHN MAURICE ÆMILIUS GATTI, on September 14th, aged 57 years, chairman of the L.C.C. in 1927-28, managing director of the Charing Cross Electricity Supply Co., Ltd., and a past-President of the E.D.A.

MR. WILLIAM BANNISTER, on October 1st, aged 81 years, an original director and 27 years chairman of the Chloride Electrical Storage Co., Ltd.

MR. ALFRED BAKER, on October 25th, for 24 years general manager of Birmingham tramways department.

PROF. G. F. CHARNOCK, on November 7th, professor of engineering at Bradford Technical College.

SIGNOR GUIDO SEMENZA, on November 7th, aged 61 years, past-President of the International Electrotechnical Commission.

MR. CHARLES ALBERT BLASCHECK, on November 26th, aged 55 years, chief engineer of the Canterbury electricity undertaking.

SIR R. A. LISTER, on December 6th, aged 84 years, founder and chairman of R. A. Lister and Co., Ltd.

ADMIRAL OF THE FLEET SIR HENRY JACKSON, on December 14th, aged 74 years. In 1895 Sir Henry began experiments and trials under sea-going conditions, inclusive of the use of balloons and kites, with the view of utilising the effect of Hertzian oscillations for naval signalling purposes. In 1901 the Royal Society elected him into its fellowship. From 1901 to 1929 he was chairman of the Radio Research Board.

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POWER STATION DEVELOPMENT IN 1929.

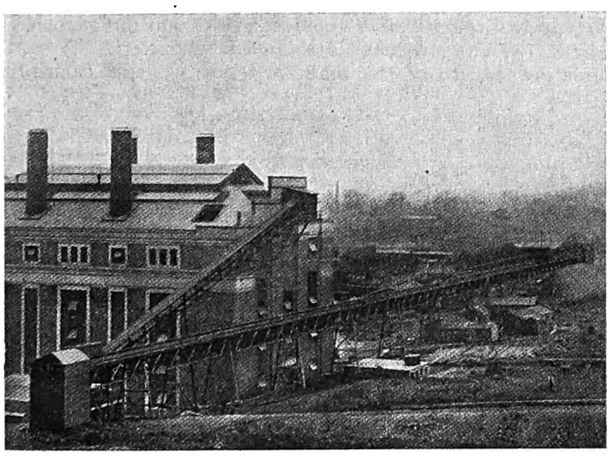
Opening of "Selected" Stations in Central and North-West England and North Wales Electricity Schemes—Extensions at Torquay, Stoke-on-Trent and Portishead.

POWER station activities in the year under review included, in order of retrospection, the opening of the first section of the Birmingham Corporation's new station at Hams Hall, which, included in the Central England Electricity Scheme as a selected station, has a present installed capacity of 60 000 kW. Under the provisions of the Central England scheme an addition of 30 000 kW will be made by the winter of 1933–34, while further additions aggregating 150 000 kW will be made by 1940–41.

The principal plant at present installed includes two main turbines and two house turbines. The main machines have a continuous rating of 30 000 kW and run at 1 500 r.p.m., while the house turbines have a maximum rating of 1 875 kW at 3 000 r.p.m., and drive their respective generators through speed reduction gears. In all cases steam is supplied at 350 lb. and 700 deg., and the turbines are designed for 1 lb. per sq. in. absolute pressure at the exhaust. The main turbines are of the single casing type fitted with impulse blading throughout. The steam expands in a velocity stage with two rows of moving blades, which are followed by three drums, of small to medium diameters, carrying 30 rows of blading. Both the moving and stationary blades in the high-pressure and intermediate pressure portions are completely machined, whereas in the low-pressure portion the moving blades are machined all over and the stationary blades cast into the diaphragms. The two main alternators are capable of a continuous output of 37 500 kVA at 0·8 power factor. The machines generate at 11 000 V three-phase 25 cycles and run at 1 500 r.p.m.

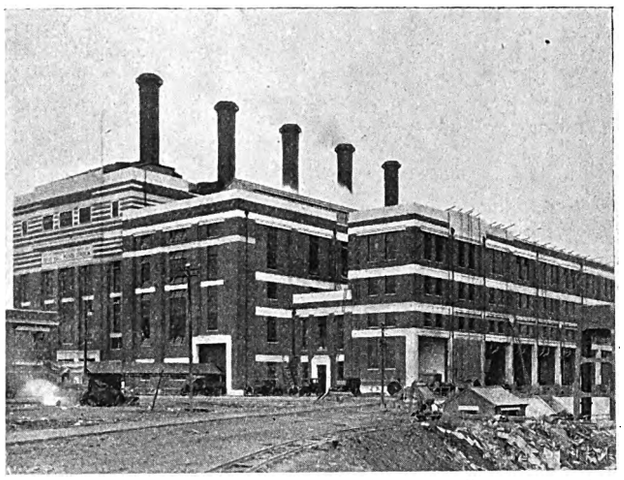
Driven direct from the end of an alternator rotor are an exciter and auxiliary generator, and though these machines are electrically separate they are mounted in a common shell. Excitation is at 220 V, while the auxiliary machine is of sufficient capacity to supply one main circulating water pump and one main extraction pump at 440 V.

There are two circulating pumps and two extraction pumps per set, one of which is normally supplied from the auxiliary generator, and the other from the d.c. board, so that two separate and distinct electrical systems have to fail simultaneously before the set is shut down due to absence of power from the condenser auxiliaries. The d.c. switchboard can, moreover, be supplied from three separate sources, namely, by two 1 875 kW, 460 V d.c. generators, two 500 kW generators direct coupled to 750 H.P. motors supplied from 11 000 V busbars, and by a 440 V, 2 000 Ah battery.



The conveyor plant at the Portishead station belonging to the Bristol Corporation.

The switchgear section includes a large 11 000 V stonework cubicle switchboard, electrically remote controlled, a d.c. flat back switchboard which is also electrically controlled, together with the control boards. In addition there are several electrically operated auxiliary switchboards, a low-tension a.c. board of the metal clad type controlling the house supply from two 1 750 kVA transformers, and a 33 000 V isolating link cubicle board on the e.h.t. side of the main transformers. The whole of this switchgear is contained in the switch house, on the top two floors of which are installed the 11 000 V stonework cubicle board and the control board, the former occupying the greater portion of the two floors, while on the two lower floors are situated the d.c. and a.c. boards, auxiliary panels, and the 33 000 V isolating link cubicles. The 11 000 V cubicle board is divided into 21 main panels, control being provided for the two 37 500 kVA turbo-alternators, six trunk feeders supplying power direct to various sub-stations, two 500 kW motor generator sets and two 1 750 kVA works supply transformers. There are also several cubicles containing busbar couplers, section switches and such necessary gear. Main and transfer busbars are each provided with their own sets of isolating links, etc. The equipment of the cubicles—which is practically the same for all the circuits controlled, with the exception that each alternator is supplied with a potential transformer and two oil circuit breakers, one for connecting to the main busbars and the other for the transfer bars—consists of an oil circuit breaker, isolating links and instrument transformers. For all the circuits controlled the breakers have a rupturing capacity of 750 000 kVA.



Hams Hall, which was opened during November, is a "selected" Central England station.

The control room contains the necessary controls, the a.c. board, controlling the alternator cubicles, six trunk feeder cubicles, bus section switch, bus coupler, works supply cubicles, and two motor generator cubicles.

Each alternator control panel is equipped with two two-way control switches for operating the oil circuit breakers, red and green signal lamps indicating the position of the breakers. A further control switch operates a single-phase oil circuit breaker installed in the neutral earthing circuit of each alternator. Each feeder control panel possesses an oil switch controller, ammeter, single pole leakage relay and a triple pole inverse time overload relay. The d.c. board is equipped with panels controlling the two auxiliary generators, the d.c. sides of the two 500 kW motor generator sets, battery and booster, trip circuit master control, works lighting and power, and the two house turbo-generators. Several blank panels are left unequipped for future extensions. The positive and negative boards controlling the same circuit are separated from each other so that the board is split into positive and negative sections. Most of these panels are equipped with a new type of d.c. circuit breaker known as the line contact circuit breaker, which is said to give a greatly improved form of laminated contact. The laminations are in the form of standard vee-edged blades, bedding into corresponding grooves formed in the contact block. By using any number of these blades any capacity of circuit breaker may be constructed up to 20 000 A without overheating.

In the basement of the switch house are located the main 12 000 kVA feeder transformers, together with three 1 750 kVA works supply transformers, one of which functions as a spare. Each of these latter transformers is supplied with three-phase 25 cycle current at 11 000 V, stepping down to 440 V. The cables from the secondaries of the two tranformers in use are taken to two incoming units of the low-tension metal-clad switchboard situated on the same floor. This switchboard, which supplies power to the various boiler

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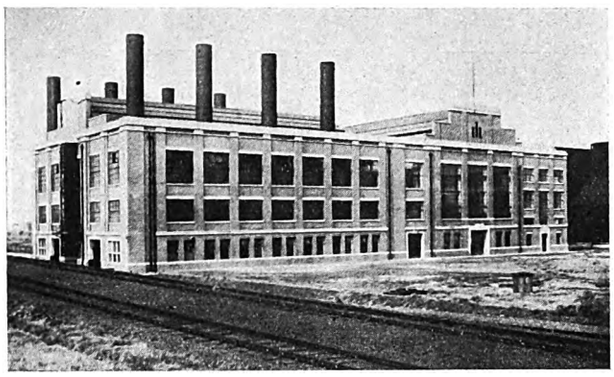
house drives, comprises 12 units, two incoming and ten outgoing, each unit being equipped with an oil circuit breaker of 150 000 kVA rupturing capacity. The 33 000 V isolating link cubicles are also housed in the basement, together with the liquid earthing resistances for earthing the neutral points of the two main turbo sets, and the six main feeder transformers. Each of the latter is situated in a separate room, the six rooms running the length of the switchhouse. With



The Slacks Valley power station which will form a unit in the North-West England and North Wales Electricity Scheme.

each transformer is associated one of the 33 000 V isolating link cubicle switchboards previously mentioned, and the appropriate earthing switch.

Another interesting development in power station progress during the year was at Portishead where the Bristol Corporation brought into operation two 20 550 kW turbines, each direct coupled to a 25 000 kVA alternator. The main turbines are designed to operate with steam at a pressure of 300 lb. per sq. in. gauge, and superheated to a total temperature of 727 deg. F. The high-pressure cylinder, which contains twenty expansion stages, is of cast steel, symmetrical in design, while the diaphragms are built up of mild steel with machined nozzles. The low-pressure cylinder is of the divided flow type. The steam, after expanding through two stages, is divided, one half being diverted to the second half of the cylinder, from which it proceeds through three expansion stages to the condenser, while the remainder of the steam is expanded through one ordinary and one multi-exhaust stage to the common exhaust. The high- and low-pressure turbine shafts are connected by means of a "Bibby" type flexible coupling, while the low-pressure turbine shaft is coupled to the alternator shaft by means of a semi-flexible coupling. In the latter type the degree of flexibility desired is obtained by means of a steel shell of corrugated section bolted between the ends of the respective shafts. To each turbine is direct connected an alternator of 25 000 kVA capacity, 11 000 V, three-phase, 0·8 p.f., 50 cycles, with a house service alternator of 600 kVA, 550 V, 0·9 p.f. on the same shaft, together with a house service exciter. The excitation of each main alternator is provided by two motor-generator sets, each capable of supplying the whole of the excitation current. Each set is supplied from a separate source. The stator winding of the main alternator is of the basket or involute type, the coils being former wound and placed in open slots. Each generating unit is connected to the 11 000 V terminals of a 25 000 kVA bank of transformers, stepping up to 33 000 V. The transformer equipment comprises six 8 333 kVA single-phase units and one spare. All switching and synchronising is arranged on the 33 000 V side. The main e.h.t. switchgear is of the metal-clad, compound-filled, draw-out type incorporating full interlocking features, the oil circuit breakers having a rupturing capacity of 750 000 kVA. The main busbar system as an initial installation consists of two sections with provision for extending up to six or eight sections. Each section of busbars will be interconnected by means of a synchronising busbar through suitable reactors, the whole forming a star reactance scheme. The two bus sections each control the output of one 20 000 kW alternator. The third section now under construction will control a 50 000 kW set.

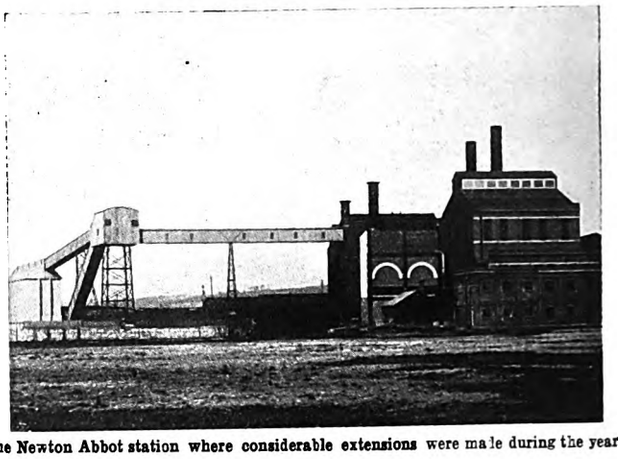
E.H.T. Switchgear.

The e.h.t. switchgear is of the remote electrically operated type. All auxiliaries essential to the running of the station have been duplicated, and at least two entirely separate sources of supply are available for each motor. Auxiliary switchgear principally consists of one 20-panel 550 V main switchboard and two 10-panel 550 V "unit" switchboards. The former is the distribution board for station auxiliaries not intimately associated with the turbine and is supplied through two 800 kVA. three-phase, 33 000/550 V transformers, and, in addition, by an emergency house service set of 550 kW capacity. The 10-panel "unit" boards each control the turbine auxiliaries, each board being fitted with double busbars, one set of bars being supplied from the 550 kW auxiliary alternator on the main alternator shaft, the other set of bars being supplied by a feeder from the main distribution board. The oil circuit breakers have a rupturing capacity of 35 000 kVA.

Slacks Valley.

A new station put into operation by Oldham Corporation as part of the North-West England and North Wales Electricity Scheme is that at Slacks Valley, the present generating plant of which is 37 500 kW; the whole site, however, is capable of ultimate extension to accommodate a total of 150 000 kW of plant.

The turbine house has an initial installation of three turbo-alternator sets, each running at 3 000 r.p.m., and each capable of giving a normal output of 12 500 kW at 6 600 V. The normal conditions for which the turbines are designed are 250 lb. steam pressure at stop valve; 650 deg. F., total temperature of steam at stop valve; and 28·2 in. vacuum. Each turbine is of the two-cylinder type, designed so that only steel is exposed to high-temperature steam. Four comparatively small diameter pipes provide a flexible connection from the steam chest to the turbine cylinder, and pipes with corrugations are arranged on each side of the machines, to give flexible connections between the two cylinders. The low-pressure cylinder is made of cast iron and incorporates a number of rateau impulse stages and "Baumann" multi-exhaust. The alternators are each capable of a continuous normal full load output of 12 500 kW at 0·8 power factor. The exciter is direct coupled to its alternator and is of the overhung type. The switch and control rooms are arranged so that the operator in the control has a complete view of the turbine house, which obviates the necessity of installing signalling apparatus. The switch room is equipped with 6 600 V duplicate busbar electrically operated draw-out metal-clad switchgear controlling the three 12 500 kW turbo-generators and six group feeders, so interlocked that it can be correctly handled with perfect safety. The main units have two distinct triple-pole oil circuit breakers (having a rupturing capacity of 1 500 000 kVA), one for each set of busbars. These switches are motor operated. A rather interesting feature of the main switchgear is that each phase



The Newton Abbot station where considerable extensions were made during the year

has a complete non-magnetic earthed metal enclosure throughout, so that should any faults develop they will be earth faults only, the fault current being limited by the neutral earthing resistance. The smaller units controlling the outgoing feeders have two triple-pole oil circuit breakers (rupturing capacity 750 000 kVA) in the one tank, which allow the feeders to be put on either set of busbars as desired. These switches are solenoid operated. The generators are fitted with the self-balanced type of protective gear, which is so interlocked with the field suppression pillar that the latter equipment only functions when the breaker opens under an internal fault condition. Stand-by definite time limit overload protection is also provided. Over the feeder panel board is fixed an automatic indicating line diagram. The supply of energy

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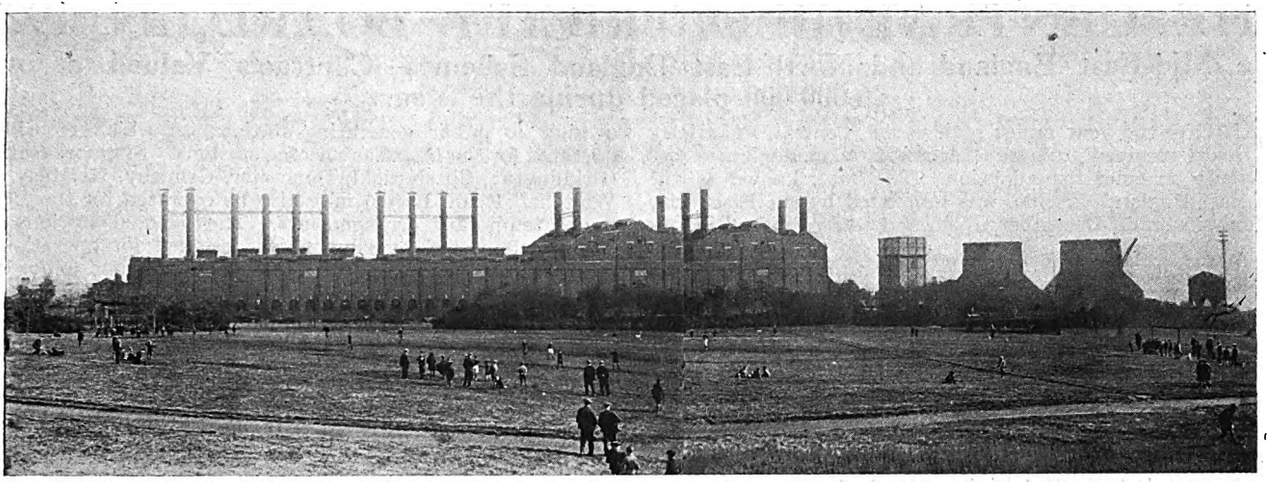

The station belonging to the Stoke-on-Trent Corporation was also extended during 1929. This station, like Hams Hall, is one of the "selected" stations of the Central England Electricity Scheme.

for auxiliary power and for lighting is obtained from three 1 000 kVA 6 600/400 V transformers. These transformers are connected to a low tension ironclad switchboard arranged on the switch room side of the turbine house at floor level. The supply to the boiler house switchboard is also controlled from this point. An 800 Ah battery is provided to operate the switchgear and to provide stand-by lighting when required.

Extensions made during the year also include the starting up of a 7 500 kW turbo-alternator with surface condensing plant at the Newton Abbot station of the Torquay Corporation, making the total maximum continuous rating of the station 18 000 kW. The new machine has a power factor of 90 per cent., runs at 3 000 r.p.m. and delivers 11 000 V at 50 cycles. For the purpose of withstanding accidental short-circuit, the alternator has been designed to have an inherent protective reactance of 15 per cent. The inherent regulation of the machine at 90 per cent. power factor is 35 per cent. and the unit power factor 24 per cent.; the voltage is maintained constant within 1·0 per cent. plus or minus by means of an automatic voltage regulator of the "Tirrill" type. The turbine is of the "Curtis" impulse type and the alternator closed circuit air cooled. An exciter of the shunt connected commutating pole type is directly coupled to the end of the alternator shaft by means of a flexible disc coupling.

The e.h.t. switchgear is of the cellular type, duplicate busbars are provided and the oil circuit breakers, which are fitted with welded boiler plate tanks for each phase, are electrically operated from a vertical type control board installed in the control room gallery. The generator equipments include circulating current protective gear, together with definite time limit overload relays, also automatic field suppression switches. The d.c. switchboard is of the vertical flat back type and is arranged to control the d.c. side of the rotary convertors, the town supply and various auxiliary circuits of the station.

Extensions were also made at the central station of the Stoke-on-Trent Corporation, this unit being another of the selected stations in the Central England Electricity Scheme. The extensions comprised a 12 500 kW turbo-alternator, boilers, pumps and auxiliaries. The turbine is a single cylinder machine of the impulse type designed to operate at 3 000 r.p.m. with steam at 250 lb. per sq. in. gauge pressure, superheated to a total temperature of 650 deg. F. No cast iron parts are exposed to high-temperature steam, the high-pressure end of the cylinder and the valve chest being of steel throughout. The steam inlet is controlled by automatic valves controlled by oil pressure from an automatic governor. The governor valve is provided with motor-driven mechanism by which the turbine can be regulated from the switchboard.

The alternator is designed for a load of 12 500 kW at 0·8 power factor, three phase, 50 to 51½ periods, at 6 600 V. The stator windings are protected by the "Merz-Price" balanced current system, and in the event of any fault on the machine windings the Merz-Price relay will open the main 6 600 V switch and also an automatic field switch mounted against the exciter. The e.h.t. main switchgear has been extended by the addition of six metal-clad circuit breaker units with remote control, one of the new units connecting the output of the new turbo-alternator to the busbars, one serving as a busbar coupling switch, one controlling the high-tension supply to a transformer for the station auxiliaries, and three control the supply to outgoing feeders. The circuit breakers are of the totally enclosed metal-clad double busbar type, with oil immersed isolator switches and provided with interlocks. The busbar coupling switch has a continuous rating of 1 800 A, the alternator switch a capacity of 1 500 A and the transformer and feeder units 300 A each. Each switch has a rupturing capacity of 350 000 kVA. A further addition to the equipment is an earthing cubicle fitted with an electrically operated oil circuit breaker by means of which the neutral point of the alternator is connected to earth through a resistance. The circuit breaker is operated from the control board, which also carries a drop type relay with flag indicator and lamp, which signals if any earth fault current flows in any part of the e.h.t. system. The station service transformer is an 800 kVA three-phase unit taking 6 600 V and giving a supply at 415 V for operating the auxiliary motors of the new equipment. The l.t. switchgear has been extended by the addition of a busbar sectionalising panel and one transformer panel, both with a rating of 1 500 A and a breaking capacity of 100 000 kVA. Four 400 A feeder panels with a breaking capacity of 25 000 kVA have also been installed to control the supply to cables feeding power distribution boards in various parts of the power house.

SWITCHGEAR EQUIPMENT.

B.E.S.A. Specification for Three-Phase A.C. Circuit Gear.

PUBLICATION No. 195–1929, dealing with switchgear equipments for three-phase a.c. circuits, which has just been issued by the British Engineering Standards Association, is a companion specification to No. 194, published in 1926, which dealt with switchgear equipment for d.c. circuits. These schedules for three-phase a.c. circuits have been drawn up with a view to specifying the least amount of apparatus which will control the machine or circuit, and yet avoid fire hazards, discontinuity of supply and danger to the operator. In many cases, according to the nature of the service, size of plant, and other circumstances, additional apparatus will be required or desired, and to this end the appropriate additions to the various equipments are separately scheduled as "Optional extra Equipment" from which a selection should be made after consideration of the requirements of the individual case. The necessary apparatus for earthing the neutral point of a three-phase system, either solidly or through a resister, is scheduled, and certain requirements are laid down regarding the accessibility of switchboards for cleaning and examination. As in the case of B.S. Specification 194, the schedules are accompanied by a series of diagrams illustrating each type of circuit for which standard equipment is specified. Incidentally, these diagrams afford an excellent illustration of the manner in which the British Standard symbols for electrical purposes may be employed on schematic diagrams.

Copies of the Specification, No. 195–1929, may be obtained from the Publications Dept., British Engineering Standards Association, 28, Victoria Street, London, S.W.1: Price 2s. 2d. post free.

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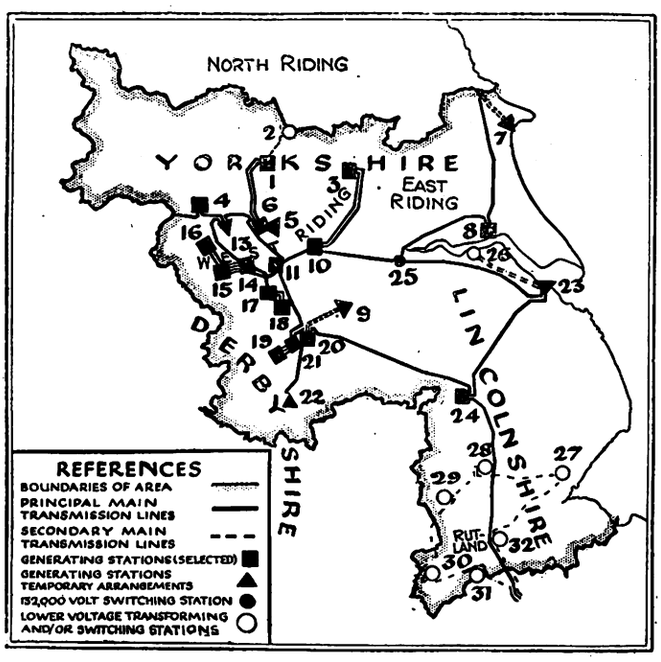
THE CENTRAL ELECTRICITY BOARD IN 1929.

The Mid-East England and North-East England Schemes—Contracts Valued at over £6 000 000 placed during the Year.

DURING the year under review the Central Electricity Board received from the Electricity Commissioners two electricity schemes for adoption. The first, known as the Mid-East England Scheme, was submitted by the Electricity Commissioners in December, 1928, and was published by the Board in its adopted form in March of this year. The scheme is now being carried into effect and covers about 7 545 square miles, including the East and West and part of the North Ridings of Yorkshire, the counties of Lincoln and Rutland and part of the counties of Nottingham and Derby. The area had a population at the last census of approximately 4 666 500. The scheme embraces the area of 73 authorised undertakings owning 40 public generating stations, of which 16 will be operated for the Board as selected stations. Six more stations (Bridlington, Chesterfield, Doncaster, Grimsby, Keighley and Whitehall Road, Leeds) may also be operated for the Board under temporary arrangements. The selected stations will be interconnected by ring mains designed for operation at 132 000 V, and capable of transmitting not less than 50 000 kW. Secondary main transmission lines will also be erected, operating at 33 000 V.



Illustrating the Mid-East England Electricity Scheme as adopted by the Central Board in the current year, the "selected" stations being :—(1) Harrogate, (3) Foss Islands, (6) Kirkstall, (8) Hull, (10) Ferrybridge, (11) Wakefield, (13) Valley Road, (14) Thornhill, (15) Huddersfield, (16) Halifax, (17) Barugh, (18) Barnsley, (19) Blackburn Meadows, (20) Prince of Wales, (21) Neepsend, and (24) Lincoln. The "temporary arrangements," switching and transformer stations, main and secondary transmission lines are indicated, the numbers representing :—(2) Boroughbridge, (4) Keighley, (5) Leeds, (7) Bridlington, (9) Doncaster, (22) Chesterfield, (23) Grimsby, (25) Readness, (26) Barton-upon-Humber, (27) Boston, (28) Sleaford, (29) Grantham, (30) Oakham, (31) Peterborough, (32) Stamford.

The second scheme, to be known as the North-East England Electricity Scheme, was transmitted by the Electricity Commissioners to the Board in June, 1928, and at the time of going to press was still under consideration. The scheme deals with about 5 050 square miles covering Northumberland, Durham and a part of the North Riding of Yorkshire, The area had a population at the last census of approximately 2 674 800 and embraces coal-mining, shipbuilding, iron and steel, engineering and the chemical trades. It also covers wide tracts of agricultural territory which, with a few isolated exceptions, are at present unprovided with any system of supply. At present there are 32 authorised undertakers in the area, owning between them 15 public generating stations. The consumption in 1927-28 was about 247 kWh per head of population and it is estimated that this will increase to an average of 410 in 1935-36. Under the proposals, six existing stations will be selected and operated for the Board, namely, Carville (A), Carville (B), Dunston, North Tees, Darlington and Sunderland. It is not anticipated that any new stations will be required, but the scheme provides for five further stations to be worked under temporary arrangements for a few years. There are several waste-heat and private generating stations connected up to the system of undertakers in the area, and it is assumed that these undertakers will continue the arrangements already entered into with the owners of these sources of supply. Broadly speaking, four of the selected stations, namely Carville (A) and (B), Dunston and North Tees, will supply the base load, while the remainder will be used for meeting the peak load in the area. The stations will be interconnected by high pressure main transmission lines designed in a series of ring mains. These are not necessarily completed in the present scheme, but the primary transmission system has been laid out so as to permit of later amplification under schemes for adjoining areas. The main transmission system will comprise 102 route miles of line and five transforming stations.

During the year the Central Board placed a number of contracts in connection with schemes already in hand and among these may be mentioned those given below, representing in cash value no less than £6 044 836.

SOME CONTRACTS PLACED BY THE CENTRAL BOARD DURING 1929.

Material.	Name of Firm.	Scheme.	Value.
132 kV transformers	Ferranti, Ltd. Fuller Electrical & Manufacturing Co., Ltd.	S.E. England	£400 000
Filter plant	Stream-line and Filter Co., Ltd.	Central Scotland	£20 000
66 kV cables	British Insulated Cables, Ltd. Callenders Cable and Construction Co., Ltd. Pirelli General Cable Works Co., Ltd.	S.E. England	£3 250 000
66 kV switchgear	British Thomson-Houston Co., Ltd.	S.E. England	
132 kV cables	Balfour Beatty and Co., Ltd.	Central England	
132 kV switchgear	General Electric Co., Ltd.		
132 kV cables	Foundation Co., Ltd.	N.W. England and N. Wales	
66 kV transformers	Hackbridge Electric Construction Co., Ltd. British Electric Transformer Co., Ltd.	S.E. England	£1 500 000
132 kV transformers	British Thomson-Houston Co., Ltd. British Electric Transformer Co., Ltd.	Central England	
132 kV transformers	British Electric Transformer Co., Ltd. British Thomson-Houston Co., Ltd. Ferranti, Ltd.	N.W. England and N. Wales	
132 kV switchgear	Ferguson Pailin, Ltd. Metropolitan Vickers Electrical Co., Ltd.	N.W. England and N. Wales	
Secondary lines	Watshams, Ltd. Siemens Bros. and Co., Ltd. John Collier and Co., Ltd.	S.E. England & Central England N.W. England and N. Wales	£300 000
Secondary transformers 33 kV switchgear 132 kV transformers	English Electric Co., Ltd.	N.W. England and N. Wales N.W. England and N. Wales Central Scotland	£80 000
33 kV cables	British Insulated Cables, Ltd.	S.E. England	£494 836
33 kV switchgear	A. Reyrolle and Co., Ltd.		
132 kV cables	General Electric Co., Ltd.	Mid-East England	
Steel structural work	Tees Bridge and Engineering Co., Ltd.	Mid-East England	

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SOME OUTSTANDING CONTRACTS PLACED DURING THE YEAR.

A Selection from the Many Large Contracts which were Placed with British Firms During the Year, for Works Both at Home and Abroad.

WE give below a selection from the large number of contracts which were successfully tendered for during the year by firms in this country, many of which were secured in the face of strong foreign competition. These contracts are only a selected few of the many secured, and are also exclusive of those placed by the Central Electricity Board, but, notwithstanding these facts, they represent well over £3 000 000 in cash value.

Cable, etc.

AUCKLAND POWER BOARD: Johnson and Phillips, Ltd., about 13 miles of 22 000 V, 0·25, three-core underground transmission line.

SOUTHERN RAILWAY: Johnson and Phillips, Ltd., h.t. cable for Dartford-Gravesend and Twickenham-Windsor sections.

ANGLO-BELGIAN TELEPHONE CABLE: Siemens Bros. and Co., Ltd., 7-quad cable from Canterbury and Dumpton Gap to La Panne.

EGYPTIAN GOVERNMENT: Pirelli-General Cable Works, Ltd., trunk telephone line between Alexandria and Cairo, £193 000.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Standard Telephones and Cables, Ltd., supply of l.t. cable required for extension work, services, etc., and main e.h.t. lines.

Steam Raising Plant.

LONDON POWER CO., LTD.: Babcock and Wilcox, Ltd., six water-tube boilers, each evaporating 250 000 lb. of water per hour (normal rating), economisers, superheaters, etc., for new Battersea station.

BRISBANE CORPORATION: Babcock and Wilcox, Ltd., three boilers, £74 266.

VICTORIAN ELECTRICITY COMMISSION: John Thompson Water Tube Boilers, Ltd., eight boilers, superheaters, pipework, etc., for Yallourn power station, £223 288.

BRIGHTON CORPORATION: Yarrow and Co., Ltd., two boilers, each of 75 000 lb. evaporation, £46 130.

SHEFFIELD CORPORATION: Stirling Boiler Co., Ltd., three 120 000 lb. boilers and accessories, £140 206.

HALIFAX CORPORATION: Babcock and Wilcox, Ltd., two boilers, with auxiliaries, £83 411.

HACKNEY (LONDON) B.C.: Stirling Boiler Co., Ltd., three boilers, each with maximum evaporative capacity of 150 000 lb. per hour, coal handling plant, etc., £310 679.

CROYDON CORPORATION: Babcock and Wilcox, Ltd., £101 712.

HACKNEY (LONDON) BOROUGH COUNCIL.—Simon-Carves, Ltd., additions to boiler plant at Millfields Road generating station, including installation of three water-tube boilers each having evaporative capacity of 125 000 to 150 000 lb. of steam per hour, travelling grate, mechanical stokers, economisers, superheaters, mechanical draught plant, and independent chimney to each boiler, foundations and civil engineering work, steel-framed brick boiler house, and coal handling and storage plant. Total valueo f boiler plant contract (£250 000 approximately).

Generating Plant.

ROTTERDAM MUNICIPALITY: Metropolitan-Vickers Electrical Co., Ltd., two 42 000 kW turbo-generators.

HACKNEY (LONDON) B.C.: C. A. Parsons and Co., Ltd., 30 000 kW turbo-alternator and condensing plant, £104 052.

SHEFFIELD CORPORATION: English Electric Co., Ltd., 25 000 kW turbo-alternator, etc., £94 413.

SWANSEA CORPORATION: British Thomson-Houston Co., Ltd., 10 000/12 500 kW turbo-generator, £34 476.

LIVERPOOL CORPORATION: Metropolitan-Vickers Electrical Co., Ltd., 50 000 kW turbo-alternator, with accessories, £193 370.

CROYDON CORPORATION: Metropolitan-Vickers Electrical Co., Ltd., turbo-alternator, etc., £76 851.

LONDON COUNTY COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., provision of rotary convertor, with supervisory control. British Thomson-Houston Co., Ltd., supply of six rotary convertors. Metropolitan-Vickers Electrical Co., Ltd., two rotary convertors.

Switchgear, etc.

HACKNEY (LONDON) B.C.: A. Reyrolle and Co., Ltd., £62 200.

IRISH FREE STATE ELECTRICITY SUPPLY BOARD: Metropolitan-Vickers Electrical Co., Ltd., switchgear, in connection with Shannon power scheme.

ROTTERDAM MUNICIPALITY: British Thomson-Houston Co., Ltd., 25 000 V switchgear, comprising 39 isolated phase equipments, with oil circuit breakers of 1 500 000 kVA interrupting capacity.

SHEFFIELD CORPORATION: General Electric Co., Ltd., £55 067.

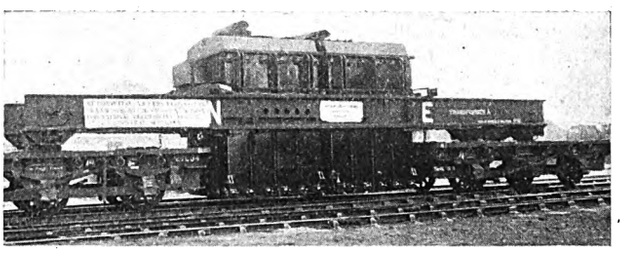
VICTORIAN ELECTRICITY COMMISSION: Australian General Electric Co., Metropolitan-Vickers Electrical Co., Ltd., and Gibson, Battle and Co., switchgear and feed pumps, for Yallourn station; total £50 000.

CROYDON CORPORATION: English Electric Co., Ltd., £44 227 10s.

LIVERPOOL CORPORATION: British Thomson-Houston Co., Ltd., main auxiliary switchgear section at Clarence Dock station, £72 651.

Electric Lighting Equipment.

LONDON COUNTY COUNCIL: Charing Cross Electricity Supply Co., Ltd., General Electric Co., Ltd., and Pirelli-General Cable Works, Ltd., improvement of Victoria Embankment lighting.



A 60 000 kVA transformer bank leaving the works of the Metropolitan-Vickers Electrical Co., Ltd., for the Central Scotland Electricity Scheme.

DUNOON U.D.C.: Johnson and Phillips, Ltd., complete lighting scheme.

Transformers.

PRESTON CORPORATION: English Electric Co., Ltd., transformer plant, £35 100.

Miscellaneous

GREAT INDIAN PENINSULA RAILWAY: Metropolitan-Vickers Electrical Co., Ltd., 21 electric locomotives.

LONDON COUNTY COUNCIL: Dorman, Long and Co., Ltd., tramway track rails, etc., £55 381.

CENTRAL ARGENTINE RAILWAY: Metropolitan-Vickers Electrical Co., Ltd., 20 000 V transformers and switchgear for power stations, complete equipment for five new sub-stations, extension equipment for four sub-stations and electrical equipment for 145 coaches.

FERRO-CARRIL CENTRAL DE BUENOS AIRES: Westinghouse Brake and Saxby Signal Co., Ltd., electro-pneumatic signalling between Federico Lacroze and Callao.

MANCHESTER SOUTH JUNCTION AND ALTRINCHAM RAILWAY: Metropolitan, Cammell Carriage Wagon and Finance Co., Ltd., 24 motor cars, 22 trailer cars and 22 driving trailer cars; total £200 000 (approximately).

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY: Westinghouse Brake and Saxby Signal Co., Ltd., power signalling material for Bombay Central Station.

LONDON COUNTY COUNCIL: Hurst, Nelson and Co., Ltd., 100 double deck electric tramcar bodies, £172 200. English Electric Co., Ltd., 100 car sets of electrical equipment, assembly of bodies with trucks, etc., £83 750.

SWEDISH TELEGRAPH BOARD: Marconi's Wireless Telegraph Co., Ltd., equipment for new 60 kW broadcasting station near Stockholm, Kr. 400 000 (approximate).

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ELECTRICAL OVERSEAS TRADE IN 1929.

Brief Summaries of Overseas Trade during Each Month of the Year—Eleven Months Trading Shows Exports to be £10 334 440 in Excess of Imports—This Year's Returns Compared with those for 1928.

THE latest figures dealing with this subject were published by the Board of Trade on December 12th, the returns at that date being for the month of November. For the purposes of this review we are therefore perforce to confine our observances to the first eleven months of the year, January to November, and, taking each month in turn shows that, on the whole, the electrical industry has maintained its reputation in the overseas markets.

During January, for instance, electrical exports at £1 614 301, were £67 610 in advance of the value credited to the same month of 1928, and while imports also increased by £25 341 during the month when compared with January of the previous year, the favourable balance for the month of exports over imports was £1 016 206, an increase of £42 269 on the position at the same time last year. The increase in imported goods was largely due to telegraph and telephone instruments, and wires and cables, excluding submarine cables. The export position was improved by shipments of motors and generators, other than railway and tramway motors, rubber insulated wires and cables and glow lamps. Submarine cables, an item which invariably shows an improvement, declined during January by £11 464 when compared with the same month of 1928.

Though during February our overseas trade did not maintain the improvement of the previous month, the position was better than it at first appeared. Electrical exports for the month were valued at £1 462 365, or £19 837 less than the return for February, 1928. On the other hand, the total electrical exports for the first two months of the year were valued at nearly £50 000 more than for the corresponding months of 1928. Imports during the month also increased, the amount being £28 292, or for the two months £53 633. This increase was due mainly to larger importations of telegraph and telephone instruments, which item alone, when compared with February, 1928, advanced by £56 931. The favourable trade balance of exports over imports was, however, as high as £953 549, or £1 969 755 for the two months.

The First Quarter.

The falling off of trade during February was again in evidence during March, for exports at £1 372 691, were £372 233 less than during the same month last year, while for the quarter a similar comparison showed a decline of £324 460. Electrical imports on the other hand advanced during the same month and period by £56 527 and £110 160 respectively. Export items which contributed to the fall in values were chiefly various motors and generators, which between them accounted for £100 352, and submarine cables with a decline of £50 995. Exports during the month were, however, well in advance of imports, the favourable trade balance standing at £800 667, or, for the three months of the year, £2 770 442.

An improvement set in during April and the returns for the month valued electrical exports at £1 674 234, an advance of £244 743 on the figures for the same month last year. Imports for the month increased by £89 225, but the balance of exports over imports was, nevertheless, £1 130 997. The improved position was assisted by larger shipments of electrical machinery, which increased by £57 315 when compared with April, 1928, and various wires and cables with an advance of £55 196. Importations of rubber covered wires were higher in value by £15 424, and telegraph and telephone instruments by £45 666. The excess of four months' exports over imports was, however, still satisfactory at £3 901 419.

A Further Improvement.

The favourable trade movement indicated in April still showed signs of existence in May, electrical exports being valued at £1 850 244, or £250 994 more than during May, 1928. This improvement was largely accounted for by shipments of wires and cables, other than submarine, which advanced by £176 174, and various electrical goods by £114 395. Imports during the month, when compared with the same month of last year, increased by £150 672, electrical machinery showing an increase of £37 000, and telegraph and telephone instruments £52 439. For the five months of the year the total electrical exports were £7 973 835, or £171 277 more than for the same period of 1928, and total imports at £2 840 857 showed an increase of £350 057. The favourable trade balance for the five months stood at £5 132 978, and for the month £1 123 559.

A setback in overseas trade was recorded in the returns for June, and electrical exports at £1 383 752, declined by £191 199 when compared with June, 1928. Electrical machinery exports alone showed a decrease of £116 365, and various wires and cables, including submarine, a further £61 449. Imports of electrical machinery and apparatus also increased by £147 544, telegraph and telephone instruments again being responsible for a considerable percentage of the total with an increase of £76 164. The favourable trade balance for the month was £761 604, and for the six months £5 894 582.

A recovery was made during July, the export return at £1 703 316 showing an improvement of £592 336 against the figures for July, 1928, and for the seven months at £11 060 903 an advance of £272 414 on the return for the same period last year. July imports were again in advance of the July, 1928, figures, the amount being £103 464, or for the seven months £601 065. With the exception of switchboards, various motors and generators, and batteries and accumulators every export item showed an improvement during the month, the largest being telegraph and telephone instruments with an increase of £100 749, when compared with last year's return of the same goods for July. Imports of electrical machinery by the same comparison declined during the month by £12 205. The excess of exports over imports for the month reached the more satisfactory figure of £1 114 247, making the favourable trade balance for the seven months £7 008 829.

(*Continued on page* 814.)

SUMMARY OF ELECTRICAL OVERSEAS TRADE, 1929.

Month.	Imports.	Increase (+) or decrease (−) on previous month.	Increase (+) or decrease (−) on same month, 1928.	Exports.	Increase (+) or decrease (−) on previous month.	Increase (+) or decrease (−) on same month, 1928.	Balance of exports over imports for month, 1929.
	£	£	£	£	£	£	£
January ..	598 095	—	+ 25 341	1 614 301	—	+ 67 610	1 016 206
February ..	508 816	− 89 279	+ 28 292	1 462 365	−151 936	− 19 837	953 549
March ..	572 024	+ 63 208	+ 56 527	1 372 691	− 89 674	−372 233	800 667
April ..	543 237	− 28 787	+ 89 225	1 674 234	+301 543	+244 743	1 130 997
May ..	618 685	+ 75 448	+150 672	1 850 244	+176 010	+250 994	1 231 559
June ..	622 148	+ 3 463	+147 544	1 383 752	−466 492	−191 199	761 604
July ..	589 069	− 33 079	+103 464	1 703 316	+319 564	+592 336	1 114 247
August ..	748 286	+159 217	+172 302	1 678 755	−124 561	+242 356	930 469
September..	782 931	+346 45	+303 613	1 330 540	−348 215	−148 038	547 609
October ..	1 007 423	+224 492	+356 625	1 925 580	+595 040	+380 458	918 157
November..	897 672	−109 751	+237 889	1 827 048	− 98 532	+177 451	929 376

Total Imports for first Eleven Months of 1929=£ 7 488 386. Increase on Same Period 1928=£1 671 494.
„ Exports „ „ „ „ „ „ =£17 822 826. „ „ „ „ =£ 924 641.
Favourable Trade Balance of Exports over Imports for Eleven Months 1929=£10 334 440.
„ „ „ „ „ „ „ „ „ „ 1928=£11 081 293.
Decrease on last year=£746 853.

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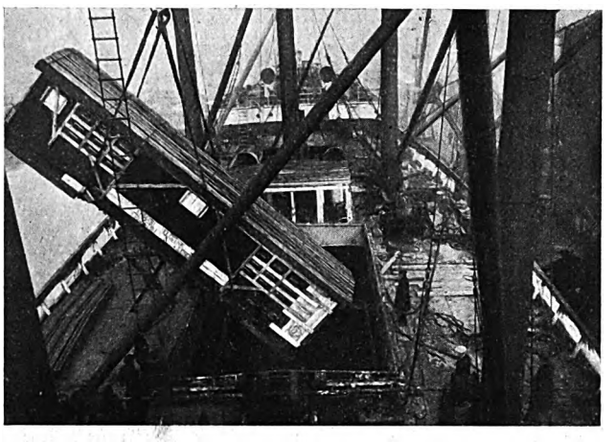
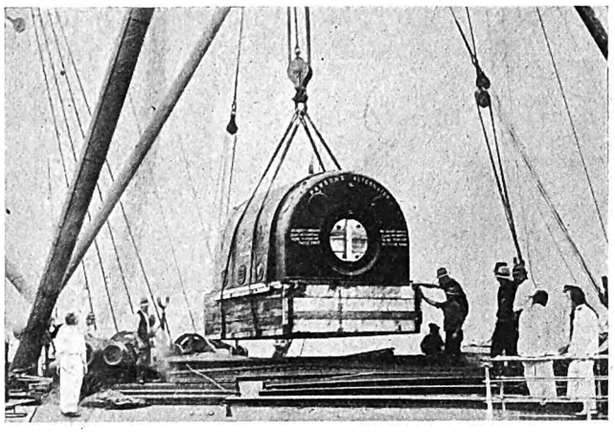
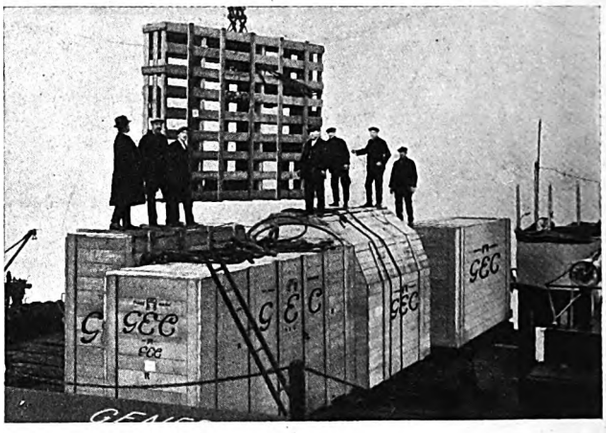


MORE BRITISH EXPORT PICTURES.

Left—A shipment of 100-ton electric locomotives manufactured by the English Electric Co., Ltd. Bottom left—A large alternator by C. A. Parsons & Co., Ltd., being unshipped overseas. Bottom right—A consignment of machinery by the General Electric Co., Ltd., bound for Canada.





Shipments of British electrical goods during August again recorded an increase, the total amounting to £1 678 755, or £242 356 more than during August, 1928. Similar exports for the eight months amounted to £12 738 658, an increase of £513 770 when compared with the same period of 1928. Imports during August were valued at £748 286, or £172 302 more than during August, 1928, making for the eight months an advance of £773 367 on the total for the corresponding months of last year. Shipments of various wires and cables strengthened during the month, the increase over last year's return for August being £73 585, and, in the case of telegraph and telephone instruments, £87 494. Importations of electrical machinery during the month were £18 325 in advance of August last year, while telegraph and telephone instruments increased by £125 328. August exports were, however, £930 469 in excess of imports, and for the eight months £7 938 298.

September Figures.

A slight decline in export trade was again experienced during September, when electrical exports, valued at £1 330 540, were £148 038 less than for the corresponding month last year. For the nine months similar exports amounted to £14 070 198, an improvement of £366 732 on the return last year for the same period. Imports were again higher during the month, the increase over September, 1928, being £303 613, and for the nine months an increase of £1 076 980 over the total for the same period of 1928 was recorded. Though the export values for the month were generally lower than for the same month last year, various motors and generators improved by £34 653, and various wires and cables by £73 117. Imports of electrical machinery were again higher in value when compared with September, 1928, the increase being £40 218; the largest increase, however, appeared under the item telegraph and telephone instruments, the amount being £146 497. In spite of the increased value in imports, exports showed an excess of £547 609 for the month, and for the nine months £8 486 907.

An improvement was recorded during October, when exports, returned at £1 925 580, were £380 458 higher than for the same month of last year. Similar exports for the ten months of 1929 amounted to £747 190 more than for the corresponding months of 1928. Imports for the month were higher than for October, 1928, by £356 625, electrical machinery having increased by £40 130, telegraph and telephone instruments by £160 901, glow lamps by £47 344, and batteries and accumulators, £27 169. During the ten months of this year imports, by comparison with the corresponding months last year, increased by £1 433 605. The improved position in exports was largely brought about by increased shipments of various wires and cables, which, by comparison with October, 1928, increased by £205 836. The excess of exports over imports was for the month, therefore, £918 157, and £9 405 064 for the ten months.

Eleven Months.

Export trade during November amounted to £1 827 048, or £177 451 more than during November, 1928. Imports of similar goods during the same month were £237 889 in excess of those for the corresponding month of last year. For the eleven months of this year exports were £924 641 in advance of those for the same period of 1928, while imports for a like period and by the same comparison showed an increase of £1 671 494. Exports for November exceeded imports by £929 376, while for the eleven months the excess was £10 334 440. During the month shipments of various wires and cables, when compared with November, 1928, improved by £85 014, submarine telegraph and telephone cables by £16 903, telegraph and telephone instruments by £55 443, and various apparatus, £88 505. The increased value in imports was mainly due to electrical machinery, increase £25 202; various wires and cables, £12 096; telegraph and telephone instruments, £72 476; and electric glow lamps, £37 290.

It will be seen from the summary on page 812 that during the eleven months under review exports showed improvement during seven of the months when compared with the corresponding months of 1928, while imports for the same period and by the same comparison increased during each of the eleven months.

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PROFESSIONAL & TRADE ASSOCIATIONS IN 1929.

A Concise Symposium of Reviews of the Year's Work and Progress.

THE multiplicity of technical and trade organisations in the British electrical industry prevents all but the most diligent and inquiring minds from acquiring full knowledge, not only of the aims but of the achievements and progress of those in which he is not directly interested through personal membership. There are also cases where pressure of work or other circumstances prevents electrical people from obtaining an adequate view of the work that is being done by the bodies of which they are members. In order to provide concise and authoritative information of the work that has been done by electrical institutions and associations during 1929 we have obtained from the secretaries or other officials of practically all of the bodies concerned a series of specially written and signed reviews of the year's work. Space limitations have militated against detailed development of quite a number of useful activities, but on the whole the statements which we print below will be found to give a true perspective to the picture.

THE BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION.—The steps initiated in 1928 to secure more adequate support from all sections of the industry for the work of the Electrical Research Association are now beginning to bear fruit. As the result of many discussions between representatives nominated by the interested bodies, recommendations have been made as to the contributions which might be expected from different sections of the industry. The railway groups have already agreed their quota. A marked increase in membership and contributions received from the authorised undertakings has taken place, and favourable replies have been received from the manufacturers' associations.

Whilst during the present year the Association has had to retain many important researches on its waiting list, there is every prospect that this list will be reduced to reasonable proportions during 1930.

An outstanding feature in the year's work was a conference in the summer, which was attended by leading investigators into the properties of steam, from the Continent and America, to discuss methods of test, and existing differences in experimental results. As a result it has already been possible to prepare agreed tables subject to tolerances which will doubtless be reduced in the near future.

Important contributions were made to the proceedings of the 1929 Paris Conference, on circuit breaking, overhead lines, three-phase single conductor cables and impurities in insulating oils; and these were well received.

The I.E.E. awarded the Kelvin Premium to the authors of an E.R.A. Report on the Phenomena of Circuit Breaking, in which a gas blast switch was described, anticipating a design now receiving wide attention on the Continent.

Methods of estimating the heating of electric cables exposed to the sunshine in racks have been completed, and good progress made in the evaluation of the heating of multiple cables in ducts, and of deeply buried cables.

The issue of a novel report on the resistance of earth to the movement of bodies embedded in it will go far to put the design of pole foundations on a sound footing.

Results of researches on the transfer of heat from tube to water in steam condensers have been brought into commercial use, and apparatus is being developed for dealing with the problem of heat transfer from steam to tube.

Important work has been done for the Central Electricity Board on interference with communication circuits, and valuable reports prepared, at the request of the Electricity Commission, dealing with the arrangement and carrying capacity of high voltage cables and overhead lines. Good progress has been made in the study of vibration in overhead lines and the elimination of breakdown from this cause. The numerous researches on properties of materials which have contributed so largely to standardisation in this field have been maintained.

Increased facilities for fundamental research on the properties of dielectrics have been arranged with the N.P.L., and good progress made elsewhere in the elucidation of the phenomena of plastic yield and brittleness.

The printed schedule of headings under which researches are now being carried on runs to 18 pages.—E. B. WEDMORE.

* * *

THE BRITISH ENGINEERING STANDARDS ASSOCIATION (ELECTRICAL INDUSTRY SECTION.)—The reorganisation of the work of the Association consequent upon the granting of a Royal Charter has not influenced the work of the Electrical Section to any appreciable extent, since the working of this Section has, from its reorganisation in 1913, been along the lines now adopted for the other industry sections.

The thirty-one technical committees and some seventy subcommittees of the Electrical Industry Committee cover a very extensive field, ranging from rules for the performance of large steam and hydraulic turbines for electrical plant, and specifications for steel forgings for use in their manufacture, on the one hand, to the details of electrical lampholders and the components of wireless receivers on the other hand.

The Committees have widely different functions, which may be classified broadly into three groups, viz.: (1) Specifications for the testing and performance of machinery and apparatus; (2) Dimensions to secure interchangeability and to reduce the number of designs. (3) Specifications for the testing and performance of materials.

During the year under review, specifications falling into these three categories have been issued as follow:—(*a*) Specifications for the Testing and Performance of: Distribution Boards (B.S. Spec. 214); Electricity Meters (B.S. Spec. 37, revision); Ceiling-type Electric Fans (B.S. Spec. 367); X-ray Transformers (B.S. Spec. 326); Hydraulic Turbines (B.S. Spec. 353); Instrument Transformers (B.S. Spec. 81, revision); Indicating Instruments (B.S. Spec. 89, revision); Recording Instruments (B.S. Spec. 90, revision); Electrical Protective Relays (B.S. Spec. 142, revision); Flame-proof Enclosures for

ASSOCIATION REVIEWS

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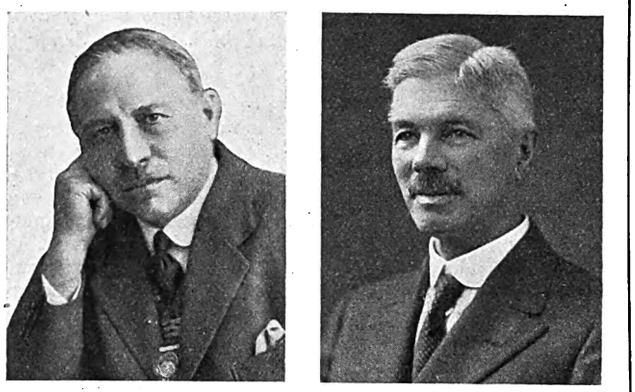
Electrical Apparatus (B.S. Spec. 229, revision); Traction Motors (B.S. Spec. 173, revision).

(*b*) Specifications to secure interchangeability and to reduce the number of designs have been prepared and issued for: Ceiling Roses (B.S. Spec. 67); Three-pin Plugs and Sockets (B.S. Spec. 317).

(*c*) A Specification for the testing and performance of varnish-paper boards and tubes (B.S. Spec. 316) has been published. This was based on the work of the Electrical Research Association.



Two presidents of the I.M.E.A.
Left: Mr. A. Nichols Moore (1928-29); right: Mr. J. K. Brydges (1929-30).

(*d*) In addition to the above, a specification covering rules for the measurement of voltages with sphere-gaps (B.S. Spec. 358), which is applicable to the testing of machinery and apparatus, and also to the testing of insulating materials, has been published. This also was based on the results of work of the Electrical Research Association.

Among the specifications at present in preparation, those for the following apparatus and materials are nearing completion:—

Clear Baking Oil Insulating Varnish; Leclanché-type Primary Cells; A.C. Switchgear Equipments; Desk-type Electric Fans; Steels for Electrical and Allied Machinery; Standards of Resistance of Aluminium; Mains Supply Apparatus for Radio and Acoustic Reproduction; Graphical Symbols for Railway Signalling Purposes; Lampholders (revision); Steam Turbines (revision); Oil-immersed Switches and Circuit-breakers (revision); Hard-drawn Aluminium Conductors for Overhead Lines (revision); Porcelain Insulators for Power Lines (revision); Ebonite (revision); Bare Annealed Copper Wires (revision).

Specifications dealing with the following are also in preparation, but the work is only in its early stages:—

Accumulators; Railway Signalling Apparatus; Ball and Roller Bearings for Electrical Machinery; Graphical Symbols for Electrical Purposes (revision); Telegraph and Telephone Material (revision); Methods of Testing Permanent Magnets; Yellow Varnished Cotton Cloth.

International Standardisation.

International electrical standardisation is carried out under the ægis of the International Electrotechnical Commission, and during the past year international meetings were held in London for the purpose of preparing international ratings of electrical machinery, traction motors and steam turbines. Delegates from the principal foreign countries attended these meetings, which lasted over a fortnight. The delegates to the meetings were appropriately entertained by the British Committee, in association with the Institution of Electrical Engineers, the British Electrical and Allied Manufacturers' Association and the Cable Makers' Association.

As a result of the meetings, it is hoped that the I.E.C. will be able to publish international rules for the rating of electrical machinery at an early date, and to secure approval at the Plenary Meetings, which will be held next year in Scandinavia, to the international standards for both steam turbines and traction motors.

International discussions covering a wide range of electrical subjects, including acceptance tests for steam turbines, are in process, and the technical committees of the Electrical Section have during the past year spent a good deal of time in preparing proposals for discussion in the international committees.—P. Good.

* * *

The Incorporated Municipal Electrical Association.—The past year has been an exceptionally busy one, and the Association's activities have increased considerably. The total membership is now 252, which is equivalent to 82% of the municipal electricity undertakings in the country.

The Council of the Association during the past year have dealt with very many important matters affecting municipal electricity undertakings, and in many of these matters they have sought the co-operation of other kindred associations, such as the Association of Municipal Corporations, the Institute of Municipal Treasurers and Accountants, the Municipal Tramways Association, and other bodies. It is felt that by close co-operation with all associations representing local authority interests, greater benefits accrue to local authority electrical undertakings.

Co-operative Work.

The Association is constantly in touch with the Electricity Commissioners, Central Electricity Board, and various Government Departments, upon vital matters affecting the municipal electrical industry. The Association is officially recognised as representing municipal supply. There are five Standing Committees of the Council and many Special Committees, in addition to which, the I.M.E.A. is represented on many other bodies such as the E.D.A., B.E.S.A., E.R.A., Committees of the I.E.E., etc.

The Council are constantly being consulted in legal, administrative, and technical matters, and it is impossible in a short note fully to expound upon the valuable work done by the Association on behalf of municipal electricity undertakings.

The Annual Convention of the Association is looked upon as an important event in the electrical year, and the Association has many times been congratulated upon the excellence of the various technical papers which have been read at these Conventions. This year's Convention was held in June at Torquay, when the attendance of delegates was nearly 1 000.—J. W. Simpson.

* * *

The British Electrical Development Association, Inc.—During the past twelve months considerable progress has been made by the E.D.A. in all directions. Some 35 new members have joined the Association, and the reorganisation of the Association's Area Committees in all parts of the country has been successfully completed. Area Committees, fully representative of all sections of the electrical industry, have been formed in the nine provincial areas into which the

Lt.-Col. W. A. Vignoles (left), director of the E.D.A., and Mr. V. W. Dale, the Association's business manager.

kingdom is divided, the names of the areas and the towns at which they are centred being as follows:—South West, Bristol; South Wales, Cardiff; South Midland, Birmingham; North West, Manchester; North Midland, Leeds; North East, Newcastle-on-Tyne; East of Scotland, Edinburgh; West of Scotland, Glasgow; North of Ireland, Belfast.

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Arrangements have been made for all E.D.A. Circles to be represented on the appropriate Area Committees, and as the latter in turn have representation on the E.D.A. Council ample facilities are available for local and area opinions to receive the fullest consideration.

The Area Committees have effectively carried out propaganda work in the form of conferences, lectures and participation in exhibitions, and they form, in addition, a means for co-operation with individuals in places where E.D.A. Circles are now being formed. In each area there is an E.D.A. representative who is anxious to assist and co-operate with all those who are interested in development work.

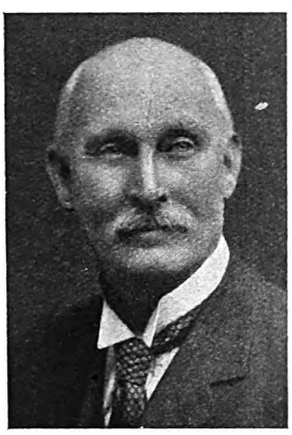
Among the more important Area Committee activities during the past year may be mentioned the E.D.A. Stand at the North East Coast Exhibition. The E.D.A., through its Area Committees, also took part in the British Industries Fair, and the Smoke Abatement Exhibition.

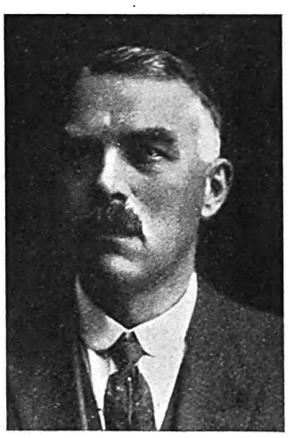
Several Sales Conferences similar to those held in London each month have also been arranged in provincial centres, and have attracted large audiences.

The Association has given advice and assistance in connection with the organisation of many local electrical exhibitions all over the country, notably at Brighton in October.

The Factory and Workshop Lighting Campaign, conducted by the E.D.A. last winter, was brought to a successful conclusion by circularising in October, to a carefully prepared list of factory owners, a booklet containing photographs of lighting installations which had been brought up-to-date as a result of the campaign.

The National Campaign for 1929–30 is the E.D.A. Electric Homes (Outlet) Campaign, which is designed to secure a larger number of plug points for the convenient use of electricity in houses that are being built, and in existing houses. An attractive booklet entitled "The House You Want" has been prepared, and will, it is hoped, be widely distributed.





Mr. L. B. Atkinson, director of the C.M.A. and Mr. A. C. Cramb, hon. secretary of the I.M.E.A.

A Home Wiring Specification has also been drawn up, which is designed to assist both the house buyer and the electrical contractor to stipulate a minimum standard number of points to be installed in the various rooms of a house.

A number of posters dealing with domestic applications of electricity have been produced, and increasing use is being made of this effective and economical method of publicity.

A large number of lectures has been given by the Association's official lecturer and others, the more important audiences addressed including the Architectural Association, the Smoke Abatement League, and the Royal Sanitary Institute, while a series of lectures has been given in Leeds, Newcastle and London, to teachers and students of domestic science. The latter class of audience is keenly alive to the possibilities of electricity in domestic service, and it is hoped that manufacturers and supply undertakings will co-operate by arranging for electrical apparatus to be available for practical use in schools.

Last March the production of a cinema film, entitled "Country Currents," showing the use of electricity on the farm and in rural industries, was completed, and it has since been shown with great success to audiences in rural areas, and at agricultural shows. Continuous use has been made of other E.D.A. films.

A large number of propaganda booklets dealing with a wide range of applications of electricity, such as refrigeration, industrial heating, electricity on the farm, and in schools, have been produced.

This winter the Association is continuing to circulate each month, to the whole of the electrical industry, booklets describing current advertising material available for local advertisements, and suggestions for effective window displays, the material for which can be obtained at small cost.—W. A. VIGNOLES.

* * *

THE TELEPHONE DEVELOPMENT ASSOCIATION.—Definite progress has been made by the Association during 1929 in its task of inoculating the British public with the telephone habit, and of increasing, not only the number of telephones in use in Great Britain, but also the average user per station or instrument.

The number of telephones on the Post Office system on October 31st, 1929, was 1 822 990, and though the complete figures for the year are not yet available, it seems very probable that the official estimate of a "record" increase of 128/129 000 nett new stations during the year will prove to be confirmed.

Sir Alexander Roger, chairman of the T.D.A.

In August, 1924, when the Association came into existence, the number of telephones was 1 205 102; the nett increase, therefore, in something over 5 years has been 617 888 and is equivalent to a percentage growth of 51·27%. This rate of growth is only exceeded in Australia, where telephones have more than doubled their number since 1920.

So far, so good. But the position is still not one that can be viewed with anything approaching complacency. We are making some progress, but nothing like enough, as the Engineer-in-Chief to the Post Office pointed out recently in his presidential address to the Institution of Electrical Engineers, to enable Great Britain to retrieve its arrears of telephone development in a reasonable time.

Joint Salesmanship.

The telephone industry, by virtue of the multiplicity of its sections, lends itself admirably—more so, perhaps, than almost any other industry—to the general idea of joint salesmanship and collective publicity, which finds expression in the work of the Development Association. It is a fact that Post Office orders for telephone plant affect over 50 trades, and it is equally a fact that any movement designed to stimulate the demand for telephone service benefits, both directly and indirectly, all those engaged, whether as masters or men, in every one of these 50 trades and industries. The result is that there is to-day hardly a firm that ranks for anything at all in the telephone supply industry itself or in its collateral industries that is not a supporter of the T.D.A. and its work. In these days when pessimism and "defeatism" are all too prevalent in industrial and financial circles, it is both refreshing and encouraging to note the single-mindedness of an industry which sets out, courageously and optimistically, to create a larger demand for its own product, especially when, as in the case of telephone service, the success of the effort spells increased employment in a large range of trades as well as an all-round enlargement of the facilities of communication, so essential in modern business and social conditions.

This is not the time to cry halt, for very much remains to be done. People are still too ready to believe ill, rather than good, of the telephone, and there is still a surprisingly large amount of uninformed criticism of the telephone service, which is from time to time made vocal in the columns of the lay Press. Nobody wants to muzzle legitimate criticism or to pretend that no improvement is possible in our telephone system. But it is worth while to remember that British

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telephone and cable and battery manufacturers do business abroad as well as at home: these constant criticisms are apt, it has been proved, to give the impression abroad that there is something wrong with the plant itself, as distinct from—or as well as with—the service, an impression which, of course, is entirely incorrect, but which makes it all the more difficult for British manufacturers—not only of telephone plant—to get orders abroad at the precise moment when they are most urgently needed.

The Association can therefore continue its good work with the assurance that it carries with it the goodwill of all concerned.—H. E. Powell-Jones.

* * *

The Electric Lamp Manufacturers' Association of Great Britain, Ltd.—The Electric Lamp Manufacturers' Association during the past year has taken steps to encourage two important ideas which affect the industry as a whole.

The first is the standardisation of types, by the elimination of various types in the same wattage, and encouraging the use of fewer wattages.

Its efforts in the past to minimise the disadvantage of glare, by advocating the use of suitable shades with lamps, have only met with partial success. Its latest effort to replace the numerous lamps with clear bulbs by glareless lamps is rapidly meeting with success owing to the lamps with inside frosted bulbs being marketed to-day at a cheaper price than the corresponding lamps with clear bulbs.

Mr. C. W. Sully, director of the E.L.M.A.

This occasion has also been utilised for popularising a 25 W lamp in the place of the old 20 and 30 W lamps, thus reducing the more popular demand from five to four different wattages.

The other and still more important idea promulgated by E.L.M.A. during this year is in the matter of voltage standardisation. A committee of the I.E.E. approached E.L.M.A., and other trading bodies, with the request that the manufacturers should do all they could to encourage the standardisation of supply voltage to the domestic consumer throughout the country.

After careful consideration, E.L.M.A. decided to take the long view, and to market their most popular types of standard voltage lamps at cheaper prices than any others. At the same time they offered the authorities who have to carry out the conversion of their systems special terms on all 230 V lamps when purchased by them in wholesale quantities for the definite purpose of replacing lamps of other voltages on their customers' premises.

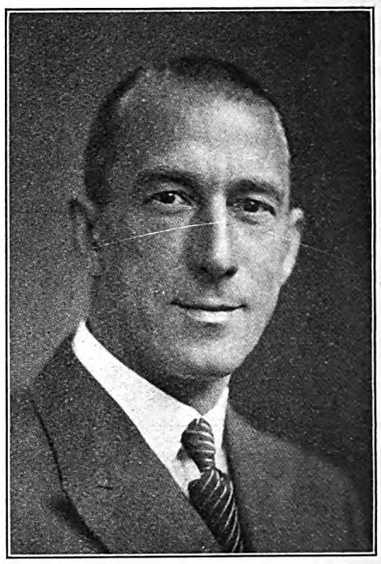
Standardisation in this latter direction has the full support of the B.E.S.A., the I.E.E., and the Government, through its Electricity Commissioners, as it will eventually prove advantageous to the manufacturer, the dealer, the user, and, by no means least, to the supply authorities throughout the country.

Therefore this Association, throughout the year, has played its part in assisting the electrical industry to maintain its reputation as being one of the most progressive in this country.—C. W. Sully.

* * *

The Electric Light Fittings Association.—This Association, which was established in 1926, has as its main aims and objects the regularisation of the trading principles of manufacturers and distributors in the marketing of electric light fittings. The Association is working in close co-operation with electrical contractors in an endeavour to arrive at trading conditions which will give full protection to the electrical contracting industry. Trading principles have, from time to time, been discussed with the representatives of the E.C.A., and the decisions arrived at have undoubtedly had an influence upon many manufacturers engaged in similar lines of business, although not members of the E.L.F.A. The E.L.F.A. has direct representation on the Electric Fittings Statutory Committee responsible for the administration of Clause 48 of the 1926 Electricity Act. It has representatives also on the Fair Trading Committee, a body representative of manufacturers, wholesalers, electrical contractors and municipal electrical engineers, and charged with the duty of framing a Fair Trading Agreement.

In addition to these activities the Association is represented on the E.D.A. Electric Homes (Outlet) Campaign on B.E.S.A. Committees for the standardisation of fittings, and on a committee of the Electrical Research Association which is investigating the question of connections for large gasfilled lamps. A special section of the Association is dealing particularly with industrial lighting fittings, and has rendered active and financial assistance to the E.D.A. in connection with that Association's Factory and Workshop Lighting Campaign. The Association has more than justified its existence by the results of its collaboration with various authorities and associations with the object of securing the most satisfactory working conditions not only for manufacturers but for distributors, electrical contractors, and other branches of the electrical industry.



Mr. F. Winstanley, chairman of the E.L.F.A.

In the membership of the Association the following firms are included:—Benjamin Electric Ltd.; Galsworthy, Ltd.; C. Harvey and Co.; Metro-Vick Supplies, Ltd.; Peyton, Hoyland and Barber, Ltd.; Osler and Faraday, Ltd.; Best and Lloyd, Ltd.; Falk Stadelmann and Co., Ltd.; General Electric Co., Ltd.; John A. Harry Hunt; W. McGeoch and Co., Ltd.; Siemens Electric Lamps and Supplies, Ltd.—F. Winstanley.

* * *

The National Register of Electrical Installation Contractors.—This organisation, which was set up six years ago by association representatives of the entire electrical industry, is an independent body which exists for the protection of the public and in the interests of good electrical installation work. It maintains a register containing the names of such electrical installation contractors as can satisfy its Executive Committee of their ability to carry out sound installation work with good materials, and grants to contractors meeting its requirements a certificate of registration and a license to use the mark of the National Register. Complaints of shoddy workmanship by registered contractors are carefully investigated, and, if substantiated, result in the deletion of the offending contractor's name from the Register.

During the past year the Register has taken energetic steps to acquaint architects, builders, municipal engineers, consultants and others likely to have the placing of installation orders, of the usefulness of the Register to them, and of the desirability of employing contractors who are pledged to do sound work, and an educational advertising campaign was undertaken in appropriate professional journals.

Efforts have also been made to warn the general public of the unwisdom from many points of view of entrusting unqualified contractors with wiring work, and over 100 000 copies of a simply worded pamphlet prepared by the Register have been bought by contractors and supply authorities for distribution to members of the general public. In the public press and in other directions the desirability of employing properly qualified installation contractors has been emphasised.

During the period from October 31st, 1928, to October 31st, 1929, the number of electrical installation contractors on the roll of the National Register has increased from 1 185 to 1 315, a net increase of 130 after taking into account deletions

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from the Register of the names of 44 contractors for various reasons.

The year has also seen a further increase in the number of municipal and company electricity undertakings, consulting engineers and architects and other authorities which make a practice of restricting orders for installation work to contractors on the roll of the National Register.

During the year the National Register has issued for the information of contractors a list of practices which the Executive Committee feel would justify them in cancelling the registration of a contractor found to be offending in this manner. This list which has come to be known in contracting circles as the Register's "Nine Commandments," has definitely helped to raise the general standard of installation practice.—A. MONTGOMERY.

* * *

THE INSTITUTION OF RAILWAY SIGNAL ENGINEERS, INC.—The 17th year of this Institution's incorporated existence has been as satisfactory as any. It has been marked by the appointment of a signal and telegraph engineer for the whole of the London Midland and Scottish Railway, a Past President, Mr. A. F. Bound, being selected for the position, which is probably the most important of its kind in the British Empire.

During the year the membership has increased to more than 750, applications being received from all over the world.

In June the Summer Meeting was held in Holland, when the signalling on the Netherlands Railways was inspected by the courtesy of the Dutch railway authorities.

The annual dinner, held in London in October, was attended by a much larger company than ever before, 180 ladies and members being present.

Ten representatives of the Institution are serving on Committees of the British Engineering Standards Association, and the National Illumination Committee also includes an institution representative.

The bequest of £1 000 by the late Mr. W. J. Thorrowgood, past president and at one time signal and telegraph superintendent of the Southern Railway, will result in the Thorrowgood Scholarship being available for student members after the necessary conditions of its award have been worked out. The ultimate advantage to the signalling profession from an educational standpoint will be undoubted.

The Institution possesses a unique railway signalling library, and members may borrow these books free of charge. An up-to-date catalogue is published twice yearly in the Proceedings of the Institution.

As a technical Institution it probably represents as completely as any the profession for which it stands, its council including the leading men of the day on both the railway and manufacturing sides.—M. G. TWEEDIE.

* * *

THE ASSOCIATION OF CONSULTING ENGINEERS (INCORPORATED).—As the work of the Association is confined solely to matters affecting the professional side of engineering and the practice of its members, it is difficult to deal with the progress made during any one year.

Mr. P. V. Hunter, chairman of the National Register, and Mr. V. Watlington, chairman of the B.E.A.M.A.

The Association has now been established nearly twenty years, and includes in its ranks the majority of those engineers who confine themselves solely to professional consulting work. It affords a medium by which the public may learn the rules governing the practice of a "consulting engineer," one of its primary objects being to secure that persons undertaking to advise public and private bodies on engineering matters shall be fully qualified technical engineers, unconnected, directly or indirectly, with any manufacturing or contracting interests likely to prejudice their position as independent professional advisers. The Association does not in any way encroach on the functions of the Councils of the other leading engineering institutions.

Whilst ensuring that each of its members shall, as evidence of his technical skill and scientific knowledge, be either a corporate member of the Institution of Civil Engineers or a full member of the Institution of Electrical Engineers or the Institution of Mechanical Engineers or the Institution of Civil Engineers of Ireland, it recognises that the main purpose of these larger institutions is to deal with the science and problems of engineering which are of common interest to all engineers. The Association, on the other hand, confines itself strictly to matters affecting the status, professional conduct, emoluments and welfare of those practising in the consulting branch of the profession of engineering.

Mr. S. B. Donkin, president of the Association of Supervising Electrical Engineers.

Amongst the matters to which attention has been given during the past year has been the question of the collaboration of engineers with architects and with engineers practising in other branches of consulting work than their own. In view of the increasing complexity of modern architectural and structural work, it is obviously advisable that there should be the closest possible collaboration between the architect and the engineer on all large and important buildings, and it is hoped, as the result of the discussions which have taken, and are taking place, satisfactory arrangements will be arrived at.

The Committee have also been actively engaged in preparing a standard set of Conditions of Contract for use in connection with civil engineering contracts, as an addition to its standard conditions of contract for use in connection with contracts for electrical and mechanical work.

A large number of matters arising in connection with the position of members of the Association who have sought the opinion and counsel of the Committee on questions of difficulty have also been dealt with.—A. H. DYKES.

* * *

THE OVERHEAD LINES ASSOCIATION.—During the second year of its existence the membership of the Overhead Lines Association has doubled, both at home and abroad.

Ten other associations and bodies have co-operated in co-ordinating economy to consumers of electricity, amenities and mutual interests. The revised regulations have been given a year's trial in practice without criticism.

The simplest and most comprehensive wayleave forms have been put in the hands of all interested parties and after the lapse of twelve months the Association has again analysed all comments, all other proposed forms, held an open meeting to discuss same, and submitted to the authorities its considered opinion. Allotments are no longer claimed to come under "pleasure grounds."

For the information of all, but particularly for those members who cannot attend all meetings, more complete "Proceedings," papers and discussions have been issued monthly during the year.

The report of the Councils for the Preservation of Rural England and Wales has had consideration.

With a desire to inspire farmers to make full use of electricity for increasing output and minimising labour, the O.L.A. :—

(*a*) Is compiling a full record of the electricity consumed on every farm now electrified, and of the specific uses made of electricity on each farm.

(*b*) Has published a map of the British farm which is best equipped electrically, showing its existing three-phase power

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line throughout the axis of the farm, designed for electric ploughing and cultivating every arable field, using an equipment the individual farmer can afford to own (so that his work is independent of the inconvenience of waiting for contracting power ploughing companies), and that can be operated by one ploughman; also for grinding and cutting food crops, crop- loading, water pumping, etc.

Mr. W. Fennell, president of the O.L.A. in 1929.

The Association has also summarised, from Bulletin No. 5 of the Institute of Research into Agricultural Engineering, the electricity consumed and the cost of eight applications of electric power on eight British farms which vary from 70 acres to 380 acres (average 260 acres).

Papers read before this Association, within the year under review, included "Economic Rural Electrification," which mapped in an area of 72 000 acres within 12 miles of Aylesbury, Bucks (46 miles of 11 000 V three-phase distribuotin; 60 miles of 11 000 V single-phase branch lines) with a prospective demand from 175 farms and 30 villages, giving full details of capital cost involved and of revenue expected; and an able analysis of the "Hydro-Electric Power in Ontario," showing how Ontario has solved the problem of a cheap and abundant supply in an area devoid of coal, by transmitting power even 240 miles and there supplying it in bulk at less than a halfpenny. Appreciation of the value of this contribution has been demonstrated by its re-issue in the form of a pamphlet by The Royal Society of Arts.*

The Overhead Lines Association meets, by courtesy of the Council of I.E.E., at the Institution of Electrical Engineers on the third Wednesday each month at 5.30 p.m.—THEODORE STEVENS.

* * *

THE ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.—The 1929 Conference of the Association of Public Lighting Engineers had been arranged to take place at Bournemouth, Mr. Noah Wright, the Lighting Superintendent of that borough, being President-Elect. In spite of his regretted death last winter, the co-operation of Bournemouth Corporation made possible the retention of the arrangement to meet there. Mr. S. B. Langlands, the first President of the Association, was unanimously chosen to fill the chair of the Association for 1929-1930.

Opportunity was taken of the British Industries Fair at Birmingham in February to hold an extra meeting. Some useful Association business was done, and the President, Mr. J. F. Colquhoun, gave a talk, illustrated by lantern slides, describing his experiences as leader of the Street-Lighting Sub-Committee of the British delegation at the meetings of the International Commission on Illumination in America last year.

Mr. Langlands, in his Presidental address at Bournemouth, mentioned that the Association, now about six years old, had four honorary, 104 ordinary, 35 junior members, and 26 associates. Future activities outlined included a Research Committee, an organised effort to obtain more uniform and encouraging tariffs for the supply of electricity for public lighting, and a watch on provisions for the lighting of thoroughfares in any enactments concerning control of vehicular traffic on roads.

The papers read at Bournemouth discussed "Lighting and Rating"—not technical but financial difficulties hinder the improvement of street lighting, "Compromise in the Use of Illuminants for Public Lighting," the lessons from America for British street-lighting, and the possibilities of supplementing public by private lighting.

The exhibition of public lighting appliances showed many novelties.

Reference was made at Bournemouth to the growing recognition of the A.P.L.E. by kindred Associations and by public authorities. During the year the President of the Association was invited to be a Vice-President of the Public Works, Roads and Transport Congress, and the authoritative position of the A.P.L.E. in public-lighting matters at the Congress is now being recognised. The President is also, ex officio, a member of Council of the Illuminating Engineering Society.

The Association is being affiliated to the National Safety First Movement.

Largely as the result of the demonstration of the British Standard Specification for Street Lighting arranged by Mr. Colquhoun at the Sheffield Conference in 1928, the Street-Lighting Sub-Committee of the B.E.S.A., on which the A.P.L.E. is represented, is now engaged on the revision of that specification.

The A.P.L.E. is also represented on the Sub-Committee dealing with Traffic Control Signals.

The Association has representatives on the National Committee already preparing for the visit of the International Commission on Illumination in 1931. The A.P.L.E. is merging its annual conference for that year into the series of meetings to be held during the tour, and will arrange for the street-lighting sessions at Edinburgh. The prospect of the "invasion" ought to prove a healthy stimulus to the betterment of British public lighting.

Meantime, arrangements are in hand for the programme of the 1930 conference to be held at Leicester under the presidency of Mr. T. Wilkie, Superintendent of Public Lighting there.—E. T. STEWART.

* * *

THE ASSOCIATION OF MINING ELECTRICAL ENGINEERS.—The membership is keeping up, and the activities of the branches are maintained, papers read at the different meetings having led to valuable discussions.

The President at the present time is Capt. S. Walton-Brown, a prominent coal-owner in the North of England. The Treasurer is Mr. Roslyn Holiday, who is an active coal-owner in the Yorkshire District, and took the place of Mr. Alexander Anderson, of Flemington Electrical Works, Motherwell, as Treasurer,

Numerous meetings have been held to discuss the various current problems in connection with electricity applied to mining. The various publications of the British Engineering Standards Association have received the attention of both the branches and the General Council, and the Association's opinions have been communicated to that Association upon the different points.

Evidence was given by a representative of the Association before the Departmental Committee with reference to the qualifications of colliery officials, and the question of the Association's examinations has also received careful attention with regard to present-day requirements; also the question of the necessity for considering advanced education on the part of those who have the handling of the colliery electrical plant.

The annual meeting of the Association was held on July 5th, 1929, at Newcastle-on-Tyne, and was one of the most successful ever held, the attendance being considerably above the average. Numerous excursions and other functions had been arranged, and were fully appreciated by all those present; an official reception being given by the Lord Mayor on that occasion.—C. St. C. SAUNDERS.

Mr. L. B. Langlands, president of the A.P.L.E. for 1929-30.

* * *

THE DIESEL ENGINE USERS' ASSOCIATION.—Meetings have been held during 1929 at Caxton Hall, Westminster. Mr. Percy Still, Hon, Secretary since 1913, resigned and his place was taken by Eng.-Capt. J. Hope Harrison, R.N., on January 1st. In consequence of Mr. Still's resignation the offices of the Association were moved to 307, Abbey House, Westminster.

In accordance with the usual practice, an annual report on

* Journal R.S.A., Vol. 77, No. 4 013, October 18th, 1929. (Price to Non-Fellows, one shilling).

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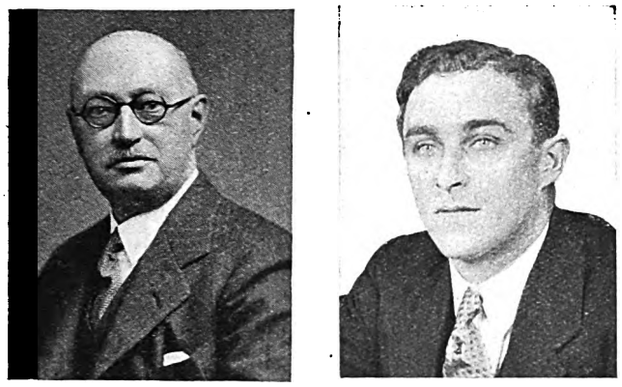
Heavy Oil Engine Working Costs has been prepared for 1929, and it is proposed to publish the report early in the new year.

The increasing favour which heavy oil engines are finding with electrical engineers for generating power in small stations and for peak loads, as well as for a number of other purposes, particularly water pumping stations, has considerably increased the numbers of members and subscribers, in spite of the fact that a number of small generating stations have been, or will be, closed in the near future.



Mr. W. H. Walton, president of the E.C.A. (1928-29), and Mr. L. C. Penwill, the general secretary.

In issuing the Report for 1929, the Committee will again refer to the operation of oil engine installations for peak load and stand-by services in conjunction with bulk supplies of electricity.

Members of this Association are scattered over the whole world, and a special feature is the report of proceedings which is circulated to all members and subscribers as soon as possible after each meeting, thus keeping those who find it difficult to attend meetings informed on matters discussed.

The Association is frequently consulted on matters connected with the purchase and maintenance of heavy oil engines, and is represented on British Engineering Standards Association Committees.

A standard insurance policy for the insurance of heavy oil engines against breakdown has been prepared by the Committee, and a standing Sub-committee on this question is maintained to deal with any questions that may arise.

The importance of such an Association has been recognised in America, where a similar society has recently been formed under the name of the American Diesel Users' Association.

Diesel users are at present interested in the problem of obtaining suitable fuel near home, and arrangements are now being made to carry out tests of fuel oils obtained from coal.—J. Hope Harrison and C. O. Milton.

* * *

The Electrical Contractors' Association.—It is impossible to give an adequate picture of the "progress" of such an organisation as the E.C.A. in a few hundred words. For example, to say that the membership of the E.C.A., the N.E.C.T.A. and the National Federated Electrical Association has been increased, during the past year, by the inclusion of seventy to eighty new individuals or firms, means nothing at all—or a very great deal—depending entirely upon one's personal conception of how many, or how few, installation engineers there are in the country who are eligible for membership, and yet remain outside the organisation. If we believe, as those within the Association certainly do, that the bulk of the sound installation men and firms in the country are already members of the E.C.A. and Allied Associations, then the membership "progress" already indicated is certainly very satisfactory, death and other wastage being taken into account. In other directions, however, the "progress" of the E.C.A must be singularly apparent to those who follow the work and activities of the organisation with any degree of real attention. During the past year, for example, the E.C.A. Bournemouth Conference attracted larger numbers and achieved a higher standard of business and social excellence than ever before. The best and most dependable electrical contractors in the country are, through the E.C.A., closer together to-day than ever before, and the consequence of that solidarity is exhibited, not only in the growing importance and success of the annual conferences, but also in the growing vigour of the Association's team work in many other directions.

In discussing the "progress" of the Association it is impossible to ignore the negotiations that take place with many Government Departments, while the work of the Association in connection with the administration of the Electricity (Supply) Acts represents a lengthy, but vital service, in the interests of ordered electrical trading. The story can be duplicated in many other directions. The negotiations that take place between the E.C.A. and the other organised sections of the electrical industry, from organised manufacturers to organised labour, involve the Association in an immense volume of work, and exhibit possibilities of very real good to all concerned. For another outward and visible sign of the "progress" of the Association, it is certainly permissible to refer to the publication of "Electrical Security," the new E.C.A. guide and handbook to better installation work; while yet another example of progressive team work is provided by the projected "Electrical Trading Register" which represents a constructive, forward movement of the greatest possible importance to all electrical traders.

To conclude, and to sum up in my opening words, it is wholly impossible to exhibit a picture of E.C.A. progress within the limit of five hundred or five thousand words. An adequate impression of its progressive labours is obtained only by those trade and public spirited men who come inside the organisation and carry on the good work.—L. C. Penwill.

* * *

The Electrical Wholesalers' Federation, Ltd.—The work of the Federation during 1929 has been directed to maintain the status of the wholesaler.

Knowing that the wholesaler is the legitimate channel and the most economical and efficient unit for the distribution of electrical supplies, our Council and Committees have fought strenuously for the "rights," not only of our members, but of the wholesale trade generally—and each section of the industry has been covered.

Our labours have had excellent effects, and many important concessions have been obtained. At any rate, the future holds out great hopes for our wholesalers. Issues such as hire purchase, preferential discounts, sale or return, and National Trading Register are some of the many subjects which have, and still are, being faced.

This much can be said with certainty. Between manufacturers (electrical and radio) and kindred associations there exist with our Federation the very best and helpful relations. We have fought hard and in unison with the manufacturers for clean trading, and to run the price-cutters to earth.

For 14 years the Federation's work has gone on. Its members include most of the leading wholesalers throughout Great Britain, and the Electrical Wholesalers' Federation has become utterly indispensable to the profitable success of the industry.—James W. McKay.

* * *

The Radio Manufacturers' Association.—The R.M.A. was brought into being on September 6th, 1926, and the first general meeting of members was held on December 8th, 1926, at which date 44 firms were on its membership roll. To-day, the R.M.A. claims the adherence of 152 members, and the Association has received general recognition as an organisation truly representative of the manufacturing side of the British radio industry.

Mr. J. W. McKay, secretary of the E.W.F.

Constituted on the principle of non-interference in the domestic trading policy of its members (which policy has been strictly adhered to) the R.M.A. has directed its attention to matters affecting the interests of radio manufacturers as a whole.

In such connection, the outstanding activity of the Association during the past year has been its negotiations with the Marconi Wireless Telegraph Co., Ltd., in the matter of royalty chargeable on receiving sets. Those negotiations have resulted in a new form of licence being agreed, to be known as

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the A.3 Licence, which the Council of the R.M.A. recommends the trade to accept as a standard form of licence. Holders of such licence will now pay a royalty of 5s. per valve holder as against the former charge of 12s. 6d. per valve holder—the reduced rate being effective as and from August 28th, 1928.

Sir William Bull, president of the R.M.A.

Through special Committees the Association is in close touch with the B.B.C. and the B.R.V.M.A., thus securing co-operative action in matters affecting the interests of the general body of radio manufacturers.

Friendly relations exist, also, with such bodies as the I.E.E. and the B.E.S.A., the R.M.A. being represented on several Committees set up by the B.E.S.A. for standarisation work.

As regards its Exhibition activities, the R.M.A. was the sole promoter, as in former years, of the National Radio Exhibition at Olympia in September last, the most successful show yet held, the paying attendance during its run of ten days reaching the figure of 140 627. The Association was connected also with the Manchester Radio Exhibition, and, further, is now arranging a Radio Section in the "Ideal Home Exhibition" at Olympia in the early part of next year.

Reverting to general matters, it may be stated that, as elected by members at the Annual Meeting, an Executive Council controls the activities of the Association, which are given effect to by Committees appointed by the Council, and acting under the chairmanship of a member of the Council.

In conclusion, it can safely be said that the Association's progress during the past year has been uninterrupted. Its membership roll includes the great majority of well-known radio manufacturers, its financial position is strong, and it faces the future with every confidence that its past success will be maintained.—D. Grant Strachan.

* * *

The Wireless Retailers' Association of Great Britain.—The remarkable progress that marked the preceding year has been repeated in 1929, so that in place of 500 the W.R.A. now voices the wishes of upwards of 1 000 organised radio retailers.

Various branches have been formed during the year; the South Wales W.R.A. has abandoned its independent status and become a branch of the W.R.A. of Great Britain; and other branches are in process of formation. The policy of encouraging the formation of branches has been justified by the highly satisfactory results obtained in dealing with local problems.

One of the principal objects for which the Association was formed, and towards which it has steadily worked, namely, co-operation with other sections of the industry, was realised during the past year, a period of careful negotiation resulting in the reciprocal understanding between the R.W.F. and the W.R.A.

It has long been evident to the administrators of the W.R.A. that improved trading conditions were to be attained only by the co-operation of the leading wholesalers, among themselves and with the W.R.A. Accordingly, the understanding embodies, amongst other provisions, the principle that in return for retailers confining their purchases as far as possible to members of the R.W.F. that body will supply only bona fide retailers.

The foregoing arrangement constitutes only one item in a large programme of co-operation which the Association hopes to carry out, and already overtures have been made to the R.M.A., which, it is hoped, may ultimately result in agreements having far-reaching results.

Anti-price-cutting and anti-dabbling schemes are in operation, and the stronger the membership of the W.R.A. the more effective they become. Additional schemes are under consideration.

Official certification of the Association as a Trade Union was obtained during the year.—A. H. Clifford.

* * *

The Radio Wholesalers' Federation.—It is common knowledge that the number of firms purporting to be radio wholesalers is excessive for the requirements of the industry, and one of the chief objects of the Federation, in conjunction with the manufacturers, is to secure that a list of wholesalers shall be compiled which can ultimately be regarded as authoritative. As a step towards this the Federation has issued a list of wholesalers comprising nearly 200 establishments, and this has been very well received amongst those manufacturers who are desirous that this matter shall be regulated. This list is considered to constitute an excellent guide to a manufacturer in organising his wholesale distribution.

Owing to the excessive number of firms claiming to be wholesalers, a pernicious system has arisen of competing for the favour of retailers by giving extra discounts, and that has had a deleterious effect on the whole industry, by the retailers in turn making equivalent concessions in price to the public, resulting in no benefit to either entity concerned, but only loss to the industry as a whole. The R.W.F. consider that if wholesalers maintain the proper terms this undesirable system will be checked, if not entirely eliminated.

Apart from these two main considerations the Federation exists to assist its members in many other circumstances of business. With the Wireless Retailers' Association of Great Britain, it has established an understanding aimed generally at defining the relative status of wholesalers and retailers, and at securing that this comparatively young industry shall operate on the lines proved successful in older industries.

In the short period of its existence—since March 1928—the Federation has succeeded in creating an atmosphere favourable to the attainment of its objects.—J. Macfarlane.

* * *

The Electrical Power Engineers' Association.—During the year the E.P.E.A. has continued to make steady progress; its membership has increased, and at the moment of writing has attained the figure of 4 400, whilst its financial position, with invested funds of £22 000, indicates a strong and substantial standing.

Of its activities during the past twelve months, the most important relate to its proposal for a revised schedule of salaries and conditions of employment. These were submitted to the employers' side of the National Joint Board in the early portion of the year, and have received close consideration by the Board. It is interesting to note that the revision has been brought about by, and is designed to meet the change of conditions in the electricity supply industry at the present time, as compared with the circumstances which obtained in 1923, when the schedule was last revised. At the same time the new schedule has been designed so as to cater, as far as can be foreseen, for the development which is likely to take place in the industry during the next few years.

Mr. A. G. Beaver, a prominent worker in the Electrical Manufacturers' and Merchants' Association.

On its technical side the association has met with great success with the scheme of technical groups which it instituted towards the latter end of 1928. Three groups—viz., London, Manchester and Birmingham are in active work, and, encouraged by the success of the previous session, have arranged programmes of technical lectures for the present session, which will be instructive and beneficial to both sections of the members of the groups—viz., the electrical manufacturing engineer who is responsible for the design and manufacture of electrical machinery and apparatus; and the supply engineer upon whom falls the burden, or otherwise, of operating such machinery. The lectures which have been held or are pro-

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jected, have been arranged to cover all spheres of activity in the industry.

In addition, the National Technical Group has organised many technical lectures to sections of the Association where a Local Technical Group has yet to be established.

On the protective side of its activities the Association has been energetic on behalf of certain of its members who have been displaced consequent upon the operation of the Electricity (Supply) Act, and its latest success in this direction is that recently it has been able to secure the sum of £2 500 in one case, and £450 in another, for members who had lost their employment as the result of a shutting down of a generating station. This award, which was officially given by the referee appointed by the Ministry of Labour, was the result of a mutual agreement arrived at after protracted negotiations between the company concerned and the Association. The expenditure of time and money caused by such negotiations emphasises very strongly the value to the member concerned, of such transactions being sponsored and conducted by an organisation, rather than individually.

It might also be mentioned in connection with this particular sphere of activity, that the Association has continued its vigilant watch upon all legislation introduced into Parliament, and has been able to secure in various Bills affecting the electricity (supply) industry, suitable clauses safeguarding the compensation clauses of the principal Acts, and thus protecting the interests of members who might otherwise be adversely affected by local legislation.

The social side of the Association's activities has also been well looked after, and in nearly every section of the Association it is now customary to hold annual dinners, smoking concerts, whist drives, etc.—W. ARTHUR JONES.

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THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—The records for 1929 will show a period of solid progress, not only for the A.S.E.E., but for the electrical industry as a whole. We have always appreciated that the success of the industry reflected on the position of the Association, and in our efforts to assist all movements for the good of the industry we have realised that we were really helping ourselves.

One of the outstanding points during 1929, as far as the Association is concerned, has been the great difficulty which we have experienced in supplying men for vacancies notified to the Association by employers and members. In fact, in a number of cases we have been unable to put forward nominations for various positions, which is a tribute to the standing of the Association and the exceedingly busy time experienced in the industry during the past months. It is therefore gratifying to report that the Association has not at the present time a single unemployed member, while it is also pleasing to record a greater recognition of the policy of employing fully experienced and qualified engineers in executive positions.

There has been a greater readiness on the part of employers to pay adequate rates of remuneration for such men, which is at least a realisation of the Association's policy, namely, that the employment of efficient men at adequate rates of remuneration is a good business proposition. The new Schedules of Minimum Salaries and Designations issued by the A.S.E.E. this year have no doubt played their part in this respect.

The need for lectures of a practical nature is shown by the ever-growing numbers attending the lectures of the Association, while such audiences are evidence that the supervising electrical engineer of to-day is more fully alive to the necessity of keeping himself *au fait* with everyday developments. Keener interest in educational matters has been one of the outstanding features of 1929.

The Association has naturally felt the benefit of this electrical liveliness, and its membership returns are well in advance of previous years.

The demand for efficient workmanship has been more insistent, and it would appear that employers and employees are paying more attention to the question of good materials, while there is a greater desire, so far as installation work is concerned, to recognise and to understand the Institution of Electrical Engineers Wiring Regulations for the Electrical Equipment of Buildings. The continued sales of "The Employees' Guide to the I.E.E. Wiring Regulations," published by the A.S.E.E., bears evidence in this respect, although some may interpret the sales of the booklet as a desire for more concise regulations. That greater interest is being taken in such regulations is all to the good and will reflect, in the long run, to the credit of the industry as a whole.

The progress in connection with the Suggested Scheme of Apprenticeship put forward by the A.S.E.E. has not been so rapid as many expected. This is not due to lack of effort on the part of the A.S.E.E., but our investigations have shown

Mr. H. Willoughby Ellis, the 1929-30 President of the E.C.A., and Mr. W. Finlay, Secretary of the E.C.A. of Scotland

that while all parties are alive to the need for some scheme of co-operation which will ensure a steady flow of skilled men to the industry, there are difficulties, which are not insurmountable, in connection with certain sections of the industry. Negotiations are, however, still proceeding, and we have every hope that by the end of the year further substantial progress will be secured. A number of Associations have already signified their support, but those experienced in committee work will appreciate how slow-moving this machinery is.

The emblem presented to the Association in October by the President, Mr. S. B. Donkin, crystallises our ideal by its inscription "Ease the Path to Progress," and there is reason to believe that this slogan is one to which the industry as a whole would subscribe.

To sum up, the year 1929 has been one of continuous success for the A.S.E.E., if by success we mean no unemployed members, the greater recognition of the principle of adequate remuneration for efficient labour, increased membership, increased attendances at educational and social gatherings, and an expressed desire on the part of all concerned to improve not only their individual progress but that of the electrical industry generally.—A. BRAMMER.

* * *

THE ELECTRICAL ASSOCIATION FOR WOMEN.—Undoubtedly the outstanding feature of the E.A.W. work during 1929 was the Conference arranged at the North-East Coast Exhibition, Newcastle-on-Tyne, during July, when, in addition to the women present from different parts of Great Britain, interesting papers were given by representative women from the United States, Holland, and Germany. This is the first time in the history of electricity that there has been an international platform expressing the woman's point of view on matters electrical. The Conference was opened by the President, Mrs. Wilfrid Ashley, and in the unavoidable absence of the Rt. Hon. Margaret Bondfield, M.P., a message from her was read by Dr. S. Z. de Ferranti. Not only did the exhibition authorities support the Conference, but the Lord and Lady Mayoress of Newcastle-on-Tyne were present at practically all the functions, and gave the delegates a civic welcome. The success of the Conference was very largely due to the splendid co-operation of the electrical engineers on the North-East Coast.

The number of E.A.W. Branches has been steadily increasing throughout the year, the total at the end of 1929 being 20, with a membership running into several thousands. It is a matter for congratulation that at each of these Branches a woman of outstanding eminence has been secured as the President, and on all the committees there are women representing such interests as Domestic Science, Girl Guides, Women's Institutes, National Council of Women, Smoke Abatement, Medicine, etc. In addition, women of all shades of political opinion are to be found in the ranks of the E.A.W., and in London the officers include all three of the political parties.

The work of organising the local Branches is carried out

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by women interested in the district, with, in most cases, the co-operation of the local electricity supply engineer, contractors and manufacturers.

The Association has continued to pursue its interest in the Outlet Campaign, although this has been largely merged this year in the E.D.A. Campaign. The E.A.W. have co-operated throughout the country in connection with E.D.A. in this campaign.

An outstanding feature of the year has been the educational work in connection with school teachers. A deputation was arranged to the Board of Education on June 24th, led by Mrs. Hammer, when the speakers included Miss Haslett for the E.A.W., Dr. Ferranti for the industry, and Miss Clarke and Miss Shaw from the teachers' point of view. Great interest has been aroused as a result of the deputation, and there are indications that a Summer School for Teachers will be held in 1930. In addition, the Headquarters of the E.A.W. has sent out a suggested Syllabus of Lectures for Teachers all over the country, and has also arranged for a number of conferences in London.

Miss C. Haslett.

While the Association does not set out to be an Employment Bureau, it is more and more being recognised as the authority for looking after the interests of women demonstrators and saleswomen for the electrical industry. Many employers have been put in touch with suitable applicants during the year, and advice has been given to applicants re training.

During the year the Association has expressed the woman's point of view on matters electrical in many ways, including a Deputation to the Committee set up by the Electricity Commissioners on "The Uniformity of Electricity Charges and Tariffs."

To attempt to give a complete outline of the work of the E.A.W. would occupy more space than the Editor has allowed, but suffice it to say that the organisation is daily answering queries and questions, and is acting as a general clearing house for women's interests in regard to electricity.—CAROLINE HASLETT.

* * *

THE ELECTRICAL CONTRACTORS' ASSOCIATION OF SCOTLAND.—The Association continues to progress, and may be truly said to represent the electrical contracting trade in Scotland. The membership is 270. During the past year, owing to the extension of supply to the smaller districts, a considerable number of small new businesses have been started in these districts, and quite a large proportion of these new starts have applied for admission as members.

The whole membership of the Association is comprised in four branches, located at Glasgow, Edinburgh, Dundee and Aberdeen, and country members are joined to the Branch that is nearest and most convenient to them. There are local secretaries in each of these four districts. The Association is governed by a Central Board, elected by branches according to their membership, and this Board meets once a month alternately in Glasgow and Edinburgh. At these monthly meetings reports from each of the branches are submitted. The central office of the Association is at 55, Frederick Street, Edinburgh.

During the past year no question has arisen which was of burning interest. In Scotland there is no sliding scale for the regulation of wages, with the result that for a good many years now the rate of pay has stood fixed at a standard sum.

The Association has always felt that more might be done in the industry to avoid trading differences which arise between the different sections of the industry as to their respective interests. The Association continues to impress on the other sections the desirability of setting up a Fair Trading Agreement which will provide machinery for the adjustment of disputes without unnecessary friction.

The relations existing in Scotland between contractors and the supply section of the industry have been most cordial, and throughout the whole four areas steps are always taken to co-operate in every scheme that will tend to extend the uses of electricity.—WALTER FINLAY.

* * *

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.—The year 1929 will surely go down to history as that which marked the real awakening of this Institution, and it is but right that it should, for next year marks the twenty-fifth anniversary of its inception; the child will become the man.

Last year the Executive Committee decided that the time had come when the affairs of the Institution called for the full-time services of a secretary, and the writer was chosen to fill this position.

Several new ideas have been introduced, and have proved most satisfactory. A competition was organised during the summer months, which instantly caught on and also kept the Institution before the industry during that part of the year when hitherto it has been content to slumber peacefully. This is but one of the many innovations which have been introduced during the year. The real stroke of genius which the Committee achieved, however, was in persuading Mr. Howard Marryat to become the president of the Institution.

Mr. Marryat, having accepted the position, threw every ounce of his well-known enthusiasm into his task; he brought his vast experience to bear on the matter, and he used to the full the affection and respect which every member of the industry bears to him. This cannot better be illustrated than by the way the members of the Electrical Contractors' Association rallied to his aid (incidentally, this Association already stands as a monument to Mr. Marryat's energies and abilities in the past) and organised functions and collections throughout the country.

The results achieved by Mr. Marryat are literally astounding; more than £9 000 was raised, the greater part of which will go to swell the capital fund of the Institution.

Perhaps a better idea of the benefit that this huge sum can confer may be gained from the fact that it represents eighteen pensions. Eighteen people who have hitherto existed in the precarious state of mind that is conveyed to them by the words "temporary relief" can now be told that their income for the remaining years of their life is assured; their terrible anxieties of the past can be put to rest by the word "Pension."

To a no less degree are the thanks of the whole industry due to those who have taken up a vice-presidency of the Institution by subscribing a sum of £500 or more to its funds—Sir Hugo Hirst, Mr. Dane Sinclair, Sir George Sutton, Sir T. Callender, Mr. J. A. Crabtree, Mr. M. Frankenburg—to these, and to the many others who have subscribed smaller amounts must the heart-felt thanks of these new pensioners be given.

Mr. Howard Marryat, 1929 President of the E.T.B.I.

There are, of course, others who give just as unstintingly to this good cause, who give all the year round of their time, their brains and their energy to ensure that the wheels of the Institution may continue to work smoothly and that its funds may be utilised to the best advantage. These are the members of the Executive Committee—Mr. E. A. Gatehouse (chairman), Mr. Justus Eck (vice-chairman), Mr. J. Y. Fletcher, Mr. A. G. Beaver, Mr. J. N. Stephens, Mr. J. M. Sim, Mr. S. D. White, Mr. E. E. Sharp, Mr. E. F. Johnson, Mr. L. C. Penwill, and Mr. J. E. Edgecombe—to these, in a no less degree than to those previously mentioned, must the thanks of the whole electrical industry be given.

One final word; a record has been made this year, but this money was very badly needed, and, in spite of this result, more is still needed to ensure that the Institution may continue its good work unrestricted. It is therefore hoped that readers will join in using every endeavour in the future, and help to place the finances of this very worthy cause on a safer and surer basis.—J. T. KEEPING.

* * *

THE ELECTRICAL TRADES' COMMERCIAL TRAVELLERS' ASSOCIATION.—The year 1929 has proved to be one of excep-

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tional progress in this Association, and at the end of this, its fifth year of existence, it can be said fully to have justified the cheery optimism of its founders.

Sociability, charity and mutual assistance have sufficiently appealed to electrical travellers to produce, during the past twelve months, an increase in membership of over 30%.

This sociability was amply demonstrated at the Association's annual dinner at the Connaught Rooms in February last, when a large assembly was presided over by the President, Mr. Arthur Chamberlain. But more recently their capacity for enjoyment was proved at the dinner dance, the second of the series, which took place at the Hotel Cecil on December 11th. The company, which numbered about 200, included several vice-presidents and well-known trade figures, and from start to finish everything went with a swing. The entire absence of speeches and the introduction of music during dinner proved a very welcome innovation.

The cause of charity, always warmly supported by this Association, has benefited in increased measure, contributions having been sent to the Electrical Trades' Benevolent Institution, the Royal Commercial Travellers' Schools, and the Commercial Travellers' Benevolent Institution.

Fortunately, calls for benevolence within the Association have been few, and the benevolent fund has been ample to provide timely assistance.

Cases of unemployment have been remarkably scarce, and here again the Association has been able to render valuable service through its Employment Bureau. This has in preparation a unique scheme, details of which will be published shortly. Suffice it to say, that it aims at being of as much service to employers as it should be to members.—J. W. WARD.

* * *

THE BATTI-WALLAHS' SOCIETY.—Founded in 1906 by the electrical engineers of the P. & O. Steam Navigation Co., Ltd., This society exists to promote social and friendly relations among the members, and to provide opportunities for meeting and entertaining.

The Society in 1922 revised its rules and, with a remnant of its former membership, decided that new members must be electrical engineers, who have, or have had, close association with the sea, either through the Royal Navy, the Mercantile Marine, or a recognised yacht, motor boat or sailing club. Every member is subject to re-election annually.

The new Society has gone on steadily growing, and the membership includes a number of eminent electrical engineers. Luncheons are held at intervals when a notable chief guest can be secured to address the company.

The Batti-Wallahs' Annual Ladies' Night and Ball is now one of the chief social events of the electrical engineer's year, and tickets are in great request. The next function of this kind is to be held at the Hotel Cecil, London, on Friday, March 21st, 1930.

The President for 1929-30 is Mr. H. L. Howard, and Mr. W. McClelland is vice-president.—M. WHITGIFT.

LIGHTING THE BODLEIAN.

FOR over three hundred years from its foundation in 1602 no artificial light of any kind was allowed to be introduced into the famous Bodleian Library at Oxford, though in 1913 the use of electric torch lamps was permitted for staff purposes. On account of this lack of artificial lighting, it was necessary in winter to close the reading rooms at 3 p.m., and this had always been a great inconvenience to scholars. The proposal to instal electric lighting into the Bodleian building was brought forward in 1926, and finally approved in the summer of 1929.

The contents of the Bodleian Library being of priceless value, quite irreplaceable and uninsurable, the most important point was to make the electrical installation perfectly safe, and also to convince the jealous guardians of this magnificent library that such could be done.

A scheme was therefore devised by which no flexible cords are used. The highest quality electric lighting wires enclosed in steel tubing are used, and these are conveyed to every lampholder, whether it be of a portable fitting, pendant, or other similar device.

All switches, lampholders and fittings of all descriptions are metallically and electrically connected to the conduit, and the whole system carefully earthed at many points, so that in the event of any improbable damage to an insulated wire, the only effect would be that the fuse protecting that circuit would "blow," and cut off the circuit from the supply until it was repaired. Under this system it is claimed that there is no possible chance of fire.

The system has been carried out throughout the reading rooms and the picture gallery, and very little conduit is visible, in spite of the fact that no walls have been chased and no tubing sunk or hidden anywhere, except under the floor boards.

In the Upper Reading Room and Picture Gallery, which are full of readers' desks and catalogue stands, as well as bookcases, two schemes were proposed :—

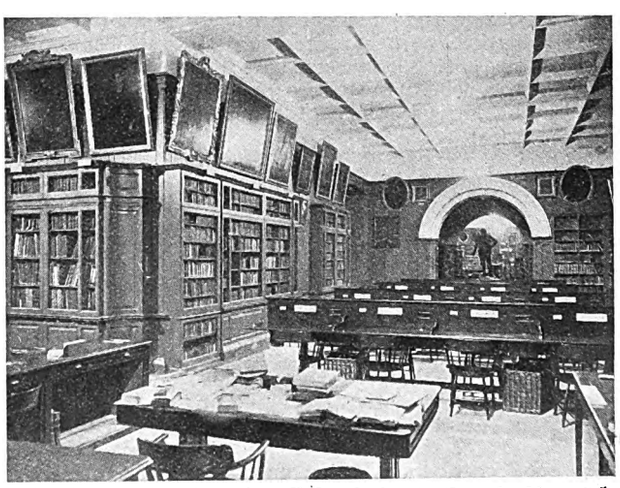
(1) To light each individual reader's desk strongly, and to provide a low general illumination.

(2) To provide a general illumination of high intensity, and no local illumination at all.

After discussion it was decided that the second arrangement was best, as it permitted the rearrangement of the desks, catalogue stands or bookcases without any alteration to the electric wiring.

After experimenting with many types of fittings it was found that the Holophane reflector refractor fitting was the most suitable, and each of these rooms, which are 172 ft. long and 26 ft. wide, is illuminated with nine reflector refractor units with 300 W lamps. The illumination from these is approximately 7 foot candles over the whole of the table surfaces throughout the two galleries.

These fittings are unobtrusive by daylight, and the shape



TWO views inside the famous Bodleian Library in which artificial illumination has just been installed. Owing to the valuable nature of the contents no lights of any kind were permitted until it was shown that electrical illumination would be perfectly safe.

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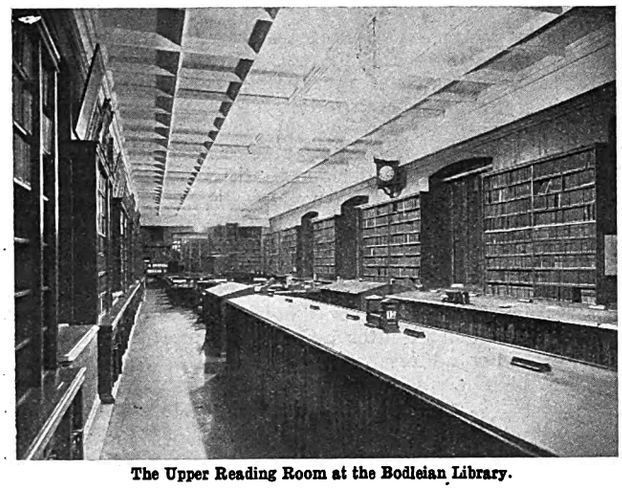
of the glassware and lines of the four supporting chains blend with the architectural features of the room. Each light is controlled by its own switch, the switches being grouped at the fuseboards, and under the control of the janitor.



The Upper Reading Room at the Bodleian Library.

One special feature of these fittings is that the circuit wires are continued down to the lampholder from the junction box in the ceiling, and are protected by a flexible metallic tube which is metallically connected both to the conduit and to the lampholder.

In the older part of the building, the Duke Humphrey's Library, with the Arts and Selden Arts, are treated in an entirely different manner. Here the ceiling is painted, and of great beauty. It was, therefore, decided that no work was to be done on these ceilings at all. At the same time their beauty made it desirable that they should be shown up at night by illumination.

The final design evolved was to put standards with wooden columns and heavily frosted enclosed bowls upon the tops of the projecting bookcases in the Duke Humphrey's Library, and on the tops of the gallery rails at the two ends. The effect is very beautiful, the ceiling being lightly illuminated; the floor area and bookcases also receiving a moderate general illumination.

This illumination, however, is not sufficient for the readers. Therefore, in each alcove in the Duke Humphrey's Library, short brackets with metallic reflectors are clipped to the book shelves, and certain of the desks in other parts of the Old Reading Room also have standards with metal reflectors. Thus the readers' and staff desks are brightly illuminated without the light straying from these lamps to the upper part of the Library and spoiling the general illumination by strongly marked lines of shadow.

The bookcases under the galleries are illuminated by a number of lamps with metal shades hidden under the mouldings.

In every case the circuit wires are taken direct into the lampholder, and each lampholder is connected metallically to the conduit.

The illumination and electrical specifications for this interesting installation were prepared by Messrs. Dolby and Williamson, consulting engineers, of 8, Princes Street, Westminster, S.W.1, whilst the entire electrical work has been carried out by Messrs. Hill, Upton and Co., George Street, Oxford.

A.C.E.C. ANNIVERSARY.

We have received from the A.C.E.C. of 56, Victoria Street, London, S.W.1, a copy of the company's quarterly review for July-September, 1929, No. 123. This number has been specially prepared to commemorate the 25th anniversary of the existence of the company under its present name, although the firm was originally founded under another name in 1886, that is 53 years ago. This publication, with its 117 pages and 130 illustrations, describing as it does the progress and development of the company's activities, should prove of considerable interest. The aerial photograph on page 29 of the review gives some idea of the extensions which have been recently built to cope with demands and machines of increasing size and it is interesting to note, in this connection, that the new extension of the heavy engineering shops is provided with a 150 ton overhead travelling crane of A.C.E.C. manufacture.

COAL HANDLING.

Demonstration of New Coal Wagon Introduced by the L.M.S.

REPRESENTATIVES of the Press, electricity authorities and undertakings, colliery officials, and coal transporters and users visited the London, Midland and Scottish Railway Co.'s generating station at Stonebridge Park on December 20th to inspect a new type of coal wagon and the coal conveying, steam raising and electricity generating plant in the station.

The new type of coal wagon is a great improvement upon those in general use, as it has a capacity of 40 tons and is discharged instantaneously without any appreciable manual labour.

The coaling arrangements at the station provide for the entire absence of any handling of the coal by hand. The coal is delivered from the sidings adjacent to the main line on to the gantry above the coal store in hopper-bottomed wagons which discharge the coal into concrete hoppers extending the whole length of the gantry. Beneath these storage hoppers are two continuous tray conveyors, each of 40 tons per hour capacity. These tray conveyors deliver the coal to bucket conveyors, which elevate the coal to the bunkers above the boilers. From these bunkers, which are capable of holding 2 500 tons of coal, the coal is fed through automatic weighing machines to the mechanical chain grate stokers of the boilers. Labour saving appliances are also installed for dealing with boiler ashes.

The boiler house contains 20 Babcock and Wilcox water-tube boilers, having an evaporative capacity of 25 000 lb. of steam each at a pressure of 210 lb. per sq. in. and 200 deg. superheat.

The generating plant in the engine room consists of four Westinghouse-Siemens turbo-alternators, each having a normal capacity of 5 000 kW and one Metropolitan-Vickers of 10 000 kW. The maximum steady demand over a period of half an hour has reached 21 000 kW, with peaks rising to 24 000 kW. The station has a load factor of nearly 50%, with a coal consumption of less than 2 lb. of coal per kWh generated and a thermal efficiency of over 16%, and it has for many years held the record as one of the most efficient and economical power stations in the country. The station was designed by the company's electrical engineer, Lt.-Col. F. A. Cortez Leigh, assisted by the late Mr. George Broughall.

Current is generated at 11 000 V, three-phase, 25 cycles, and is transmitted to 11 sub-stations, where it is converted to d.c. at 630 V for the traction supply. In addition to its employment for traction purposes, current is supplied to the Euston station and hotel for lighting, heating and cooking, and working lifts, to St. Pancras station and hotel, for working hydraulic pumps at Camden and Broad Street goods stations, and for numerous lighting and power installations in the London district.

COPPER WIRE.

Issue of Revised B.E.S.A. Standard Dimensions and Resistances.

A REVISION of British Standard Specification No. 128 has just been issued, and is intended to meet the needs of users of bare annealed high-conductivity copper wire for winding electric machinery and apparatus.

One of the principal differences between the new and the 1922 editions is that the tolerances permitted on the resistivity of the copper and on the diameter of the wire are smaller in the new edition. A further difference between the new and the old edition is that in the latter specification the tables showed the standard resistance corresponding to the standard maximum and minimum permissible diameters of the wires, whereas the tables in the new specification give the standard resistances of a wire of standard diameter, and show the *actual* maximum and minimum permissible resistances of all wires, irrespective of the variation in diameter from the standard diameter within the tolerance provided. In other words, the maximum and minimum resistances take account of both the tolerance on specific resistance of copper and the tolerance on standard diameter of wire, no further tolerance, therefore, being allowed on the values given in the tables in the specification.

Copies of this Specification, No. 128-1929, may be obtained from the Publications Department, British Engineering Standards Association, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

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CABLE RESEARCH.

Plant for Testing Behaviour of Super-tension Cables when Laid in the Ground—The Cable Testing Trenches—Measuring Devices.

SPECIAL plant and apparatus has been installed at Prescot by British Insulated Cables Ltd., for testing the behaviour of super-tension cables when laid in the ground, drawn into pipes, or disposed in any other manner required in service.

The principle involved in the tests is that of subjecting a cable to cyclic loading with superimposed voltage. By cyclic loading is meant the heating of the cable by means of current for a definite period to a predetermined temperature, followed by a definite cooling period without current, this process being repeated for a length of time depending on the nature of the test. The voltage is applied continuously during both heating and cooling periods.

It was considered of prime importance when laying out the plant that the cables to be tested should be laid as under working conditions, and no less important that the lengths under test should be at least full drum lengths. To this end a site of 3½ acres of ground was chosen and the building to house the plant was placed at one side. The length of the building is 160 ft., and in this length on one side nine concrete openings suitably protected from rain and surface water are provided. Through these openings the ends of the cables enter the building, where they are connected to terminals, and on the ground side of the openings the trenches containing the cables are arranged (Fig. 1). It is possible comfortably to accommodate in the space available 18 cables, each 220 yd. in length, without getting serious mutual heating effects. It is possible, however, to test lengths up to ½ mile.

Inside the building there are nine bays, each fenced with expanded metal sheeting, corresponding to the nine openings. For convenience of description these will be referred to as the first three, second three, and third three bays respectively. Each of the first three contains a 70 kVA single-phase voltage transformer which will supply any required voltage up to 25½ kV to earth, and three single-phase loading transformers whose secondaries are insulated for 25½ kV. The second three bays each contain a 100 kVA single-phase voltage transformer suitable for voltages from 19 kV to earth up to 47½ kV to earth. Also two of these bays are each provided with three

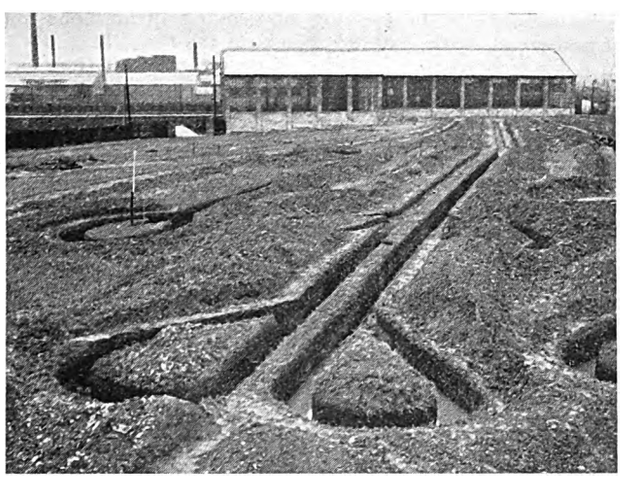

Fig. 1.—The cable testing trenches which have been made for use with apparatus for observing the behaviour of cables at the Prescot works of British Insulated Cables Ltd.

single-phase loading transformers, while the third has a three-phase loading transformer, part of an older plant used for this same purpose. The secondaries of all the loading transformers are insulated for the highest voltage.

All the voltage transformers, although connected to a three-phase supply, are separately controlled. This is a very great advantage when dealing with the three-core screened-type cable, as it is unnecessary with this type to apply three-phase voltage to the conductors. It is possible, therefore, in these bays to run six cables under six different voltages, instead of only the two which would be the case if three-phase were required. As, however, three-phase is sometimes necessary—overhead lines have been provided so that this may be done.

So far only the first and second three bays have been considered. The remaining three each contain one single-phase loading transformer only. The secondaries of these transformers are insulated for 200 kV, and have been put in with a view to future developments. In front of these third three bays, and separately fenced off, are three 400 kVA, 200 kV single-phase transformers (Fig. 2). The secondary windings

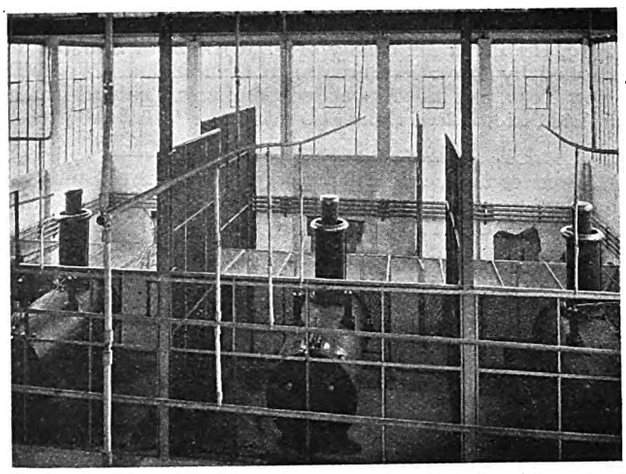

Fig. 2.—The 400 and 200 kVA transformers used for cable testing at the works of British Insulated Cables Ltd.

are arranged for series parallel connection, and the full output can, therefore, be obtained at 100 kV. These transformers are supplied from a 4-unit motor generator set consisting of 3 400 kVA single-phase sine-wave alternators driven by a synchronous motor. Excitation is from a separate exciter set with potentiometer regulators and each alternator can be separately controlled. The alternator stator windings are also arranged for series parallel connection, so that stability at low voltages with a cable load on the transformers is assured.

Adjacent to the three 200 kV transformers, ample floor space has been left where electrical breakdown tests and other special tests on short lengths of cable can be carried out. Although the transformers give only 200 kV to earth, it is, of course, possible by connecting two transformers to the same machine, or, alternatively, by adjusting the coupling between two of the generators, to apply 400 kV to a length of cable suitably insulated from earth.

One of the most important measurements made on a super-tension cable is that of dielectric loss and power factor. This is effected by the Schering bridge. Two reference air condensers of negligible loss are employed: one of 0·0001 μF capacity can be used for voltages up to 100 kV and one of 0·0003 μF capacity for voltages up to 50 kV. These condensers are fixed each in a screened chamber and by means of overhead lines, also screened by expanded metal cages, and connection can be made to any cable. Cables of low capacity connect the earth side of the transformers and condensers to the Schering bridge. For resistance measurements the Kelvin double bridge is employed; and cables of heavy copper section connect the bridge to the cables under test.

All high voltage connections are made by overhead lines of extruded seamless aluminium tubing made at the Prescot works. Two sizes are in use, one of 2 $\frac{3}{16}$ in. external diameter for the 200 kV plant and the connectors for the Schering bridge condensers, and one of 1 $\frac{3}{16}$ in. diameter for the remaining plant. Corona effects are thus made negligible.

For the measurement of voltage, some of the transformers have separate windings, while the older ones have tappings on the high voltage winding. It is necessary, however, to have a reference standard, and this consists of eight oil-immersed resistances, some or all of which can be placed across the voltage to be measured. The current through the resistances is then measured. Each resistance is in a galvanised iron tank mounted on insulators. The tanks are connected to tappings from a condenser potential divider, so that errors due to capacity between the resistances and earth are reduced to a negligible quantity. The maximum voltage which can thus be measured is 80 kV to earth. For higher voltages the sphere gap will be used.

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SCIENTIFIC DEVELOPMENTS IN STEAM-DRIVEN POWER STATION PRACTICE.*

Combined Low-temperature Carbonisation and Combustion with Coal in the Pulverised Condition—Some Interesting Tests at Worcester.

(*Concluded from page* 526.)

By DAVID BROWNLIE, B.Sc.

IN the field of combined low-temperature carbonisation and combustion with coal in the pulverised condition, much the most important process is the "M'Ewen-Runge," originated in 1919, the invention chiefly of S. M'Ewen, of London, and controlled by Messrs. International Combustion Corporation of New York, and the Associated Company, Coal Oil Extraction, Ltd., of London, along also with the "K.S.G." process.

Early Investigations.

M'Ewen commenced his investigations in 1919, and after several years experimenting in London the work was transferred to the United States, partly because of the difficulty at that time of obtaining properly pulverised coal in Great Britain, and continued by International Combustion Engineering Co., under the superintendence of Dr. Walter Runge. An experimental retort, consisting essentially of a single cylinder 30 ft. high and 12 in. diameter, the plant being about 48 ft. high overall, was erected in 1924 at the Lakeside power station, Milwaukee. With this installation much valuable work was undertaken, and in 1925 there was commenced the erection of a very large plant of 210 tons of coal per twenty-four hours throughput. This consisted of two cylinders, one above the other in series, and the complete installation with necessary accessories in the shape of condensing and by-product equipment, was started up in August, 1926.

All the finely divided low-temperature carbonisation fuel is burnt under the power station boilers instead of pulverised coal, and the tar and the light oil recovered in the usual manner with the gas stored in a gasholder and available for any desired use, including, of course, burning under the boilers.

It is stated to be the intention to run the whole of the Lakeside station on this principle of combined low-temperature carbonisation and combustion with pulverised fuel firing, amounting to over 2 000 tons of raw coal per twenty-four hours. Many thousands tons of coal have been put through the retorts at Lakeside, up to 270 tons of coal per twenty-four hours, and finally, in 1928, the plant was closed down for considerable alterations in the design as the result of the above experience.

In this pre-1928 plant the two cylinders were each 30 ft. high and 6 ft. 9 in. diameter, the upper being a pre-heating unit and the lower a carbonising unit proper. The coal is carbonised as usual for pulverised fuel firing, say, equivalent to 90% through a 100-mesh screen, and falls down in a continuous shower at the rate of 200-270 tons per twenty-four hours. In the upper cylinder the duration of the travel of each particle was 35 seconds, whilst heated combustion gas with excess air entered at the bottom at 850 deg. F., all the steam and low-grade gas being discharged from the top at 500 deg. F., the main object of this being to prevent undue expansion of the coal particles on carbonisation by slight oxidation and pre-drying.

In the second and lower cylinder the heating is also on the internal principle, by means of combustion gases with 35 seconds travel, the gases entering at about 1500 deg. F., and all the mixed gases and vapours leaving the top for the cooling and condensing plant at about 650 deg. F., the rich gases and vapours being mostly driven off at 1000 deg. F. or below.

So far as can be ascertained in the reorganised plant at Lakeside, the two cylinders have been converted into one very large cylinder, 70 ft. high, since two-stage heating is now regarded as unnecessary. Also alterations have been made in the arrangement at the bottom of the setting for heat interchange between the very hot coked particles and the incoming cold air for the combustion setting. Further, the exact operation can be modified, as desired, and, for example, if it is a better proposition to sell the gas, then the heating is carried out with re-circulated gas and a gas-fired regenerator setting to eliminate the bulk of the nitrogen.

In regard to low-temperature carbonisation by means of plants adjoining but not integral with the boiler settings, the processes at the present time under active investigation upon a large scale are the "Salerni" or "Salermo," and the "Wisner" or "Carbocite Dual Carbonisation." At the present time there is being operated at the Langebrugge power station, Ghent, a large "Salerni" retort of 75 tons of coal per twenty-four hours capacity, in conjunction with travelling grate stokers, following upon two small experimental retorts, but no details are available. The "Salerni" process is controlled in Great Britain by Messrs. Salermo, Ltd., of London, and a considerable number of other plants are at work, although not in conjunction with steam-power plant, such as d'Aubervilliers (Seine), near Paris; at Heinitz, in the Sarre; at Konjscina (Jugo-Slavia); and at Resiutta (Italy).

Just recently some interesting eight-hour tests have been carried out by Messrs. Salermo, Ltd., in connection with Messrs. Babcock and Wilcox, Ltd., at the Corporation of Worcester electricity station, using raw coal on chain grate stokers, and then, under identical conditions, the low-temperature fuel from the same coal, made in a "Salerni" retort. The net result is that with the actual boiler plant, as installed and operated at Worcester, the low-temperature fuel gives 14·5% increase in equivalent evaporation as compared with the raw coal.

[A large-scale experimental "Carbocite Dual Carbonisation" plant, believed to be of about 50–75 tons of coal per twenty-four hours capacity, is now in operation at the Philo Station, Ohio.]

In the matter of combined low-temperature carbonisation and partial gasification, it will perhaps be permitted to include a reference to the "Midlands Coal Products" process, because a power station plant on these lines has been operating at Nottingham for a number of years past, although using gas engines and not steam boilers. Essentially the process consists in briquetting non-coking bituminous coal dust and smalls with, say, 8% pitch on the usual lines, up to 30% coking coal being included if necessary, and then submitting the briquettes to combined low-temperature carbonisation and partial gasification in a vertical continuous retort by means of a regulated blast of steam and air.

This process is controlled by the Butterley Co. They have operated at the Kirkby colliery a number of different low-temperature carbonisation retorts, and, because of the lack of success, finally evolved their own process, forming eventually for the purpose a separate company, the Midland Coal Products Co., Ltd., of Nottingham. The intention was to erect in this area a large power station and to sell electricity, utilising all the small coal in a plant of twenty standard retorts, on the above principle of combined low-temperature carbonisation and partial gasification after first washing and briquetting. The gas was then to be used in vertical gas engines, direct coupled to generators with recovery of low-temperature tar and sale of a high-grade smokeless fuel for domestic and similar use.

Commercial Obstacles.

However, I understand the Electricity Commissioners refused to allow the station to be erected, and, as the town's gas monopoly also prevented the sale of the gas for town's supply, the firm, like many others, were up against a blank wall when trying to make low-temperature carbonisation and utilisation of low-grade coal a practical and commercial proposition.

However, they got round these obstacles to some extent by erecting a power station on private land, that is the Colwick Estates, Nottingham, and supplying electricity to industrial establishments on this estate only, since in such a case the Electricity Commissioners have no control.

Accordingly in 1922 there was erected a plant of four standard Midland Coal Product retorts, each of 25 tons of briquettes per twenty-four hours throughput, that is, 100 tons for the complete installation, along with two 750 kW gas engine and generator sets, to which was afterwards added

* Extracts from a paper read before the Glasgow and West of Scotland Branch of the Institution of Mechanical Engineers.

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a 1 500 kW set, comprising a total plant of 3 000 kW. This operated very well and ran from 1922 on partial load until July, 1927, when it was almost entirely shut down because of the lack of a sufficient demand for electricity. For this reason also the plant has never run at its full capacity, but otherwise the operation and general results are excellent, and the only trouble is to be allowed to use the gas to advantage.

Finally, a long consideration of the problems of low-temperature carbonisation, especially for bituminous coal, whether combined with power station practice or not, has led me to the conclusion that scientific methods of this description are vital to our existence as an industrial nation of the first rank, but that nothing of primary importance will be accomplished until we regard the development of the resources of our own country as of vital necessity.

THE NEED FOR RURAL ELECTRIFICATION.

Proposals for Expediting Development—An Additional Electricity Commissioner—Long-term Loans for Rural Line Construction.

By R. BORLASE MATTHEWS Wh.Ex., A.M.I.C.E., M.I.E.E. F.R.Ae.S.

IT is proposed to deal with rural electrification very briefly on the basis (*a*) that it will mean immediate work for many of the workless;* (*b*) that it will cause many of the town toilers to go back to the land and health; and (*c*) that it will convert farming from a pleasant pastime into an important business which plays a primary part in the nation's needs.

These objects, it must be admitted, are sound; the present question is, how are they to be attained? A careful examination of the subject shows that rural electrical development in the past has been hindered by the existence of artificial restrictions, and the removal of such unnatural hindrances is an easier matter than if they had arisen, say, through the physical configuration of the country.

One of the most important of these artificial restrictions is due to the development of electricity supply on ineffective lines, and the selfish restrictions of those suppliers within the boundaries of large towns; whereas, since each town depends to a large extent upon the rural area around it, the supplier should therefore attempt to meet the electrical needs of the neighbourhood.

In other words, the area supplied by the electricity mains of each town should be extended until they meet the areas supplied by the mains of the adjoining towns. The towns would of course raise many objections to this procedure, the most specious of which would be that it would not pay, and the writer would certainly agree with them if they were content with their present antiquated methods of management and entire lack of knowledge as to the best methods of supplying a rural area.

As a matter of fact, hardly any of these town suppliers are giving an adequate supply to their own residents. In one case, the chief engineer of a town pointed out to the writer a collection of three thousand signed applications for electricity supply which he was not seriously tackling in the way he should, bearing in mind that these were not possible, but rather, actual consumers if only they could get connected to the supply mains.

A practical remedy for the above is:—(1) that a survey of the electrical distribution of the country should be undertaken, with a view to the allotment of rural areas to the adjoining electricity suppliers who, technically and commercially, are best able to serve them; (2) after allotment, to see that arrangements are made, and the responsibility undertaken, adequately to supply each rural area with electricity. It is not sufficient to colour a section of a map and state that this is an area of supply, without taking more effective steps to ensure that this supply is actually available.

Education.—As has previously been indicated, it is to be feared that the management of most urban electricity supply undertakings has little practical knowledge as to how to develop rural electrification. To this end existing experience (of which there is a considerable amount available) should be collated and analysed, and then put into such shape as to facilitate the acquisition of the necessary knowledge by the above management. The educational policy, however, must be carried still further, in fact the general attitude of the greater part of the industry, from the Electricity Commission downwards, is to view the problem of rural electrification with some little interest, but to adopt a too cautious policy, which of course means that only in isolated cases is any headway made.

Considering the importance of the question, it does not seem to be too much to ask that one new member should be appointed to the Electricity Commission who is qualified by a special knowledge of the problem of rural electrification. Appointments to the Commission up to the present have been made from the ranks of those eminent gentlemen who are highly expert in urban electrical work.

It may not be out of place at this point to suggest that a Committee of Inquiry should be appointed to look into the procedure of the Electricity Commissioners. The delay which now takes place in getting Special Orders through is very serious, and it would appear that the Commissioners are nearly 200 Orders behindhand now, which is an absurd position when workless want work, and people are pressing for power.

Many supply undertakings have long since held the view that a Committee of Inquiry should be appointed, but they rather hesitate to express the view publicly, since so many of the Regulations under which they work have to be interpreted by the Commissioners. The work of the Commissioners is not under the control of any Department, as Parliament has given them full control, hence it is very difficult to get at them through Parliament. In fact it would appear that the control of Parliament is purely the somewhat negative one of objecting to any Order by way of "Prayer"; but as the Orders are now so voluminous, in practice it amounts to very little control indeed.

The writer is sure no one appreciates better than the Electricity Commissioners themselves, the enormous handicap under which they have to work, and, in fact, if they were permitted to do so, they could give most valuable advice on the reorganisation of their department and report upon the legislation which is hampering them at every turn.

Rural electrification is not entirely a rural question, but is, in fact, a national matter. No effort towards the economic reconstruction of rural England can be successful unless a supply of electricity is available. In industrial areas it has long since been realised that electricity provides the cheapest and most convenient form of power, and the time has arrived when similar facilities should be offered to those dwelling in the countryside. Rural electrification is no new problem, for it has been faced by many countries, and there are in the world to-day over a million farmers using electricity. The main advantages to be obtained from the use of electricity on the farm are:—

(1) The substitution of electricity for horse and manual labour will lower the cost of production. It will make it easier to bring under cultivation half-cultivated land, and so give employment and increased production.

(2) The use of electricity will have a direct bearing on increasing the production of the farm worker. The number of uses to which electricity can be put on a farm is very large; in fact, the writer has compiled a list of over 300 uses that he has actually seen in operation on farms, while on his own 600-acre farm at East Grinstead he uses it for 67 different purposes.

The part which a supply of electricity will play in the development of rural industries is indeed great, whilst a supply would also attract a large number of industries from the town into the countryside. Many of these industries should, from an economic point of view, be situated in the countryside if an ample supply of power was available. Not only would this give the farmer more labour to draw from, but would also remove one of the greatest tragedies of modern life, namely, the herding together of a large number of people in unhealthy industrial areas.

A supply of electricity would also raise the standard of living

* The actual work of equipment will give employment in both town and country.

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of the rural dwellers. This is especially true in the case of agricultural labourers. Their homes could be lighted by electricity, and many of the amenities now enjoyed by those residing in urban areas could be theirs by the use of small appliances operated by electric power.

The labourer's wife to-day has to do her work at night by the use of a miserable candle or evil-smelling oil lamp, which the children can knock over, and set the whole place on fire. It is estimated that it costs an agricultural labourer about £2 12s. per annum for paraffin oil to light his home. Electric light could easily be provided at this cost; in fact, in some cases the cost would be considerably lower. Then also all children, especially those of school age, are all the better for a good light in the early darkness of winter. Incidentally it must not be forgotten that water supply is largely facilitated if electric power is available to pump it.

The Electricity Commissioners and Unemployment.

It is of little avail discussing the question with farmers and power supply undertakings, if those in authority are not keenly interested in the problem. The Electricity Commission recently issued a Memorandum on Schemes for the Relief of Unemployment, in which they report on their discussion with representatives of the electricity supply industry, in regard to the amount of employment which could be provided by the industry. The Commissioners' comments, however, refer exclusively to urban development. They state that in built-over areas in urban districts it is proper to lay mains in any street in which there is reasonable prospect that within three years the annual revenue will defray the actual additional outgoings, that more undertakers should provide schemes of assisted wiring, etc., and that larger mains should be laid in residential areas to cope with the larger demand, but there is *not one word about rural development*. Here is an opportunity for schemes of work, and if loans, guarantees and grants are to be made, the rural dwellers have at least as much, if not more, right to consideration as their urban neighbours. In a speech Mr. Lansbury once stated that "Miles and miles of the best land in the world (referring to England) cries out for cultivation." Electricity will make that possible.

In conclusion, the writer would say that, as this question is of such wide national interest, the Government should consider the following recommendations, and where possible introduce some form of legislation to deal with them:—

(1) Some form of long term loans at low rates of interest in the initial years should be arranged for the construction of rural lines, for until a load is developed as a result of educational work it is difficult to make the lines remunerative.

(2) Those authorities who obtain such loans should be compelled to undertake educational publicity campaigns in the use of electricity in rural areas, and start repaying the loan as soon as the revenue permits.

(3) Those undertakings now holding Orders to supply in rural areas should be compelled to prepare schemes which will fit in with the national programme of development of the rural areas.

(4) Vested interests, from wayleaves upwards, should not be allowed to hold up such schemes of public service.

(5) Overhead lines should be erected with no more restrictions than are considered necessary with any other public utility service.

(6) An inquiry should be held into the procedure of the Electricity Commissioners.

(7) At least one member of the Electricity Commission should be an expert on rural electrification, and he should be given sufficient authority to take such action and employ such civilian staff as may be deemed necessary to produce effective results as quickly as possible.

A NEW HOUSE ORGAN.

MESSRS. WALKER BROS., electrical engineers, Temple Row, Birmingham, have started the publication of a house organ, "The Electrical News," which is distributed gratis by post. No. 2, just issued, is a special Christmas shopping number, and contains interesting chapters on "Coal or Imitation Coal," "Safety First Rules," "Litlux Comfort," "Radio News," "Our Employees" and "Ourselves," all of which are presented in an attractive form and are calculated to give the householder a livelier interest in electricity for domestic purposes. There is a brightly illustrated feature on Christmas and New Year presents and a useful electrical information bureau. The journal is extremely popular and has been the means of bringing the firm increased business. It is well printed on art paper.

CONDENSER TUBE CORROSION.

Progress in Manufacture of Tubes which are Immune from Attack.

A TROUBLE with which many power station engineers are faced is the liability of condenser tubes to corrode. One of the anxieties attaching to this phenomena is the fact that its occurrence can never be anticipated, and frequently it occurs at times when it is most inconvenient to shut down the plant for a temporary isolation of the affected tubes.

Engineers who suffer from this trouble will be interested to learn of the progress which tube manufacturers are making in the production of tubes which are immune from corrosion attack. Amongst the manufacturers whose efforts have been successful in this direction is the firm of Allen Everitt and Sons, Ltd., of Smethwick, who are the producers of the "AE" super nickel condenser tubes, and the pioneers of cupro-nickel for this purpose.

So satisfactory have cupro-nickel tubes proved themselves in service, that the British Admiralty has entirely abandoned the use of brass tubes for warships, and the specification now calls for cupro-nickel containing not less than 30 per cent. of nickel. All new British warships built within the last two or three years have had their condensers fitted with cupro-nickel tubes. The lead given by the British Admiralty has been followed by all the principal Continental navies.

A more recent development in the production of corrosion-resisting tubes is that of aluminium bronze tubes, or, to be precise, aluminium brass tubes. These tubes contain approximately 76 per cent. copper, 2 per cent. aluminium, and the remainder zinc. The alloy is one which has been produced as the result of research by the British Non-Ferrous Metals Research Association, being produced under licence from that Association, which holds the patent rights.

It cannot be claimed that the aluminium brass tubes are as good as cupro-nickel for their corrosion resisting properties, yet they have proved themselves to be far superior to either 70/30 brass or Admiralty alloy, and both the laboratory and service tests indicate that they can be safely adopted for use under conditions which render the use of brass tubes undesirable but which are not sufficiently severe to necessitate the use of the more expensive cupro-nickel tubes.

COAL MINE LIGHTING.

The Relation of Output to Good Illumination Conditions Below the Surface.

DR. W. Zwanzig read a paper on "Coal-face Lighting," at the Midland Institute of Mining Engineers on December 12th. He said attempts to light coal-faces in safety lamp pits efficiently were brought to a standstill by the Coal Mines Act of 1911, which prohibited lighting circuits with semi-permanent lamps within 300 yards of the coal-face. A minimum of 10 ft. candles on the coal-face was necessary, but the ordinary safety lamp only gave from 0·2 to 0·5 ft. candle. In a mine in Lower Silesia the use of 70 W lamps showed an increased output, and 150 W lamps gave a further increase. Mr. G. F. F. Eagar said the prohibition of semi-permanent lamps within 300 yards of the coal-face was not a part of the Act, but was a regulation under that Act, which could be varied by an Order of the Mines Department. Dr. G. Allsop, of the Safety in Mines Research Board, said there was the possibility of a broken lamp glass exposing a hot filament. It would also seem that the flexible cable was a source of danger. The Safety in Mines Research Board had devoted considerable attention to the problem of providing an automatic switch that would cut off the power should a lamp glass be broken, and to devising means of protection for flexible cables. Such progress had been made with the cable that an experimental length had been installed underground. In order to prevent the cutting of the rubber insulation from exposing live cores in a trailing cable, light pilot wires had been incorporated in the insulation surrounding the cores. In the event of the cable being damaged, the pilot system was severed, and the main switch was tripped before the cores were exposed or severed.

Imports into the Irish Free State in September, 1929, included electrical goods valued at £61 571, compared with £52 020 in September, 1928. Exports from the Free State during the same month included machinery and electrical goods valued at £24 876, against £7 800. During the nine months ended September, 1929, imports amounted to £448 768, against £337 941.

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STEADYING FREQUENCY.

New Instrument for Use on Large Power Systems.

[CONTRIBUTED.]

THE tendency in up-to-date power stations to have bigger and bigger units and to adopt all sort of devices to promote efficiency and reliability means also that, though the cost per kW installed is perhaps decreasing, the cost of each individual unit and of the whole station is rather on the increase.

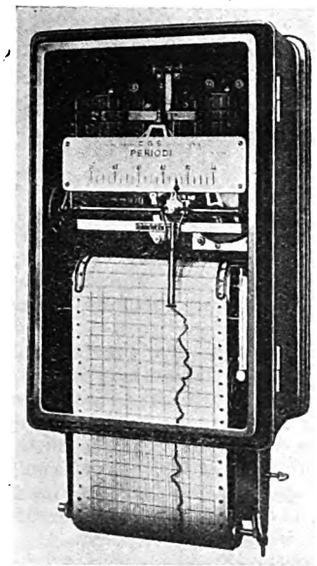


Fig. 1.—The new Frequencygraph.

Every precaution should, therefore, be taken so as to ensure smooth running of the plant, and so reduce to the minimum the risks of losses through stoppage and breakdown.

One of the precautions, however, generally neglected, is to ensure a steady frequency. This omission is probably due to the widespread opinion that, in large plant due to the use of very large generators, the frequency is obviously steady. Though this is so when under normal conditions, it cannot be so during some critical periods. For instance, during the switching on and off of heavy loads, partial breakdown of cables or of units, accidents, etc.

It is then that the machines are subjected, though only temporarily, to enormous mechanical stresses which each time bring nearer the risk of a final breakdown.

The importance of watching closely these abnormal variations of frequency during the whole of the 24 hours is therefore apparent.

The electric clock system as introduced during the last few years, though useful for other purposes, cannot properly fulfil this task. It gives no indication of the rapid variations of frequency, and the fact that the clock shows the correct time does not necessarily mean that the frequency has been correct all the time. The attendant is inclined to compensate any deviation from the correct time simply by tampering with the machine speed. So that, with this device the machines may, strictly speaking, practically never be running at the correct speed; the percentage of variation being dependent on the attendant amount of care.

A new type of C.G.S. Frequencygraph (see Fig. 1) patented and manufactured by Messrs. Istrumenti di Misura "C.G.S." of Monza, Italy, seems particularly free from imperfections generally connected with frequency recorders.

Its torque and sensitivity are considerable, and, as all important causes of mechanical friction are overcome by the motor-relay system, its accuracy, robustness and reliability are quite remarkable without the necessity of placing a heavy burden on the instrument transformers.

The scale is well spread out, two cycles being made to occupy the whole 6 in. width. Even small variations in the frequency are, therefore easily detected, measured and recorded.

Fig. 2 shows a diagram of the working principle. A sort of Kelvin balance arm is balanced on B and carries a contact arm C free to close an auxiliary circuit, either at E or at E'. But, while one circuit consists mainly of an ohmic resistance R, the other is made up chiefly of a fixed inductance L', and of a variable inductance L.

Both are connected in parallel to the line, and are so arranged as to balance each other for a given frequency. Should this vary, the equilibrium is then broken, the contact arm C will close one of the circuits and the motor F will turn in such a direction (through gear G, endless screw H propelling the block I carrying both pen and pointer) as to readjust the inductance L, and therefore re-establish the equilibrium in the balance arm.

This specimen is made for 110 V 50 cycle supply (both for the measuring portion and for the motor-relay system) with a scale arranged for the interval 49-51 cycles, the divisions being uniform.

A few points of interest are: The contact system is designed so as to allow, not only easy inspection (both contacts can be taken out and replaced exactly at a pre-determined position within a few seconds), but to allow also, whenever desired, the suppression of the very small variations on the graph.

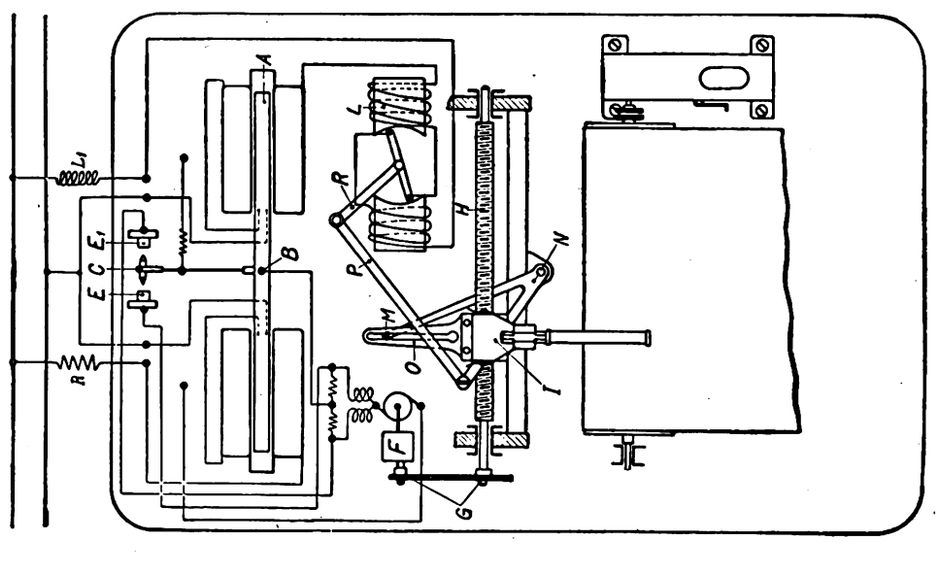
An effective spark-absorbing device is used, so that cleaning of the contacts is required only at very long intervals. The instrument is independent, up to 20% of voltage variations, and, in practice, is not influenced by wave-form or by temperature changes. Its sensitivity and its sustained accuracy are rather astonishing, especially considering its extraordinary torque, its robustness and the fact that it is not meant to be a scientific instrument, but only a really serviceable Frequencygraph for power station use.

The chart is 120 ft. long, is of the straight co-ordinate type, and is driven by an 8-day clock, supplied with a change-over lever for two speeds. To facilitate readings the chart is timed so as to correspond to millimetres per minute. Any speed from 15 up to 300 millimetres per hour can be selected.

The ink is brought to the paper through a sharp steel-blade drawing pen fed from a totally enclosed ink-holder. Ink refilling is required only about every three weeks. The whole instrument is quite compact and takes up little room. An automatic switching device can also be built in to operate speed regulators, signals, etc.

It is understood that a specimen instrument will be demonstrated at the coming annual exhibition of the Physical Society in London next month.

The diagram on the right (Fig. 2) illustrates the working principle of the new Frequencygraph described in the accompanying notes. A specimen of the instrument will be demonstrated shortly.



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BOOK REVIEWS.

Estimating. By T. H. Hargrave. (London: Sir Isaac Pitman and Sons.) Pp. viii+120. 7s. 6d. net.

Described as a manual for engineering students, draughtsmen, cost clerks, foremen and works managers, this book is mainly intended to give to young engineers an insight into the commercial side of the business, and particularly that section that deals with the preparation of estimates. The compilation of estimates is essential to practically every establishment, and no matter what the type of manufacture, whether light or heavy, simple or complicated, an analysis of the various items along the general lines indicated in the book should enable the young engineer to produce an estimated cost to a very close degree of accuracy. L. B. T.

Kurzes Lehrbuch der Elektrotechnik. By Prof. Adolf Thomalen. Tenth Edition. (Berlin: Julius Springer.) Pp. viii+359. Price: M. 14·5.

It is scarcely necessary to praise a book that has reached its tenth edition. Published first in 1903, this work has now become one of the standard textbooks on electrical technology in Germany. Since, in the space of 359 pages, practically the whole range of heavy electrical engineering is reviewed, it will be understood that to do more than "touch upon" many of the branches would be out of the question. This is not intended to convey that the treatment is in any way superficial, but rather that the book is not a treatise. It is also doubtful whether many parts would be intelligible to a beginner without a teacher. For example, Kirchhoff's laws are dismissed in a page and a half, while eight pages only are given to electro-chemistry, no attention being paid to the nickel-iron cell. Commutator windings are dealt with on orthodox lines, but in view of what may now be regarded as standard practice, subjects of this kind in a general work might well be given a simpler and more up-to-date treatment. The same remark might also be applied to the treatment of direct-current machines. Voltage regulation, static balancers, speed control of motors are among the subjects which call for fuller treatment, while such matters as the series generator can be dealt with rather more summarily when space is limited.

Networks are treated both analytically and graphically, and our pleasure increases as we reach alternating currents. The student is soon introduced to realities in the form of harmonics. He may possibly resent the introduction of the symbolic method (or complex method, as it is now called in Germany), but he will soon appreciate its powerful aid in solving problems on complicated circuits, distributed inductance and capacitance, current load inversion, etc. Unbalanced three-phase loads are treated graphically, while transients and travelling waves receive attention. The sections on alternating-current machines have been kept up-to-date by the insertion of such matters as the double-cage rotor. The economical speed control of induction motors is rarely dealt with satisfactorily. The treatment is usually incomplete, while the subject is seldom handled in a critical manner. An inexperienced reader might well conclude that certain methods or devices are widely used, though actually they are scarcely referred to outside of textbooks. The same remark applies also to alternating-current commutator motors and variable-speed sets. A section on the mercury-arc rectifier has been added.

The book is well made, the text, illustrations and binding being of the high standard associated with Springer. As an introductory textbook and for those desirous of improving their knowledge of technical German, the book can be heartily recommended.

S. Parker Smith.

Theory and Practice of Alternating Currents. By A. T. Dover. (London: Sir Isaac Pitman and Sons.) Pp. xv+539. 18s. net.

The author explains in the preface to the second revised edition that his original intention to write a single-volume general text book dealing with the theory and practice of alternating current engineering proved too wide a matter for adequate treatment in that form. Consequently, the present volume is devoted to general principles, circuits, polyphase systems, non-sinusoidal wave-forms, the magnetisation of iron, instruments, measurements, and an elementary treatment of the initial condition in the simpler electric circuits. As a thorough grounding in the principles of alternating currents is a desirable preliminary to the study of alternating current machines and apparatus, this portion of the subject is treated on a broad basis.

Special features included in the volume comprise an extended application of the circle diagram to series, parallel series, parallel circuits, the reduction of the general circuit to its equivalent series—parallel form and the development of a locus diagram therefor; the calculation of currents in unbalanced polyphase circuits and the determination of the neutral point potential in the case of unbalanced star connected three-phase circuits; the theory of the principal types of a.c. measuring instruments; and a large number of worked examples in the text. For these examples, analytical, graphical and complex algebraic methods of solution have been employed, and in some cases alternative methods of solution are given so as to show the student the steps involved in the application of the alternative methods. Over 300 illustrations are included.

L. D. B.

ELECTRIC BATTERY VEHICLES.

Revision of British Standard Specification for Charging Plugs and Sockets.

In view of the increasing use of electric battery vehicles and the more adequate provision of charging facilities, particular interest attaches to the revision of B.S. Specification No. 74, dealing with charging plugs and sockets, which has just been issued.

The new specification differs from the previous edition mainly in the fact that the plugs and sockets are rated for use on circuits up to 250 V, whereas in the old specification the plugs were suitable for use on circuits up to 120 V only.

Considerable attention has been paid to the means for securing interchangeability, and the gauges have been redesigned for this purpose. The specification does not attempt to lay down a rigid design, and only the dimensions essential to ensure interchangeability are rigidly standardised.

Tests are laid down to ensure the employment of satisfactory insulating material, and the means for gripping the cable are also referred to.

Copies of this specification (No. 74—1929), may be obtained from the British Engineering Standards Association, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

CORRESPONDENCE.

The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Standardised Page Sizes.

[To the Editor.]

Sir,—I am pleased to see our good friends the I.S.B.A. are again pressing upon publishers the advantage of a standardised page size.

It is also pleasurable to note that since last I corresponded with you on the subject, no fewer than three existing journals have come into line with a page of standard proportions.

Further evidence of the beneficial value of the I.S.B.A. propaganda may be gathered from the following:—

A new monthly paper, to be called the "Municipal Review," will make its appearance next month, with a page size of 10 in. by 7¼ in. Following my usual custom I am using standard 10 in. by 7 in. advertising blocks in its pages, thus tying up with the considerable majority of papers, amongst which is your own, which recognise the standard measurements.

I may say that when considering the proposals of a new journal for advertising purposes, its dimensions have a somewhat important bearing on the question, in that the acceptance of the standardised page by its proprietors, indicates to me that they are, in that respect at any rate, up to date.—I am, etc.,

W. McWilliam,
For The British Electric Transformer Co., Ltd.

Physics has become more and more incomprehensible.—*Prof. O. W. Richardson.*

* * *

The English market is the foreigner's excursion traffic, and electrical manufacturers can no more live on the basis of foreign prices than can English railways live by carrying all their passengers at excursion rates.—*Sir Felix Pole.*

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NEWS IN BRIEF.

Manchester and Hired Cookers—Poplar's Electrical Burglars—British Telephone Progress —The Alexandria Power Station—Electrical Women.

A MAINS superintendent is wanted by Barnes Urban Council. In the Hull electricity department an engineering assistant for sub-stations is required.

The annual dinner of the Western Centre of the I.E.E. will be held at the Royal Hotel, Cardiff, on January 13th.

The number of hired cookers connected to Manchester Corporation's mains during October was 96, making a total of 5 701.

The official inauguration of the new X-ray installation at the Colwyn Bay and West Denbighshire Hospital, by Lord Colwyn, took place recently. The installation cost £1 300.

Walsall Watch Committee has decided to instal automatic traffic control signals, at an estimated cost of £170, at the junction of Lichfield Street, Denmark Road, and Littleton Street.

Stoke-on-Trent Housing Committee has decided that a provisional rent of 18s. 8d. per house per week, exclusive of rates and water charges, be fixed for eight all-electric houses at Hanley.

Burglars recently entered Poplar Borough Council's main electrolytic depot, Violet Road, and removed platinum wire from a number of electrodes. The loss amounts to between £80 and £90.

Burnley Electricity Committee has authorised the purchase of an amplifying apparatus, or public address equipment, for use on public occasions, from the Standard Telephones and Cables, Ltd., at a cost of £129.

The late Sir James K. Caird left £200 000 to be held in trust for the foundation of travelling scholarships in engineering, electricity, aeronautics and music. There will be junior and senior scholarships in each subject, the minimum and maximum of each junior scholarship being £50 and £100 and of each senior scholarship £250 and £600.

A paper on "Petrol-Electric Vehicle Characteristics" will be read by Mr. H. K. Whitehorn before the South Midland Centre of the I.E.E. on January 13th, and before the North Western Centre on January 22nd.

Tynemouth Electricity Committee has agreed that a shop at the corner of the Town Hall buildings, with the room above, be taken over for demonstration and lecture purposes and for receipt of payment of electricity accounts.

St. Pancras (London) Electricity Committee recommends the provision of office accommodation on a site in Pratt Street. The committee is of opinion that the most suitable scheme is to erect a building three storeys high, estimated to cost £9 660.

A large party of London members of the Electrical Association for Women visited the showrooms of Berry's Electric, Ltd., on December 18th, where a short talk on electric cooking was given by Mrs. A. Mole, and a lecture on water heating by Mr. Painton.

Bedford Electricity Committee is to adapt and equip premises in High Street for a showroom and offices, at a cost of £3 000.—The Committee recommends that the electric standards in various roads be equipped with a new and improved type of lantern, at an estimated cost of £200. In due course it is proposed to improve the lighting equipment throughout the remainder of the town.

Clitheroe T.C. has agreed to the new school in Chatburn Road being heated by electricity.

Demonstrations of lighting and cooking by electricity were given recently in St. John's Hall, by Preston electricity department.

All shops and offices in Lisbon, except banks, recently closed their doors for 24 hours as a protest against the increase of prices by the electricity supply company.

Bedford Education Committee has decided to instal at the Ampthill Road School the tubular electric heating system, at a cost, including wiring, switches, etc., of £761 18s.

Eston Electricity Committee has received a report from the Electrical Engineer with regard to wireless eliminators, but has decided that the time is not opportune to institute a service in connection with them.

At Manchester last week a large crowd watched the new device, operated by pedestrians, for the control of road traffic. There was at first little inclination to use it. At last a schoolboy pressed the button, brought the traffic to a standstill, and then disappeared in the crowd. After that the signal was brought into regular use.

The number of telephone stations in the Post Office system at September 30, according to the "Telegraph and Telephone Journal," was 1 814 263; increase for the month, 10 336. Of the total, 161 623 were in Scotland, and 22 448 in Northern Ireland. London's share was 647 967. increase, 3 527 for the month Inland trunk calls dealt with in July numbered 10 653 433, an increase of 1 150 626, or 12% over the total for the corresponding month last year. Outgoing international calls in July numbered 46 774, and incoming international calls 49 742, increases of 11 031 and 11 236, respectively, over July, 1928.

The Metropolitan Carriage, Wagon and Finance Co., has been given a contract for enlarging the electricity generating station at Alexandria, the amount of the contract being £E67 000.

As a consequence of the recent gales, the Western Union Telegraph Co. announces that it is improbable that the New Year greeting traffic between this country and America can be handled as expeditiously as in a normal year.

Shipley Libraries Committee has received from the District Council's electrical engineer schemes with estimates of cost, for the lighting of the Victoria Hall. The committee will visit various halls where modern schemes of lighting have been installed, before coming to a decision on the matter. In the meantime, the Electrical Engineer will arrange for the temporary additional lighting at the hall.

In a paper on "Engineering from Cape Town to Kenya," submitted to the Edinburgh branch of the Scottish Centre I.E.E. last week, Prof. F. G. Baily, of the Heriot-Watt College, said in East and South Africa electricity was produced entirely from coal, the Rand alone absorbing 200 000 kW. The Victoria Falls Co. had no connection with the Victoria Falls. Although probably a minimum of a quarter of a million horsepower could be obtained from the Falls, there was no market for it, except at so great a distance that coal was the cheaper method.

L

LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN *dated December 27th, 1879:—*

Electric lighting was being used in the Christmas decoration of shops, and the Bridge House Estates Committee was considering "the practicability and advisability of lighting London Bridge by the electric light."

The perfection of an electric divining rod was reported from America.

An electrically-operated organ was being built for the Cathedral at Garden City, Long Island. A feature of the building was to be a large window which could be opened or shut by electrical means.

* * *

FIFTEEN years ago THE ELECTRICIAN *of December 25th, 1914, recorded that:—*

The use of any lights whatever for outside advertising or for the illumination of shop fronts in London was prohibited.

The Electric Vehicle Committee was endeavouring to secure a uniform rate of 1d. per kWh for charging vehicle batteries during off-peak periods.

* * *

TEN years ago, it was reported in THE ELECTRICIAN *for December 26th, 1919, that:—*

Mr. C. G. Robertson was to succeed Sir Oliver Lodge as Principal of the University of Birmingham.

A 220 000V transmission scheme was projected in California.

A commercial lamp renewal process was being established.

Several electricity undertakings were restricting supplies during peak hours owing to shortage of generating plant.

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PERSONAL.

MR. W. M. Selvey has been elected a member of the Institution of Electrical Engineers.

Mr. J. C. Lewis has been appointed temporary outside representative and canvasser to Fulham electricity department.

Mr. A. C. Johnson, formerly chief assistant, is the new borough electrical engineer of Southend in succession to Mr. Robert Birkett.

Estate of the gross value of £1 788 with net personalty £1 724 was left by the late Mr. John Oldham Tucker, formerly associated with J. H. Tucker and Co., Ltd.

Ald. W. Walker and Coun. J. Binns have been elected chairman and deputy chairman respectively of Manchester Electricity Committee and Audit Sub-Committee.

The vacant majority in the Tyne Electrical Engineers (T.A.) has been filled by the promotion of Captain H. Sherlock, T.D., who has held the rank of captain since 1916.

Shoreditch (London) Lighting Committee has elected Ald. W. Hebden as chairman, and Coun. T. J. Sillitoe as vice-chairman during the Committee's term of office.

Fulham (London) Electricity and Lighting Committee has appointed Ald. F. R. Flew as chairman, and Coun. F. H. Barber as vice-chairman for the ensuing year.

Estate of the gross value of £17 185 with net personalty £15 790 was left by the late Mr. Alfred Baker, for many years general manager of the Birmingham tramways department.

Mr. C. Furness, borough electrical engineer and transport manager, Blackpool, has been re-elected president of the Blackpool and District Branch of the National Association of Local Government Officers.

Estate of the gross value of £3 217 with net personalty £3 011 was left by the late Sir Henry Alexander Kirk, late director in chief of the Indo European Telegraph Department, who died on November 9th, aged 81 years.

Obituary.

MR. EDWARD RUELL, aged 72 years. He was largely instrumental in the acquisition by the Durban Corporation of the local electrical undertaking and tramways.

MR. GILBERT ARCHER, on December 13th, deputy city electrical engineer to Dublin Corporation and a past Chairman of the Dublin Branch of the Institution of Electrical Engineers.

MR. A. J. HUBER, aged 51 years. After severing his continental associations, Mr. Huber was on the staff of Ferranti, Ltd., Hollinwood, which appointment he relinquished in 1920 to join the British Electric Transformer Co., Ltd., in charge of their export work.

Mr. SHADRACH FERRIS, aged 65 years. He was in business as an electrical engineer at Swindon. At the age of five years he lost his sight owing to an accident, but, after being educated at the blind schools at Bath and London, he attended evening classes at Swindon Technical Institution and succeeded in obtaining the City and Guilds' Certificates in electrical engineering.

MR. JAMES HARRIS ROGERS, a specialist in multiplex and rapid printing telegraphy. He was credited with the discovery of visual synchronism, and methods of secret telephone and underground and submarine wireless communication, which latter system, it is claimed, enabled the United States Government to maintain uninterrupted communication with the Allied Governments during the war.

ELECTRICITY SUPPLY IN CORNWALL.

Mr. L. A. Hards, manager of the Cornwall Electric Power Co., read a paper to the Cornish Institute of Engineers recently on "Recent Electrical Development in the West. He said the great antagonism to overhead lines had seriously impeded the extension of electricity supply in Cornwall. Although the cost of production was small, the expense of distribution over the sparsely-populated county was heavy, and for this reason overhead wires had to be used. In spite of these difficulties, however, he predicted great developments. In West Cornwall alone no fewer than 33 towns and villages were supplied with electricity. A number had adopted electric street lighting, and there was likelihood of a considerable extension in that direction. In addition to the Western area, they now controlled a number of towns and villages in Eastern Cornwall, including Saltash, Torpoint, Looe, Bodmin, Padstow, and Wadebridge. Eventually, the local plant in all those places would be shut down, and they would be connected up to a system of mains which would extend throughout Cornwall.

BUSINESS ITEMS.

MR. E. INGER, electric light and power engineer, has commenced business at 1, Bank Chambers, Roushill, Shrewsbury. He has a branch concern at 50, Watling Street, Church Stretton.

A manufacturers' agent in London, Ontario, desires to obtain British agencies for electrical goods, etc., throughout Canada. The Department of Overseas Trade will supply further information. (Reference No. 614.)

Marconiphone apparatus has been chosen for installation in the Neath Cottage Hospital. The equipment consists of a "Marconiphone Model 47" receiver, operated from The Supply mains, and six of the new type "60" cone loudspeakers.

B.B.C. Revenue.

The net revenue of the BRITISH BROADCASTING CORPORATION for 1928 was £141 409, of which £134 167 was transferred to capital account to cover capital expenditure on regional stations and for other purposes, and £7 242 was carried forward.

A merchant firm in Krugersdorp, Transvaal, desires to obtain the representation, on a purchasing basis of a British firm manufacturing high-grade electrical fittings and supplies. The Department of Overseas Trade has further particulars. (Reference No. 647.)

On account of increased business, the HART MANUFACTURING CO., LTD., makers of "Diamond H" heater switches and appliances, has had an additional telephone line installed. The old number has now been superseded by the two new lines Victoria 2087 and 2088. Additional stock rooms have also been acquired situated above the company's premises at 76 and 76b, Rochester Row, London, S.W.1.

The North Metropolitan Electric Power Supply Co. are proud of the fact that this year up to December 3rd they have, for the first time in their record, exceeded 10 000 new consumers. This is no small number and reflects credit upon their business getting organisation and general vigour in contact with the public through newspaper advertising and other channels. The total number of consumers at the date mentioned was 58 000.

HOLOPHANE, LTD., of London, have recently been successful in obtaining the contract for the complete lighting installation at the New Egyptian University at Ghizeh, Cairo. The fittings include some large and special units and the installation is one of the biggest of this type during recent years. It is gratifying to know that a British firm has been successful in obtaining this important order, particularly in view of the strong competition met with from continental firms.

Arrangements have been made to transfer, as from January 1st, 1930, the pyrometer and temperature measurement department of SIEMENS BROTHERS AND CO., LTD., to the associated company, ELLIOTT BROTHERS (LONDON), LTD., of Lewisham. The technical and commercial staff, which has been dealing with these matters at the Woolwich works, is being transferred to Lewisham, together with all stocks of apparatus, records, drawings and patterns. All further inquiries and correspondence on temperature measurement matters should be addressed to Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.

The R.100.

The Airship R.100, just completed by the Airship Guarantee Co., Ltd., Howden, Yorkshire, and now about to undergo its trials, has been provided with specially designed electrical cable and equipment. The complete wiring installation of the airship, including the lighting, heating, wireless cabins and power control cars, has been carried out to suit the special conditions by W. J. FURSE AND CO., LTD., of Manchester, London and Nottingham. It is also interesting to note that this firm has provided lightning conductors for the protection of the sheds in various parts of the world where airships of this type are to be eventually housed, including one recently erected at Karachi, India.

In reviewing the year's work so far, the LONDON ELECTRIC FIRM, of Croydon, states that, in addition to the largest searchlights in the world, made for practically the smallest State in the world, the company has had the usual run on searchlights for navigating the Suez Canal, with increasing favour for the super type, which does not require trimming of the carbon during the voyage, and beyond the usual demand for Army, Navy, Air Force, Mercantile Marine, and other types, good business has been done in a large number of pilot house patterns, all brass non-magnetic types, fire brigade and life saving searchlights.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, where available.

LEEDS GUARDIANS, December 27th.—Supply of electric lamps until March 31st, 1930. Specification, etc., from the clerk, Mr. J. H. Ford, 11, South Parade, Leeds. Stamped, addressed envelope to be sent.

BRADFORD CORPORATION, December 31st.—Electric passenger and good lifts in block of shop and office premises in Leeds Road, Bridge Street and Hall Ings. Specifications, etc., from the City Architect, Town Hall, Bradford.

NORTH-WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, December 31st.—Supply and erection of extra high pressure and low pressure overhead transmission lines. Specification from the clerk, Mr. H. Battle, Stoke-on-Trent; deposit £2.

METROPOLITAN ASYLUMS BOARD, January 2nd.—Re-plating 500 Ah storage battery at St. Luke's Hospital, Lowestoft. Specification, etc., from the Office of the Board, Victoria Embankment, E.C.4; deposit £1.

METROPOLITAN ASYLUMS BOARD, January 2nd.—Alterations of electric lighting installation at South-Western Fever Hospital, London Road, Stockwell, London, S.W.9. Specifications, etc., from the office of the Board, Victoria Embankment, London, E.C.4; deposit £1.

CENTRAL ELECTRICITY BOARD, January 6th.—Supply and erection of 132 kV overhead transmission lines (special crossings and high spans), in connection with North-West England and North Wales Electricity Scheme. Specification (No. N.W.E.—P.L. 2) and form of tender from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

WHARFEDALE RURAL DISTRICT COUNCIL, January 6th.—Electrician's work in connection with erection of 10 non-parlour houses, in three blocks, on housing site at Mill Lane, Pool. Bills of quantities, etc., from the Surveyor, Council Offices, Menston; deposit £1 1s.

ISLINGTON (LONDON) GUARDIANS, January 9th.—Supply and erection of five full-automatic push-button electric lifts at the Infirmary, Highgate Hill, N.19. Specification, etc., from Mr. Albert King, Guardians' Offices, St. John's Road, Upper Holloway, N.19; deposit £2.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 13th.—Maintenance of electric lighting, heating and power installations, telephones, etc. (tender form H), and supply of electric lamps (form S). Forms of tender from the Borough Engineer.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 17th.—One year's supply of cables, electricity meters, cable terminal and other boxes, switches, wires, lamps and sundries. Specification, etc., from the Town Clerk, Municipal Buildings, Upper Street, London, N.1.

CENTRAL ELECTRICITY BOARD, January 20th.—Supply and erection of 3·3 kV, 6·6 kV, and 11 kV switchgear, for connecting the Board's supply to undertakers' busbars. Specification (N.W.E.—G.S.1) from Mr. Richard H. Fox, secretary and solicitor, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

METROPOLITAN WATER BOARD, January 21st.—Supply and erection of four steam turbines, with pumps, and two electric generators, for Surbiton pumping station. Specification, etc., from the Chief Engineer (Room 173), 173, Rosebery Avenue, London, E.C.1; deposit £3 3s.

GRIMSBY CORPORATION, January 23rd.—Manufacture, supply and erection of 10 000 kW three-phase turbo-alternator, with condensing plant. Specification, etc., from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby; deposit £2 2s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 27th.—Telegraph material, including g.i. tubular arms, insulators, upper tubes for poles, etc. (tender No. 175). (Reference A.X. 8 734.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, December 28th.—Supply and erection at site of Mankabad Barracks of three Diesel engine driven electric generators, and sinking of two wells. Specifications (£1 0s. 6d., not returnable) from Chief Inspecting Engineer, 41, Tothill Street, Westminster, S.W.1.

LOURENCO MARQUES TENDERING DEPARTMENT OF THE TREASURY, January 3rd.—Supply of oil-engine driven d.c. generator and battery. (Reference B.X. 5 961.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 13th.—Supply of four-point jacks (P. and T. 151/1897). (Reference B.X. 5 840.)

VICTORIAN ELECTRICITY COMMISSION, January 13th.—Supply of 2 200 V switchgear and accessories (specification No. 30/2). (Reference B.X. 5 827.)

Telephone Material for Australia.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of ringing motor-generator sets, for automatic telephone exchanges. (Reference B.X. 5 839.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 14th.—Supply of telephone indicators (schedule C. 518). (Reference B.X. 5 822.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 14th.—Two air compressors (capacity not less than 800 cu. ft. of free air per min.), and two electric motors. (Reference A.X. 8 784.)

TENERIFFE (CANARY ISLANDS) MUNICIPALITY, January 14th.—Supply of tramcars, rails and tramway equipment. (Reference A.X. 8 872).

CAPE TOWN MUNICIPALITY, January 15th.—Supply of direct-coupled, electric motor driven, centrifugal pump for sewage works (specification No. 475/1 829.) (Reference A.X. 8 836.)

INDIA STORE DEPARTMENT, January 15th.—Supply of wood separators for train-lighting cells. Form of tender (5s.) from the Director-General, Belvedere Road, Lambeth, London S.E.1.

NEW ZEALAND GOVERNMENT RAILWAYS, January 15th.—Supply of automatic telephone exchange equipment for new station at Auckland. (Reference B.X. 5 841.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 16th.—Plug covers for telephone switchboard plugs. (Contract P. and T. 151/1 943.) (Reference B.X. 5 879.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 28th.—Supply of induction coils and register plates (schedule No. C. 533). (Reference B.X. 5 899.)

EGYPTIAN MINISTRY OF THE INTERIOR, February 1st.—Centrifugal well pump and direct-coupled electric motor, with piping and accessories. (Reference A.X. 8 811.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 3rd.—Supply of protector blocks (carbon and porcelain). (Reference B.X. 5 948.)

VICTORIAN ELECTRICITY COMMISSION, February 3rd.—Electrically-driven mobile coal-trimming machine, for Yallourn power station. (Reference A.X. 8 681.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 5th.—Supply of indication alarm fuses. (Reference B.X. 5 947).

VICTORIAN ELECTRICITY COMMISSION, February 10th.—Supply of sine wave generating equipment and accessories (specification No. 30/3). (Reference B.X. 5 844.)

NEW ZEALAND POSTS AND TELEGRAPHS, February 13th.—Supply of opal lamp caps (P. and T., 151/2 025). (Reference B.X. 5 955.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 18th.—Telephone jacks and number plates (Schedule No. C. 541). (Reference B.X. 5 940.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, February 25th.—Jumper rings and terminal strips (schedule C. 543). (Reference B.X. 5 941.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, February 27th.—Supply and erection of h.t. three-phase, overhead transmission lines in the Northern Delta of the Nile. Specifications, etc., from the Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (£10 5s., not returnable).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Switchgear and controlling equipment. (Reference B.X. 5 798.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 110 kV switchgear, for interconnecting auto-trans-

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formers, for Waitaki power scheme, section 76. (Reference B.X. 5 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 11th.—Supply of 66 kV switchgear and protective system for Lyttelton, Lake Coleridge, power scheme, section 217. (Reference B.X. 5 796.)

VICTORIAN RAILWAY COMMISSION, March 30th.—Supply of d.c. neutral relays for power signalling purposes (contract No. 43 457.) (Reference B.X. 5 793.)

SOUTH AFRICAN IRON AND STEEL INDUSTRIAL CORPORATION, LTD., April 12th.—Electrical and other equipment for the various departments of the company's iron and steel works to be erected at Pretoria. Further information from the Committee of Consulting Engineers of the South African Iron and Steel Industrial Corporation, Ltd., c/o the International Construction Co., Ltd., 56, Kingsway, London, W.C.2.

Tenders Accepted.

CARLISLE CORPORATION.—R. M. Hill and Sons, electric light wiring of 250 houses.

STEPNEY (LONDON) BOROUGH COUNCIL.—Whipp and Bourne, Ltd., supply of 22 circuit breakers, £107.

GLASGOW CORPORATION.—C. Raine and Son, Ltd., dust extraction plant at Coplawhill car works.

BELFAST CHILDREN'S HOSPITAL.—J. Dowling and Son, electric wiring, including telephones and bells.

DONCASTER CORPORATION.—Callender's Cable and Construction Co., Ltd., low pressure cable, £859 5s. 9d.

PORTLAND URBAN DISTRICT COUNCIL.—Evershed and Vignoles, Ltd., supply of a Megger, £24 12s. 6d.

SUNBURY URBAN DISTRICT COUNCIL.—Heenan and Froude, Ltd., construction of refuse destructor, £1 502 10s.

BRAINTREE GUARDIANS.—East Anglian Electric Supply Co., Ltd., electric light installation at the Institution, £98.

PORTRUSH URBAN DISTRICT COUNCIL.—Blackstone and Co., additional plant for generating station, £2 956 13s. 3d.

METROPOLITAN WATER BOARD.—W. Lucy and Co., Ltd., supply of switchboard at Kempton Park works, £99.

STOKE-ON-TRENT COMMITTEE.—R. M. Catterson-Smith, electric kiln, for Burslem School of Art, £110 less 10%.

GLASGOW CORPORATION.—Telegraph Condenser Co., supply of power factor improvement plant at Dawsholm gasworks, £405.

MANCHESTER CORPORATION.—Barber and Colman and Forest City Electric Co., supply and fixing of automatic control signals.

LONDON COUNTY COUNCIL.—E. Showell and Sons, Ltd., and Power Equipment Co., Ltd., controller segments, finger tips, etc.

GLASGOW CORPORATION.—A. and P. Steven, Ltd., overhauling lift at Govan town hall and changing over to push-button type, £73.

G. W. SMITH AND CO. (1925), LTD. (STOCKPORT).—McClure and Whitfield, electrical work in connection with reconstruction of premises.

BARNSLEY EDUCATION COMMITTEE.—Corporation electricity department, electrical equipment of Grammar School Laboratories, £240.

HENLEY-ON-THAMES CORPORATION.—S. Bennett, electric light installation at Kenton Hall, including footlights, £83 11s. 6d.

BURTON-ON-TRENT.—Metropolitan-Vickers Electrical Co., Ltd., supply of apparatus for a metering sub-station, £834, and £50 for erection.

Overhead Line Equipment.

OLDHAM CORPORATION.—W. F. Furse and Co., erection of overhead line equipment from Oldham sewage works to Chadderton sewage works.

FRAMLINGHAM PARISH COUNCIL.—C. Garrard, Ltd., supply and fixing of electric pump and gearing to Jeaffreson's Memorial Well, £127.

WIMBLEDON CORPORATION.—Pneumatic Conveyance and Extraction, Ltd., provision of soot and grit prevention plant, at the power station, £2 400.

DEWSBURY.—Corporation Power and Lighting Cables, Ltd., supply of cable, £2 035 5s. (difference between British and German tenders was 12%).

HOLYWOOD URBAN DISTRICT COUNCIL.—Bromford Tube Co., Ltd., supply of 24 steel lighting standards, with bracket ladder arms and c.i. bases.

CITY OF LONDON CORPORATION.—W. J. Furse and Co. (London), Ltd., provision of electric lighting at crematorium buildings, £563. (Recommended.)

SHOREDITCH (LONDON) BOROUGH COUNCIL.—Stirling Boiler Co., Ltd., extension of boiler plant at Whiston Street power station, £21 174. (Recommended.)

SOWERBY URBAN DISTRICT COUNCIL.—J. Harrison and Co., electrician's work in connection with erection of 16 houses on Beechwood housing site, Sowerby.

BEDFORD EDUCATION COMMITTEE.—Young, Osmond and Young, tubular electric heating installation at Ampthill Road Council Schools, £761 18s. (Recommended.)

EAST HAM CORPORATION.—Hart Accumulator Co., Ltd., supply of control battery and switchboard for remote control and emergency lighting, £265 7s. (Recommended.)

MANCHESTER CORPORATION.—S. H. Heywood and Co., Ltd., supply of electrically driven overhead travelling crane; Equipment and Engineering Co., Ltd., supply of two rail planers.

PLYMOUTH CORPORATION.—Bromford Tube Co., Ltd., £125, supply of electric lamp columns, £125; English Electric Co., £561, supply of sub-station l.t. isolating link and fuse panels, £561.

CHESTERFIELD CORPORATION.—British Thomson-Houston Co., Ltd., supply of truck type cubicle, £132 4s. 6d.; Brush Electrical Engineering Co., Ltd., supply of a 150 kVA transformer, £110.

GLASGOW CORPORATION.—W. F. Dennis and Co. (for Felten and Guilleaume, Carlswerk, Germany), supply of copper trolley wire, £1 204. (Recommended.) Lowest of four British tenders was £1 327 4s.

STOKE-ON-TRENT CORPORATION.—E. Holloway, overhead service lines on Horwills estate Trentham, £275; Barnett and Soans, overhead wiring and services at Etruria Vale housing estate, £99 15s.

CHELTENHAM CORPORATION.—F. H. Bastin and Sons, wiring houses to be erected at Pilley, including provision of lighting points in each room and one power point in the living room, £443 12s.

Transformers, &c.

HASTINGS CORPORATION.—Ferranti, Ltd., supply of 5 000 kVA transformer, £1 495; W. T. Glover and Co., Ltd., overhead and underground cables to Battle, estimated at £7 435. (Both recommended.)

BRIGHTON CORPORATION.—Ferranti, Ltd., supply of one 200 kVA transformer, £184 16s.; Brighton Lighting and Electrical Engineering Co., Ltd., provision of traffic signalling system at Old Steine, £764.

COLWYN BAY URBAN DISTRICT COUNCIL.—Macintosh Cable Co., Ltd., supply, erection and laying of e.h.t. and l.t. overhead lines and cables in connection with Glan Conway and Llysfaen electricity supply, £2 578.

ESSEX COUNTY COUNCIL.—Electrical equipment for Black Notley sanatorium: switchboard, £101 10s., Christy Bros. and Co., Ltd.; electric light fittings, £42 5s. 7d., F. Thomas and Co., Ltd., and £13 2s. 6d., Benjamin Electric Co., Ltd.

BARKING URBAN DISTRICT COUNCIL.—Derby Cables, Ltd., supply of 2 000 yards and 1 200 yards of four-core cable, £202 and £149; Hackbridge Electric Transformer Co., Ltd., supply of 400 kVA transformer, £186. (Both recommended.)

SALFORD CORPORATION.—General Electric Co., Ltd., supply of equipment for private automatic branch telephone exchange, estimated, £668; Whitehead and Poole, Ltd., supply and erection of electrically driven balancing and operating gear for sludge delivery pipe, £140. (Both recommended.)

CROYDON CORPORATION.—General Electric Co., Ltd., spare motor for use in connection with London service tramcars, £203; British Electric Transformers Co., Ltd., supply of two 1 000 kVA three-phase transformers, £924; J. and T. Robinson, electric wiring at the sewage works, £385 5s. (All recommended.)

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—British Electric Transformer Co., Ltd., supply of three 1 000 kVA three-phase transformers, £1 177 10s. (Recommended.) Alternative tender £1 095 19s. 6d. Also tendered: General Electric Co., Ltd., £1 009 10s.; Hackbridge Electric Construction Co., Ltd., £1 020; English Electric Co., Ltd., £1 065; C. A. Parsons and Co., Ltd., £1 095; Brush Electrical Engineering Co., Ltd., £1 110; Yorkshire Electric Transformer Co., Ltd., £1 155; Johnson and Phillips, Ltd., £1 185; Metropolitan-Vickers Electrical Co., Ltd., £1 191; Ferranti, Ltd., £1 206; Bruce, Peebles and Co., Ltd., £1 275; British Thomson-Houston Co., Ltd., £1 338; Fuller Electrical and Manufacturing Co., Ltd., £1 491.

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WORK IN PROSPECT.

ABERGAVENNY.—Cottage Hospital extensions. Particulars, the Secretary.

NORTHALLERTON.—Post office. Particulars, Mr. D. Oakley

NORTHAMPTON.—School (1 200 places). Particulars, Mr. W. R. Kew.

NORTHOLT.—Ten shops and flats. Particulars, T. P. Bennett and Son, 41, Bedford Row, W.C.1.

OXFORD.—Residential quarters for Undergraduates of Balliol College. Particulars, Mr. George L. Kennedy, Chenil Galleries, Chelsea, London, S.W.3.

OXTED.—Cinema and shops. Particulars, Messrs. H. F. Murrall and R. Piggott, 44, Bedford Row, London, W.C.1.

PETERBOROUGH.—Reconstruction of theatre. Particulars, Mr. J. A. Campbell, Grantham.

POULTON LE FYLDE.—School. Particulars, the Director of Education, Preston.

PRESTON.—Sunday schools. Particulars, Rev. W. Newton.—Houses. Particulars, Pius A. Baines and Sons (228), and Mr. A. Swarbrick (22).

RAINHAM (ESSEX).—Church and Sunday schools. Particulars, the Secretary.

READING.—Reconstruction of "Four Horse Shoes" public house. Particulars, Mr. F. Sainsbury, architect, 154, Free Street, Reading.

ROCHFORD.—Central school. Particulars, Director of Education, Chelmsford.

ROMFORD.—60 houses. Particulars, Mr. P. H. Evans.

SKEGNESS.—Shops, museum, reading room, etc. Particulars, the Surveyor.

SOHO (LONDON).—Block of showrooms and offices. Particulars, Mr. A. S. R. Ley, 214, Bishopsgate, London, E.C.2.

STROUD.—Central school. Particulars, the Director of Education, Gloucester.

SWINDON.—School. Particulars, the Secretary, 22, Regent Circus.

TOLWORTH.—Roman Catholic Church. Particulars, the Priest in charge.

UCKFIELD.—Houses (12). Particulars, Mr. T. Burdett, Beacon Road, Crowborough.

WANDSWORTH (LONDON).—36 flats. Particulars, Messrs. J. Lovell and Son.

WELWYN GARDEN CITY.—Additional 200 houses. Particulars, the Surveyor.

WINCANTON.—Additional 100 houses. Particulars, the Secretary to Rural Council.

WITHAM.—Housing scheme (40). Particulars, Mr. D. Jenkinson.

WOKINGHAM.—Girls' secondary school. Particulars, the Director of Education, Reading.

WOLVERHAMPTON.—Reconstruction of locomotive repair shops. Particulars, Architect to G.W.R., Paddington Station, London.

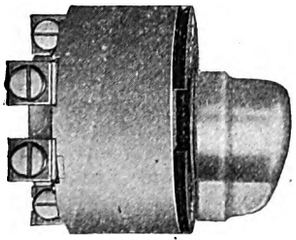
WOLVERHAMPTON.—Schools and extensions. Particulars, the Director of Education.

WORKINGTON.—School (500 places). Particulars, the Director of Education.

WORTHING.—Reconstruction of old Theatre Royal. Particulars from Messrs. Yates, Cook and Derbyshire, architects, London.

YORK.—Houses (100). Particulars, Mr. John Sawdon, Bridlington.

A NEW SWITCH.



The new heater switch of the Hart Manufacturing Co.

The HART MANUFACTURING CO., LTD., of 76–76b, Rochester Row, London, S.W.1, have recently produced a new heater switch particularly designed for use on electric cookers, etc., being of the special back connected type for panel mounting. Our illustration shows the new switch, which has a totally enclosed mechanism of new design and is dustproof. The connections are all made externally at the back of the switch. A new style clock spring mechanism is incorporated, prolonging considerably the life of the switch and giving an ease of control that, the makers claim, cannot be accomplished in any other way. This type is, we understand, standard on a large number of modern electric cookers.

TRADE PUBLICATIONS.

THE ELECTRIC CONSTRUCTION CO., LTD., Ingersoll House, Kingsway, London, W.C.2, has issued a new catalogue relative to rotary convertors. The reference is B. 626.

A catalogue just available to the trade is list No. 513, by the SUN ELECTRICAL CO., LTD., 118/120, Charing Cross Road, London, W.C.2, dealing with electric fires.

An attractive window display in connection with the sale of "Nife" hand lamps, issued by Batteries Ltd.

"Prismat" bulkhead lighting fittings form the subject of a new publication of the WARDLE ENGINEERING CO., LTD., Elcinore Road, Old Trafford, Manchester.

Publication No. 6 493 issued by the IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.2, deals with the No. 190 automatic starting panel.

"The Art of Fault-Locating on Lighting and Power Mains" is the title given to a new issue by PRICE AND BELSHAM, LTD. 52, Queen Victoria Street, London, E.C.4.

Messrs. DE BRUNNER AND LANG SIMS, 3/4, King Street, London, W.C.2, have issued a number of blotters illustrating "Marco" boiling rings, domestic water heaters, fires, hotplates and geysers.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester, have published leaflet No. 301, dealing with the Dutch motor liner "Johan van Oldenbarnveldt," and the company's equipment on board.

Stage spotlights suitable for theatres, cinemas, concert halls, etc., are described and illustrated in leaflet No. SL 4986 published by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.

The ORMOND ENGINEERING CO., LTD., Ormond House, Rosebery Avenue, London, E.C.1, has sent us a well-produced catalogue dealing with the company's portable and other wireless receivers, components and accessories.

A new catalogue, No. 243, of electrical heating appliances has been published by the WHOLESALE FITTINGS CO., LTD., of 23/37, Commercial Street, London, E.1. The catalogue, comprising over 30 pages, is well illustrated and highly descriptive.

The latest publications of the A.E.G. ELECTRIC CO., LTD., 131, Victoria Street, London, W.1, include leaflet No. X 1108E, dealing with "Furniculus" fires; No. X 1108E describing 1 and 2 kW fires; and a special booklet devoted to the "Vampire" vacuum cleaner and the "Hobby" floor polisher.

We have received from the ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2, copies of publication No. K. 43 describing the company's power factor compensator, No. K. 62 dealing with trolley 'buses and No. K. 66 relative to the company's air-operated controller for electric trolley 'buses.

A new catalogue covering the whole range of "Osram" valves has been published by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. The new issue gives all details as to normal ratings, characteristic curves, grid bias voltages, etc. Each type of valve is illustrated and approximate dimensions are indicated. The reference is O.V. 5189.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, London, W.C.2, has issued leaflet No. 1097, relative to types M.C.8a and M.C.8b, 500 W telegraph transmitters, and leaflet 1101, describing type X.M.C.2, 500 W fixed wavelength telephone set, has also been published. Type X.M.B.1a fixed wavelength telephone sets, and type M.C.13 1·5 kW telegraph sets are described in leaflets 1082/2 and 1103, respectively.

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ELECTRICITY SUPPLY.

Further Brighton Extensions—Portrush to Continue Generation—New Plant for Torquay—Chester's Change-over Scheme—Approval of Abersychan Supply Scheme—New Hydro-Electric Station at Inverness.

GLASGOW Electricity Committee has authorised mains extensions at a cost of £9 765.

Weymouth Electricity Committee has decided to lay mains in Bowleaze Coye Road, at a cost of £750.

Peterborough T.C. has applied for a loan of £25 000 for the provision of l.t. mains, cookers, and meters.

Brighton Electricity Committee has obtained sanction to borrow £50 000 for electricity mains and services.

East Grinstead U.D.C. has applied to the Commissioners for a loan of £10 000 for mains, services, and meters.

Bristol Corporation seeks powers to extend the limits for supply of electricity to Henbury and Bishopsworth.

Hastings Electricity Committee has obtained sanction for loans of £7 000 for mains and services and £450 for sub-station equipment.

Brierfield U.D.C. is to apply to the Unemployment Grants Committee for financial aid in speeding up the electricity conversion scheme.

Colwyn Bay U.D.C. has received sanction to borrow £9 628 for mains and services; £2 032 for transformers, switchgear, etc.; and £469 for meters.

The Electricity Commissioners have agreed to the linking up of the Burnley and Nelson electricity undertakings, as an additional safeguard in case of emergency.

Perth Electricity Committee has received a suggestion from the Electricity Commissioners that further schemes for the relief of unemployment should be considered.

Bedford Electricity Committee is to seek sanction to borrow £20 000 for house services and £15 000 for apparatus for hire. —Mains are to be extended at an estimated cost of £641 6s.

The Twickenham and Teddington Electric Supply Co. has intimated that, subject to a satisfactory price being reached by agreement, it would be prepared to sell its Hampton Wick undertaking.

Through the agency of Messrs. Bannister Bros., cotton manufacturers, Bee Mill, Ribchester, electricity is to be supplied to the village. The cable will be laid to the firm's mill by Preston Rural District Council.

Fulham (London) Electricity Committee has voted £350 for an extension of the mains in Kinnoul Road for affording a supply to prospective consumers in that road, under the rental wiring schemes.

The County of London Electric Supply Co., Ltd., has acquired a site on the St. Helier estate at Morden for a sub-station in connection with the supply to the London County Council housing estate.

Portrush U.D.C. has decided to take no action on the Antrim Electricity Co.'s offer of a bulk supply, and has accepted a tender for the supply of additional plant for its own generating station.

Torquay T.C. has decided upon the expenditure of nearly £100 000 on its electricity undertaking. The Electricity Commissioners have sanctioned the installation of additional plant at a cost of £98 780.

Swansea Electricity Committee has decided to change over from d.c. to a.c. in the Wassail Square district, and is to instal the necessary a.c. mains at a cost of £780.—Other mains are to be extended at a cost of £1 122.

Birkenhead T.C. has received sanction to loans of £2 100 for overhead extensions to Saughall, Massie and Ledsham, £5 966 for similar extensions to Burton and Puddington, and £900 for a supply to Great Sutton.

The Isle of Wight County Council has received a notice from the Isle of Wight Electric Light and Power Co. of intention to apply for sanction to erect overhead lines between Ventnor and Niton. The Council has decided not to raise any objection.

The promoters of the Ringmer and District Special Order have agreed to withdraw the parishes of Wilmington, Folkington, Jevington, Friston, and East Dean from their application, and these parishes will be included in Eastbourne Corporation's Extension Order.

A proposal for a bridge across the Tamar is occupying public attention at Plymouth, and in connection therewith Mr. F. J. Coles, a local trader, suggests that the bridge should also serve the purpose of a barrage by means of which electricity could be generated.

An electricity supply system carried out by Mr. J. Herbert Edwards, of Gloucester, was inaugurated at Ponterwyd on December 10th by Miss Olwen Rhys, daughter of Sir John Rhys, resident in the district. Any profit on the undertaking will be devoted to village improvements.

Dronfield U.D.C. has accepted the offer of Sheffield Corporation to supply electricity direct to Dronfield consumers at 20% above the Sheffield prices. The Council has also decided to support the Corporation's application to take over the Council's rights under the Dronfield Electricity Order, 1928.

Chester Electricity Committee recommends the adoption of a scheme to change over the Corporation's electricity supply system from d.c. to a.c. at an estimated cost of £70 000, and proposes to apply for a grant under the Development Act of 50% of the interest on the expenditure.

Kensington (London) Works Committee states that the substitution of electricity for gas lighting in streets in the borough has been extended and additional lamps have been provided. The Committee has in course of preparation a scheme for further improvements in the street lighting.

Dorchester Lighting Committee has decided to defer consideration of the question of lighting the town electrically until it can be ascertained what the developments under the recent Electricity Acts are likely to be, and what the council's position thereunder will be. The question of instituting a sliding scale for large consumers has also been deferred.

A deputation from Abersychan U.D.C. Council waited on the Electricity Commissioners to obtain authority for a loan for the construction of an electricity supply undertaking. The Commissioners approved the project, and the Ministry of Health and the Unemployment Grants Committee are to be approached in connection with the matter.

Manchester Corporation has refused to approve the recommendation of the Electricity Committee that the basis for arriving at the fixed charge under the all-in tariff for domestic users should be altered from 20% on pre-war values up to £100 to 15% on present values up to £130. An amendment that the new figure should be 12½% has been passed.

Dartford Electricity Committee recommends work being commenced at the earliest possible date in connection with the provision of the second instalment of the ring main scheme which comprises the laying of a h.t. cable from the sub-station in Princes Road to Temple Hill, and the construction of a sub-station in Princes Road at an estimated cost of £6 500.

Croydon Electricity Committee has considered reports of the Borough Electrical Engineer and the Borough Accountant with regard to the advantages to be derived from a system of continuous meter readings, in lieu of the readings on or near the quarter days. The Committee recommends that the suggested new system be adopted.—Mains are to be extended at a cost of £1 300.

Colchester Electricity Committee has arranged an interview with the engineer to the Frinton-on-Sea and District Electric Light and Power Co. to discuss terms for a bulk supply by the Corporation, and also as to further generating plant.—The Borough Electrical Engineer has submitted particulars of the lengths of cables which it will be necessary to lay in various streets in the borough within the next twelve to eighteen months, the approximate total cost being £5 462.—It has been decided to apply for permission to erect an overhead line to Ardleigh.—The Electrical Engineer estimates the cost of completing the e.h.t. ring main within the borough at £19 430.

Inverness Corporation's new hydro-electric power station at Bught and refuse destructor at Riverside Street, Inverness, were opened on December 11th by Sir Murdoch Macdonald, M.P., who said the new electricity station was able to produce electricity at a halfpenny a unit. The hydro-electric station has cost about £15 000, and the plant consists of a vertical turbine coupled direct to a vertical generator. The switchboard is entirely automatic. Preliminary tests have shown that the plant will produce something like 600 000 kWh per annum. The refuse destructor has cost about £10 000, and tests indicate that the plant is capable of burning the whole of the daily collection of town refuse and supplying a considerable proportion of the daily requirements of steam for the Corporation's adjacent electricity works.

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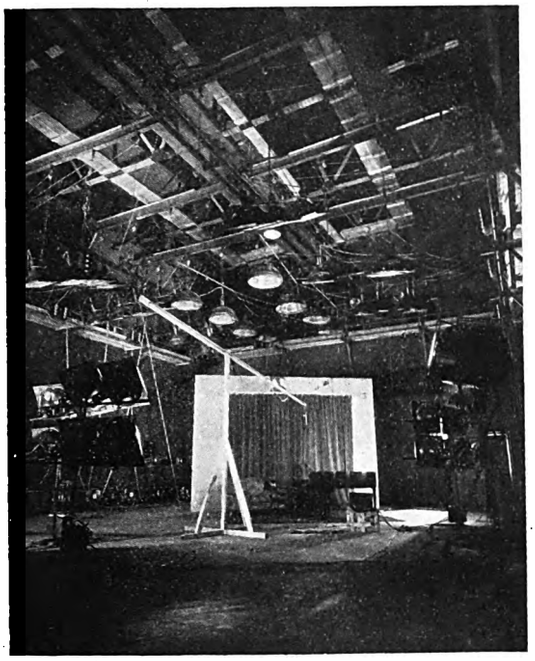
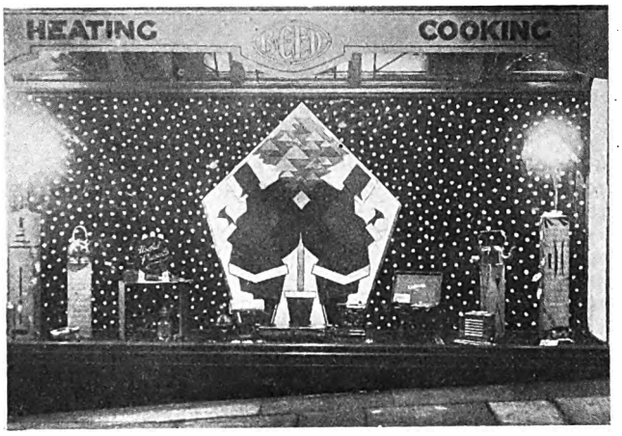
ELECTRICAL NEWS OF THE WEEK IN PICTURES.

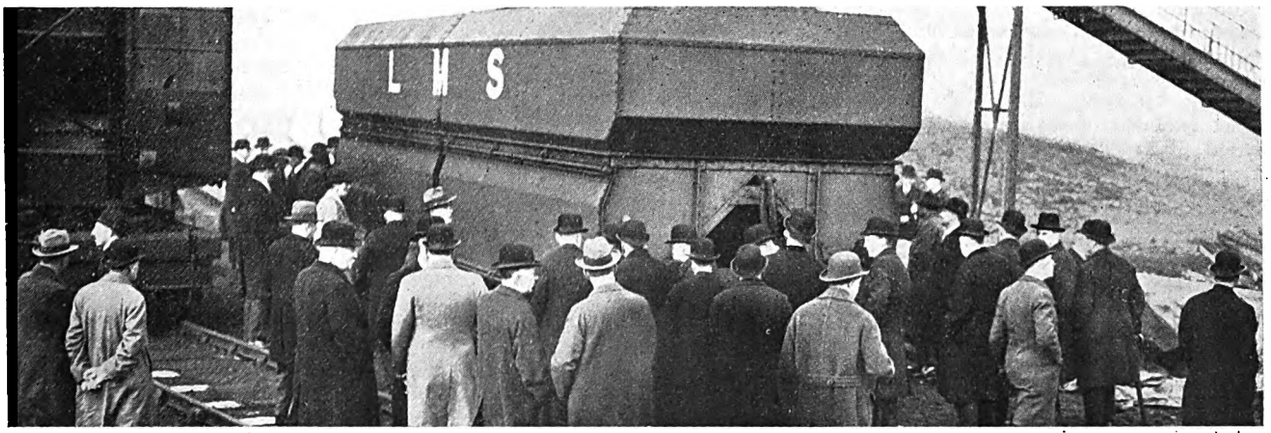


One of the latest studios at Elstree, where the British film industry is making steady progress in face of American competition. The amount of electrical equipment involved in the successful "shooting" of a film is more than the average person realises, and even in this small "set" the number of reflectors used in the lighting scheme approaches fifty.

America, with the thermometer standing at —30 deg., is experiencing the first real cold this winter. Snowdrifts have disorganised travelling facilities in many cities, but the Utah Power and Light Co. gets over transportation difficulties by using dog teams and sleighs. Curiously enough the apparatus seen in the picture is an electric refrigerator being delivered to one of the company's consumers. (Photo: "Electrical Merchandising.")



A contrast in Christmas window displays. That on the left is a window designed by J. S. Rambottom and Co., Ltd., of Keighley, featuring a snow house and Father Christmas surrounded by electrical gifts, while on the right is a futuristic impression in the window of Bradford Corporation electricity department.



A new type of 40-ton coal truck introdnced by the London Midland and Scottish Railway, which can be discharged instantaneously. The purpose of these trucks is to eliminate manual labour, and a fleet of them is being employed to carry coal direct from the collieries to the company's electric power station at Stonebridge Park. A description of the trucks and coal handling plant is given on page 826.

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COMPANY NEWS.

Swedish Companies' Financial Arrangement — Venezuela Telephone Co.'s Increased Revenue—Cape Tramways and Unfair Omnibus Competition.

GREENWOOD AND BATLEY, LTD.—Intm. div. of 2½% (same as last year) will be payable on Dec. 31.

UNITED RIVER PLATE TELEPHONE CO., LTD.—Deb. stk. and pref. sh. transfer books are closed until Dec. 31, inclusive.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—A dividend of 1% on common stk. will be payable on Jan. 2.

A LARGE sign in operation in Calcutta which flashes atten-second intervals the word "Osram," in English and Bengalee. The sign is readable at a distance of a mile, and 5 400 lamps are employed.

ANCHOR CABLE CO., LTD.—The 1st deb. stk. register will be closed from Dec. 19 to 31; inclusive, for preparatn. of int. warrts.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Qrtrly div. of $0·60 p. sh (same as last year) will be payable on Jan. 31.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—Register of transfers of 4% red. deb. stk. are closed until Dec. 31, inclusive.

PINCHIN, JOHNSON AND CO., LTD.—Transfer books of pref. shs. are closed until Dec. 31, inclusive, for preparatn. of div. warrants.

JOHNSON AND PHILLIPS, LTD.—Registers of 1st mtge.deb. stk are closed until Dec. 31, inclusive, for purpose of preparing int. warrts. payable on Jan. 1.

MANN, EGERTON AND CO., LTD.—Net pft. for past year, £24 335, agst. £30 674. Pref. div. £16 833; service of fundg. certs.. £7 510. Fwd. £10 302, agst. £12 311.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Transfer books and register of hldrs. of 6% cum. pref. shs. are closed until Dec. 31, inclusive, for preparatn. of div. warrts. payable Jan. 1.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO., LTD —Transfer books and register of hldrs. of 4½% deb. stk. are closed until Dec. 31, inclusive, preparatory to paymt. of int. due Jan. 1.

SWEDISH GENERAL ELECTRIC CO.—The company has acquired majority of shs. in Finska Elektriska Aktiebolaget Gottfried Stroemberg, the sh. cap. of which is 12 300 000 Finnish marks.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Transfer books in respect of 7% cum. participatg. pref. shs. are closed until Dec. 31, inclusive, for purpose of preparing warrts. for div. for year ended Dec. 31, 1929.

BRITISH ALUMINIUM CO., LTD.—Transfer books of 5% prior lien debs. are closed until Dec. 31, inclusive, for paymt. of six months int. on Jan. 1. Coupons to bearer are payable at the Westminster Bank, 52, Threadneedle Street, London, E.C.

CONSTANTINOPLE TELEPHONE CO.—Coupon No. 32 on 6% obligatns. and coupon No. 20 on 6% certs. due on Jan. 1, will be payable on and after that date at the Ottoman Bank, 123, Old Broad Street, London, E.C.2, where listg. forms can be obtained.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—Coupon No. 35, representg. half-year's int. due Jan. 1 on series "A" and "B" 5½% 2nd mtge. debs. and debs. drawn for redemptn. will be paid on that and succeeding days at the offices of Erlangers, Ltd., 4, Moorgate, London, E.C.2. Coupons and drawn debs. must be left three clear days.

LIMA LIGHT, POWER AND TRAMWAYS CO.—Coupon No. 14, representg. int. for six months ended Dec. 31, at rate of 8% p.a. on 8% cum. participatg. con. pref. shs. will be payable on Jan. 1. Coupons may be presented at the offices of J. H. Schroder and Co., 145, Leadenhall Street, London, E.C.3. Coupons due on Jan. 1 in respect of 6% 1st mtge. debs. may also be presented at the offices of J. H. Schroder and Co.

Company Meetings.

VENEZUELA TELEPHONE AND ELECTRICAL APPLIANCES CO., LTD.—Mr. H. S. Bennett, presiding at the meeting on December 17th, said their revenue from subscriptions, rentals, etc., increased during the past year by £15 368, and expenses in Venezuela were greater by about £9 000, and the charges in London had also risen. The net result was that their profit for the year amounted to £38 387, against £35 742. They were adding the substantial sum of £30 000 to the reserve for renewals and depreciation. Capital expenditure during the year was approximately £85 000. They saw every encouragement to go ahead and widen their field of development. When the 2 000 automatic lines now undergoing installation in Caracas were completed they would have 8 000 automatic lines all told connected to the Caracas Exchange, which was the company's largest exchange, accounting for over 62 per cent. of the total number of subscribers. The introduction of the automatic system had been a pronounced success, and further development of the Caracas and other neighbouring areas was anticipated and planned for. They expected to extend the automatic facilities to the towns of Maracay, Valencia, La Guaira, and Puerto Cabello. In recognition of the company's enterprise in developing the automatic services in those areas the authorities had consented to an increased tariff. Their subscribers numbered 9 465, a gain of 750 during the year. With the provision of additional plant facilities and by means of propaganda they believed a much larger rate of growth would be possible in the future. The report and accounts were adopted and the dividends approved.

CAPE ELECTRIC TRAMWAYS, LTD.—Mr. L. Breitmeyer presiding at the meeting on December 18th, said it was disappointing to have to announce that during the period under review no change for the better had taken place as regards motor-bus competition—the number of opposition buses running had considerably increased—in fact, more than doubled. The profits transferred to London were reduced to £40 083 15s. 6d., against £45 752 os. 9d. in the preceding year. No change as regards the control of passenger transport by the authorities had taken place, and the company was still subject to unfair competition. Licences were granted without limit, permitting competitors to run over routes more than sufficiently supplied with means of transport. The Provincial Council had, however, recently passed legislation giving wider powers to municipalities for the control of transport, and a Commission had been appointed by the Government to inquire and report upon the best means of dealing with the present uncontrolled road competition. This Commission had practically finished its investigations, and was expected to place its report before the Government before the end of the present year. The profit and loss account showed after charging London expenses, income tax, etc., and depreciation on motor-buses, a credit balance of £32 755 5s. 3d. Against this was charged the interest and redemption of debentures £19 441, leaving a balance of £13 314 5s. 3d., making, with the balance of profit brought forward from last year, £41 939 18s. 3d., out of which £5 000 was allocated to reserve, which left a balance of £36 939 to be carried forward. It was a matter of much regret to the directors that they were again unable to recommend a dividend. He thought, in view of the legislation that had been passed, the outlook for the company was more encouraging than it had been for some time past.

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NEW COMPANIES.

H. CRUTTENDEN AND SON, LTD.—Cap., £6 000. Contractors, electricians, etc. Reg. Office: 5, Ashford Road, Maidstone.

BELL-RADIO CO., LTD.—Cap., £3 000. To acquire the business of Bell-Radio Co., wireless specialists, 33, George Street, Edinburgh.

BARNES AND BARROW, LTD.—Cap., £1 000. Mechanical and electrical engineers, etc. A director: W. A. S. Barnes, 59, College Road, Handsworth, Birmingham.

ELECTRICAL REPRODUCERS, LTD.—Cap., £100. Electrical, radio, and consulting engineers, etc. Reg. Office: 102. West Regent Street, Glasgow, C.2.

BEL-CANTO RADIO REPRODUCER CO. (N.S.), LTD.—Cap., £1 100. Manufacturers of and dealers in apparatus for wireless transmission and reception, etc. Solicitors: Simpson, Curtis, Dixon and Burrill, Leeds.

FRANK HAYTOR (JUNIOR), LTD.—Cap., £100. Advertising contractors, manufacturers of, and dealers in, advertising signs, electric and other signs, etc. Solicitors: Pearson, Son and Co., 438, Corn Exchange, Manchester.

PODMORE'S, LTD.—Cap., £5 000. To acquire business of manufacturers of gas and electric heating and lighting and cooking apparatus, etc., now carried on at 34, Charles Street, Hatton Garden, E.C.1, as "A. E. Podmore and Co."

CHRONOLARM, LTD.—Cap., £100. Advertising agents and contractors, manufacturers of, and dealers in, clockwork machines, gas and electrical apparatus and machinery, etc. Reg. office: Buchanan Buildings, 24, Holborn, London, E.C.1.

A.-P. SPRINGS, LTD.—Cap., £500. General manufacturers and engineers, manufacturers of and dealers in tension and compression springs for the engineering, electrical or other industries, etc. Reg. Office: British Mills, Redditch, Worcester.

BARRI THERAPEUTIC INSTITUTE (HULL, 1929), LTD.—Cap., £1 000. Medical and general electricians, masseurs, radiologists, actino-therapists, hydro-therapists, electro-therapists, etc. Reg. Office: 21, Story Street, Hull.

RIGBY AND PARTNERS, LTD.—Cap., £500. Electrical engineers and contractors, dealers in and erectors of electrical plant, equipment, apparatus and accessories, etc. Reg. Office: 53, Victoria Street, Westminster, London, S.W.1.

ELECTRIC SERVICE CO. (BIRMINGHAM), LTD.—Cap., £2 500. To carry on business of electrical service and accumulator specialists formerly carried on by P. H. Jones and Nancy Jones, at 125, Bristol Street, Birmingham.

RAY-BEAM, LTD.—Cap., £100. Importers and exporters of and dealers in motor accessories, electrical specialities, etc. A director: J. F. Holland, 22, Esmond Road, Cheetham Hill, Manchester, J. Smith, 18, Rochester Street, Manchester, warehouseman.

STANLEY F. BALDRY, LTD.—Cap., £1 000. Advertising agents, manufacturers and producers of and dealers in advertising signs, electric and other illuminated devices, etc. A director: S. F. T. Baldry, 64, Hamilton Terrace, St. John's Wood, London, N.W.8.

J. N. BOYES, LTD.—Cap., £500. To acquire business of electrical engineering, etc., carried on by J. N. Boyes, at 10, William Street, London, to carry on the business of electrical, wireless and general engineers. etc. Reg. Office: 10, Serjeant's Inn, Temple, London, E.C.4.

JOHN BROWN (DENTON), LTD.—Cap., £2 500. Wire drawers, manufacturers and merchants, smelters and manufacturers of, and dealers in, iron, steel, copper and other metals, mechanical and electrical engineers, etc. Reg. office: Victoria Works, Two Trees Lane, Denton, Lancs.

RUNBAKEN MOTOR AND ELECTRICAL ACCESSORIES, LTD.—Cap., £8 000. To acquire the business of makers, inventors, patentees and sellers of, and dealers in, motor and electrical accessories and commodities now carried on by J. H. Runbaken and S. W. Lewis, at Tipping Street, Ardwick, Manchester, as "Runbaken Magneto Co."

ELM MANUFACTURING CO., LTD.—Cap., £1 000. To manufacture and deal in metal, ebonite or composite parts, pressings, stampings and resistances, condensers and parts, wireless, telegraph and scientific instruments or component parts, electrical gramophones, television and synchronising apparatus, etc. Reg. office: 131, Brixton Hill, London, S.W.2.

ENGLISH ALABASTER MARBLE AND LIGHTING CO., LTD.—Cap., £1 000. Manufacturers of and dealers in alabaster bowls, vases, table stands and brackets and other receptacles, ornaments and wares; electrical and wireless engineers and experts, designers and manufacturers of and dealers in lamps, globes, brackets, shades, etc. A director: H. H. D. Duncan, 144, Boleyn Road, Forest Gate, London, E.7.

ARMAFLEX PARENT, LTD.—Cap., £25 000. To acquire from Relative Engineering Co. patent rights under provisional No. 2 046/29 for improvements in, or relating to, cable making and light machines in the name of F. J. Humphrey, and Letters Patent when granted, both in Great Britain and abroad, to carry on the business of cable manufacturers, engineers, etc. Reg. office: 27, Queen Victoria Street, London, E.C.4.

BARROCK INVESTMENT TRUST, LTD.—Cap., £35 000. To carry on business as a general investment trust company, to invest and raise and borrow money for investment in purchase or acquisition of stocks, bonds, debentures, shares, scrip or securities of any electricity or other public undertaking or company, in Great Britain, India or elsewhere. Solicitors: Markby Stewart and Wadesons, 5, Bishopsgate, London, E.C.

COMMERCIAL INFORMATION

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debt. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BRITTAIN, J. V., 146, Lichfield Street, Walsall, electrical engineer (trading as WALSALL RADIO CO.) £12 16s. 4d. November 14th.

EMMS AND CO., Connaught Street, Northampton, wireless engineers. £31 1s. 9d. November 13th.

HEALD, S., 39, Steeley Lane, Chorley, wireless dealer. £12 13s. 11d. October 24th.

JACKSON AND CO., 54, Broadway, Leigh-on-Sea, electrical engineers. £15 15s. November 12th.

J.D. WIRELESS CO., 195, Breck Road, Liverpool. £43 13s. 4d. November 4th.

RADIO SERVICES, 585A, Wilbraham Road, Chorlton-cum-Hardy. £14. October 19th.

Bankruptcy Proceedings.

GASCOIGNE, Harry, 40, Cricklade Street, Cirencester, Glos., wireless dealer, etc. The public examination was held on December 18th at the County Court Buildings, Clarence Street, Swindon, when a statement of affairs was filed showing gross liabilities of £746 against assets of £138. It appeared that the debtor was out of employment for ten months after being demobilised, and he then obtained a situation but left to go into partnership as a toy, cycle and wireless dealer. He subsequently bought his partner out but he soon became aware that the business was not a success, and he got into financial difficulties after a three months' illness. It was reported that the debtor's books had been kept satisfactorily. The hearing was adjourned for closing.

WESTBURY, Leslie William, 383, Birmingham Road, Walsall, lately trading as L. W. WESTBURY AND CO., and also as the WALSALL RADIO CO., 146, Lichfield Street, Walsall, wireless goods dealer. The public examination of this debtor was held on December 12th at the Court House, Lichfield Street, Walsall, when a statement of affairs was filed showing liabilities of £1 308 and there was a deficiency of £1 289. The examination was adjourned for closing.

London Gazette, etc.

Notice of Dividend.

RADCLIFFE, Harold Howe Delmé, and HADDLETON, Frank, 51, Islington Row, Birmingham, trading as "CITY ELECTRIC SERVICES," electrical engineers. First and final dividend, 2 7/16d. per £, payable December 31st, Official Receiver's Office, 191, Corporation Street, Birmingham.

Partnership Dissolved.

WESTERN ELECTRIC LAMP CO. (John Massey FAIRHURST, Harry Barton GOBLE, and Rowland Clegg RUSDEN), factors of electric fittings and equipment, 2, Imperial Arcade, Oxford Road, Manchester, by mutual consent as from November 15th, 1929. Debts received and paid by H. B. Goble and R. C. Rusden.

ELECTRICAL TRADE MARKS.

This list has been specially compiled for us from official sources by GEE AND CO., Patent and Trade Marks Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.

AUTOREX

507 512. Class 8. Wireless telegraphic and telephonic instruments and apparatus and parts of such instruments and apparatus. Marcel Tavernier, 71, rue Francois Arago, Montreuil-sous-Bois; manufacturer. November 5th, 1929.

ALPHA. 502 003-6 740 S. Class 13. Flat irons, kettles, saucepans, steamers, coffee percolators, curling tongs, shaving pots, glue pots, soldering irons and immersion heaters, all for use with electricity, and electric switches and contacts, all being metal goods. Wright, Bindley and Gell, Ltd., North British Steel Works, Penistone Road, Sheffield; and Premier Works, Percy Road, Greet, Birmingham; manufacturers. April 20th, 1929. To be associated with No. 502 004-6 741 S. (2 693) xviii.

LIMPET. B505 610. Class 50. Adhesive textile tapes impregnated with bitumen or resin, and electrical insulating tapes impregnated with india-rubber. Connolly's (Blackley), Ltd., Blackley Vale Mills, Blackley, Manchester; cable manufacturers. August 28th, 1929. User claimed from October, 1909. The applicants undertake that this mark, when registered, and the mark No. B496 270 (2 659) shall be assigned or transmitted only as a whole and not separately.

METCOSITE. 505 449. Class 50. Compositions made from vegetable fibres and pulps and sold in sheets, slabs, rods, tubes and the like for industrial purposes, and articles, not included in other classes, made from such compositions, namely, electric insulators, electric junction boxes; lamp holders, lamp shades, reflectors and similar fittings for electric lighting; panels, bases and cases for electrical and radio instruments. The Merchant Trading Co., Ltd., 52, Bishopsgate, London, E.C.2; merchants. August 21st, 1929. To be associated with No. 505 448 (2 690).

BEXITE.—503 217. Class 50. Battery cases and parts thereof, electric light standards, electrical insulators, loud speaker bases, switch plates, switch covers, all being goods made wholly or chiefly of synthetic resin and not included in other classes. The British Xylonite Co., Ltd., Hale End, London, E.4; manufacturers. May 30th, 1929. To be associated with No. 394 493 (2 170) and another.

SEMISCURE. 506 711. Class 13. Electric lamps (ordinary). The Lunar Electrical Co., Ltd., 3 to 7, New Street Square, London, E.C.4; merchants.—October 8th, 1929.

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PATENT RECORD.

The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications when accepted, may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

314 416 Siemens-Schuckertwerke Akt.-Ges. Heat power plant working with a back pressure machine. (27/6/28.)
295 636 British Thomson-Houston Co., Ltd. Automatic control equipments for electric motors. (15/8/27.)
319 463 A. Levy and M. Levy (trading as Soc. Electro-Technique Appliquee). Supply of current to thermionic valves for wireless apparatus and the like. (14/8/28.)
296 990 A. Sismanopol. Secondary electric cells. (10/9/27.)
319 479 Siemens-Schuckertwerke Akt.-Ges. and M. Dieterlen. Cooling of dynamo-electric machines. (10/9/28.)
319 487 Alloy Welding Processes, Ltd., and E. J. Clarke. Electrodes for electric arc welding or soldering. (20/9/28.)
319 491 S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken.) Wireless receiving sets. (24/9/28.)
313 870 British Thomson-Houston Co., Ltd. Condenser microphones. (18/6/28.)
319 495 W. Stirling. Safety switch-operating device. (26/9/28.)
297 749 I.G. Farbenindustrie Akt.-Ges. Electrical insulation. (26/9/27.)
297 775 Marconi's Wireless Telegraph Co., Ltd. Thermionic valves. (27/9/27.)
319 502 R. C. Graseby. Electric reciprocating mechanism or motors. (3/10/28.)
319 504 H. B. Prentice. Distribution-board, switch, or fuse-box. installations for electric supply systems. (5/10/28.)
298 645 Siemens-Schuckertwerke Akt.-Ges. Arrangement for preventing the corona on the slot-sleeves of high-tension electric machines. (13/10/27.)
299 308 L. Siegl. Electric switch for operating the light and sound signals of motor-driven vehicles. (22/10/27.)
319 520 H. H. Berry. Spinners or fans, such as those used in imitation fires. (18/10/28.)
299 063 Associated Electrical Industries, Ltd. Adjustable mountings for supporting lighting-units, electric fans, or the like. (20/10/27.)
319 527 H. V. Higgitt and Eastern Telegraph Co., Ltd. Means for picking up submarine cable. (25/10/28.)
299 857 International General Electric Co., Inc. Electron discharge devices. (2/11/27.)
301 040 F. Marti. Electrical time-pieces. (23/11/27.)
301 047 British Thomson-Houston Co., Ltd. Apparatus for handling fragile articles. (23/11/27.)
311 727 S. Ruben. Electric condenser. (15/5/28.)
301 319 S. Hermont. Incandescent lamps of the multi-filament type. (27/4/28.)
301 424 Telefonaktiebolaget L. M. Ericsson. Impulse-senders of the finger-disc type. (29/11/27.)
302 163 Associated Electrical Industries, Ltd. Voltage regulators. (9/12/27.)
302 183 E. G. O. Pressler, A. E. M. Pressler and K. E. H. Pressler (trading as Pressler Thuringer Vakuumrohrenfabrik und Fabrik Wissenschaftlicher Apparate.) Photo-electric cells. (9/12/27.)
302 247 International General Electric Co., Inc. Speed-controlling means for alternating-current motors. (12/12/27.)
302 930 F. R. Dietrich. Electrically driven colour-spraying apparatus. (22/12/27.)
317 034 Scintilla Akt.-Ges. Ignition-coils for battery ignition-apparatus. (9/8/28.)
319 556 J. Neu and J. Neuberger (trading as Enn-Werke Neu and Neuberger, [firm of]), and C. Flamm. Electric hand-lamps. (2/1/29.)
307 907 C. Baumann. Electromotive driving- means for gas compressers. (16/3/28.)
319 570 H. Martin. Apparatus for electrically-measuring fluid flow. (13/8/28.)
319 578 G. Bozek. Instruments for measuring electric resistances. (28/2/29.)
308 347 Magnet-Werk Ges. Eisenach Spezialfabrik Fur Electro-Magnet-Apparate. Disintegrating-machines. (22/3/28.)
319 307 J. L. Baird and Television Ltd. Television apparatus and the like. (20/6/28.)
312 364 International General Electric Co., Inc. Windings for dynamo-electric machines. (25/5/28.)
288 144 Tammerik, J. Electric time switching systems. (23/3/28.)
319 798 W. H. Fordham. Magnetometers for magnetic surveying. (26/3/28.)
319 802 V. Stobie. Electric furnaces. (31/3/28.)
290 987 G. Kemmann. Automatic train-control for railways. (20/5/27.)
319 674 G. A. Mathieu. Automatic current limiting and regulating devices for use in electrical signalling. (22/5/28.)
297 812 Landis and Gyr Soc. Anon. Counting-mechanism for two-rate electricity meters. (30/9/27.)
319 809 G. M. Wright. Picture and the like facsimile telegraph transmitters. (31/5/28.)
319 595 W. Shaw G. Heptonstall and B. L. Myer. Metallic conduits for electrical conductors. (15/6/28.)
319 598 Igranic Electric Co., Ltd., and G. F. Dandridge. Variable resistance devices. (19/6/28.)
319 600 H. S. Cowx. Electric signalling and indicating apparatus and the like. (20/6/28.)
292 522 Akt.-Ges. Brown, Boveri, et Cie. Arrangement for synchronising the selectors in long-distance control systems. (20/6/27.)
319 634 C. J. Ward and S. E. Hillman. Electric accumulators. (21/6/28.)
292 539 Bamag-Meguin Akt.Ges. Electrically operated closing means for vertical chamber ovens. (29/6/27.)
294 641 Soc. Nouvelle de Constructions Telephoniques Brevets Tchoubritch-Derval. Electro-magnetic relays for controlling electric circuits. (29/7/27.)
296 978 Soc. de Paris et du Rhone. Electric cleaner. (10/9/27.)
319 637 A. Reyrolle and Co., Ltd., H. Leben and N. Cooke. Electric protective systems and relays for use therein. (25/6/28.)
319 639 Brandes, Ltd. (Federal Telegraph Co.). Loud-speaker system. (25/6/28.)
319 645 Medway's Safety Lift Co., Ltd. and B. A. Siden. Electric control apparatus for use in lift installations. (25/6/28.)
319 647 Carborundum Co., Ltd. (Carborundum Co.). Electrical resisting bodies. (25/6/28.)
319 813 H. Pearce and Associated Electrical Industries, Ltd. Electrical power-distribution systems. (26/6/28.)
319 712 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.) Compensation for phase variations on telegraph and telephone transmission lines. (27/6/28.)

Applications for Patents.

September 12th.

27 737 J. Christie, J. Mirrey and A. Reyrolle and Co., Ltd. Joints, etc., for high voltage cables.
27 760 S. E. Covo. Automatic telephone dials, etc.
27 712 E. and W. J. Daniels. Electric cigarette lighter, etc.
27 698, 27 699 V. A. Foot. Telephone apparatus for the deaf.
27 719 General Electric Co., Ltd., and F. J. Keeley. Electric switchgear.
27 798 R. Hunt. Cartons for electric lamps.
27 799 Marconi's Wireless Telegraph Co., Ltd. Piezo-electric crystals, and apparatus for use therewith. (2/10/28, U.S.)
27 753 E. W. C. Russell. Piezo-electric devices. (12/9/28, U.S.)
27 762 Siemens-Schuckertwerke A.G. Semi-conductive coating for electric conductors. (13/9/28, Germany.)
27 791 Siemens-Schuckertwerke A.G. Localising leaks in oil-filled cables. (22/9/28, Germany.)
27 789 P. B. Healey, and Telephone Manufacturing Co., Ltd. Communication means for use in aircraft, etc.

September 13th.

27 837 Associated Electrical Industries, Ltd. Electrical switches. (13/9/28, U.S.)
27 838 Associated Electrical Industries, Ltd. Electric rectifiers. (13/9/28, U.S.)
27 839 Associated Electrical Industries, Ltd. Recording meters. (13/9/28, U.S.)
27 836 N. R. Blanch. Electric conductors.
27 835 J. Christie, F. Coates, and A. Reyrolle and Co., Ltd. Electric conductors.
27 850 R. Costigan. Electric torches, etc.
27 916 Coventry Automatic Telephones, Ltd. Electric signalling systems.
27 862 F. Hodgson. Electric wire connectors.
27 866 International General Electric Co., Inc. Electric switches. (19/9/28, Germany.)
27 877 A. Nielson. Electric heaters. (14/9/28, Norway.)
27 856 E. Potter (J. Pintschakt Ges.). Magneto for voltage regulating apparatus.
27 880 Raytheon Production Corporation. Photoelectric cells. (23/11/28, U.S.)
27 846 Siemens-Schuckertwerke A.G. Electric motors. (27/12/28, Germany.)
27 920 Siemens-Schuckertwerke A.G. Electric trucks. (18/4/29, Germany.)
27 921 Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Speech transmission.
27 916 C. W. Wilman. Electric signalling systems.

September 14th.

27 997 American Cable Co., Inc. Metallic conduit. (15/9/28, U.S.)
27 956 J. L. Baird and Television, Ltd. Synchronising devices.
27 977 British Thomson-Houston Co., Ltd. Switch-operating mechanism. (14/9/28, U.S.)
27 988 Chloride Electrical Storage Co., Ltd., and B. Heap. Accumulators.
28 001 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken.). Circuit arrangements for thermionic devices.
28 002 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken. Wireless receivers.
27 925 Electrolux, Ltd. Absorption refrigerating systems. (15/9/28, U.S.)
27 958 G. Fleischer. Device for manipulating dials of telephone apparatus.
27 978 International General Electric Co., Inc. Electric switches. (14/9/28, Germany.)
27 945 A. Muratori and L. Valeri. Electric generator.
27 944 Rainbow Light, Inc. Luminous discharge tube. (14/9/28, U.S.)
27 983, 27 984 S. Ruppel. Electric switches.
27 968 E. J. Timberlake. Electromagnets for loud speakers.

September 16th.

28 083 R. S. C. Balls and Read and Partners, Ltd. Electrically heated kettles, etc.
28 058 British Thomson-Houston Co., Ltd. Balancing rotors. (17/9/28, U.S.)
28 045 A. G. G. Cadman. Sound-box for wireless loud speakers, etc.
28 104 Electrical Research Products, Inc. Signalling cable. (23/3/29, U.S.)
28 067 Etablissements Idaufix. Electric switch. (15/9/28, Germany.)
28 047 E. V. Hayes-Gratze. Electro-deposition of chromium.
28 113 E. Haefely et Cie Akt.-Ges. Electric condensers. (5/10/28, Switzerland.)
28 119 J. W. Hofmann. Clamping devices for steel aluminium conductors.
28 057 International General Electric Co., Inc. Electric switches. (14/9/28, Germany.)
28 103 H. T. Logan. Electric switches.
28 087 Maschinenfabrik Oerlikon. Electric rectifiers. (15/10/28, Switzerland.)
28 097 R. Mather. Electric heating appliances, etc.
28 089 G. Spratt. Electric switches.
28 121 O. Sturner. Electrically controlled apparatus for producing changing inscriptions. (15/9/28, Germany.)

September 17th

28 198 Arcturus Radio Tube Co. Photoelectric cells. (17/9/28, U.S.)
28 102 C. W. Bloomfield. Insulated cables, etc.
28 202 G. Brion and J. Krutzsch. Passing electric current through gases. (17/9/28, Germany.)
28 179 J. H. Broome. Electric totalisators.
28 217 Brown, Boveri et Cie, Akt. Ges., Abt. Installationen. Refrigerator cabinets, etc. (27/8/29, Germany.)
28 142 C. Day. Parelleling a.c. dynamos.
28 166 A. N. Hazlehurst. Electric accumulators.
28 128 L. C. Ratcliffe. Accumulator.
28 191 Siemens-Schuckertwerke Akt. Ges. Means or protecting electrical installations. (18/9/28, Germany.)

September 18th.

28 339 Associated Electrical Industries, Ltd. Electrical protective systems. (19/9/28, U.S.)
28 319 British Thomson-Houston Co., Ltd. Mounting filaments. (18/9/28, U.S.)
28 318 British Thomson-Houston Co., Ltd. (General Electric Co., N.Y.) Electric switches.
28 341 W. R. Bullimore. Cathode for thermionic devices.
28 342 W. R. Bullimore. Aerial wireless circuits.
28 343 W. R. Bullimore. Wireless receiving apparatus.
28 350 Electrical Research Products, Inc. Regulator systems. (20/9/28, U.S.)
28 351 Electrical Research Products, Inc. Frequency setting fork. (4/10/28 U.S.)
28 335 J. Feigelson. Regeneration of lead plates of accumulators.
28 232 E. E. Hopwood and Wardle Engineering Co., Ltd. Electric radiators, etc.
28 324 G. H. Lucas. Telephone mouthpiece disinfector.
28 340 E. S. Newland. Moving coil loud speakers, etc.
28 362 H. O'Connell. Apparatus for supplying current to wireless receivers, etc., from mains.
28 313 Patent Treuhand ges fur Elektrische Gluhlampen. Electric rectifiers (21/12/28, Germany.)
28 286 T. R. Scott and Sterling Telephones and Cables, Ltd. Electric cables.
28 285 Sterling Telephones and Cables, Ltd. and J. R. Vezey. Loading system for signalling cable.

September 19th.

28 452 Associated Electrical Industries, Ltd. Gear wheels. (19/9/28, U.S.)
28 391 Birmingham Electric Furnaces, Ltd., and A. G. Lobley. Electric furnaces.
28 373 W. Bullen. Wireless signalling apparatus.
28 471 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Soft iron measuring instruments.
28 472 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Alarm devices.
28 424 C. Farrar and R. A. S. Hoare. Gramophone amplifiers and radio receivers.
28 431 General Electric Co., Ltd., and J. W. Ryde. Mercury vapour rectifiers.
28 404 Ges fur Elektrische Apparate. Ships' telegraph. (17/10/28, Germany.)
28 396 T. and T. R. Hollis. Ceiling plates for electric light fittings.
28 439 International General Electric Co., Inc. Artificial networks. (19/9/28, Germany.)
28 432 H. L. Jones. Adjustable fittings for electric lamps.
28 478 C. Leven. Manufacture of electric lamp holders, etc.
28 385 C. Marshall. Amplifying electric impulses.
28 437 G. Nott. Cooling systems of generating sets.
28 470 Siemens Schuckertwerke Akt.-Ges. Electrical switch installations. (19/2/29, Germany.)
28 372 T. F. Wall. Alternating current rectifiers.

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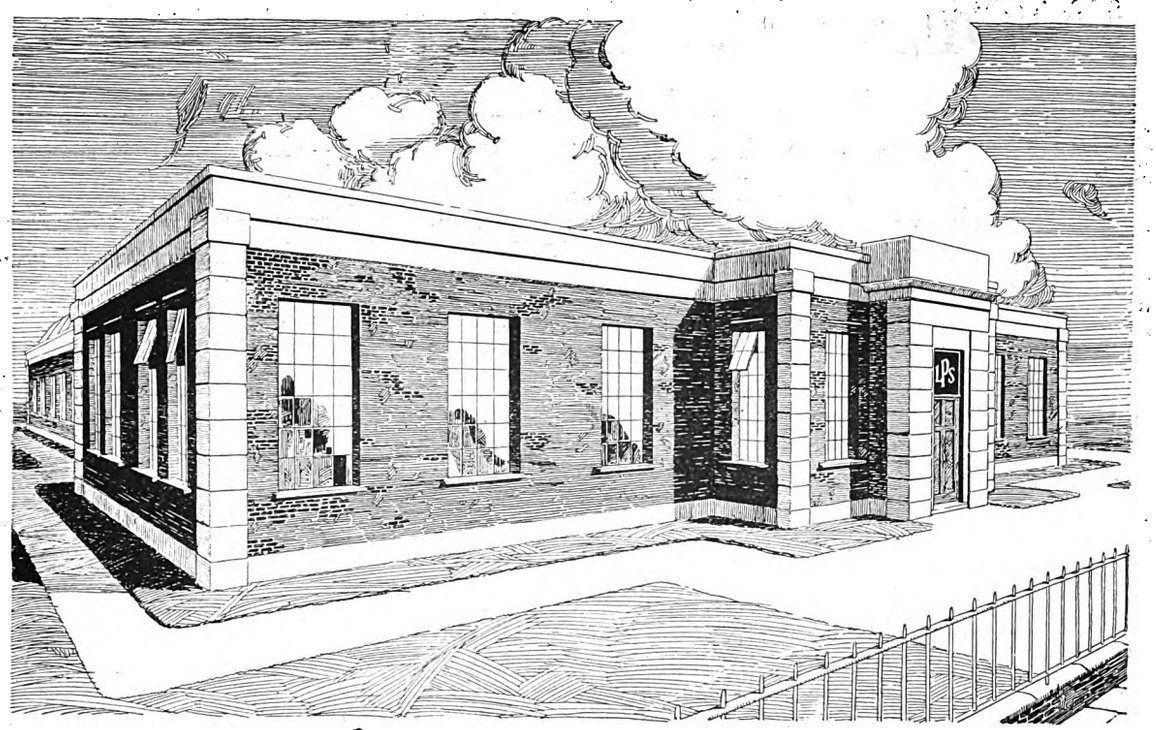


The L.P.S. New Works at Alperton, Middlesex.

DEPENDABILITY

ENAMELLED WIRE

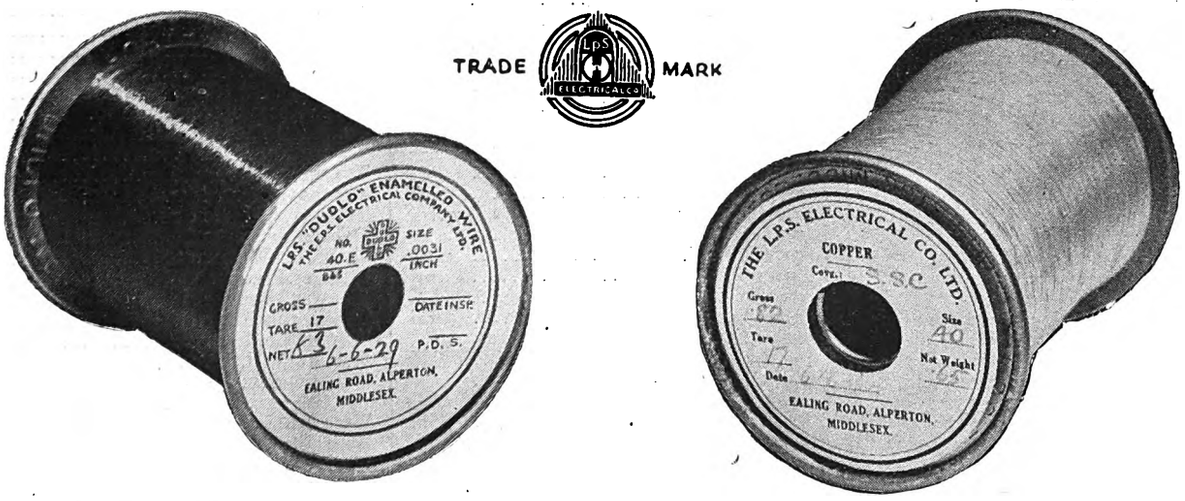
L.P.S.-Dudlo Enamelled Copper Wire is celebrated for its unique qualities of excellence and dependability. There are few commodities which are at the same time so easy and yet so difficult to make satisfactorily in commercial quantities as Enamelled Copper Wire. The test it is customary to adopt of inspecting 50-ft. taken from a few selected reels of wire can obviously prove very little in a case of this kind where continuity of insulation must necessarily be taken on trust.

This is why so many discriminating users specify L.P.S.-Dudlo Enamelled Copper Wire for safety.

OTHER L.P.S. PRODUCTS

The same regard for quality and dependability distinguishes the manufacture of our other products: **Silk and Cotton covered, plain and Enamelled Copper Wires and Strands. "Supronic" (Cupro-Nickel), "Haetanic" (Nickel-Chrome) Resistance and Heating Wires and Tapes. Cords, Flexibles, Aerial Wireless and other strands. Insulating Varnished Silk, Cloth, Paper and Tapes, Insulating Flexible Cotton and Silk Tubing, in sizes from ½ mm. to 30 mm. bore. Tungsten Contacts and Universal Test and Battery Clips.**

TRADE MARK



The L.P.S. ELECTRICAL CO., LTD.

EALING ROAD, ALPERTON, WEMBLEY, MIDDLESEX.

Telegrams: "Engineyor, Phone, London." *Telephones: Ealing 5322-3.*

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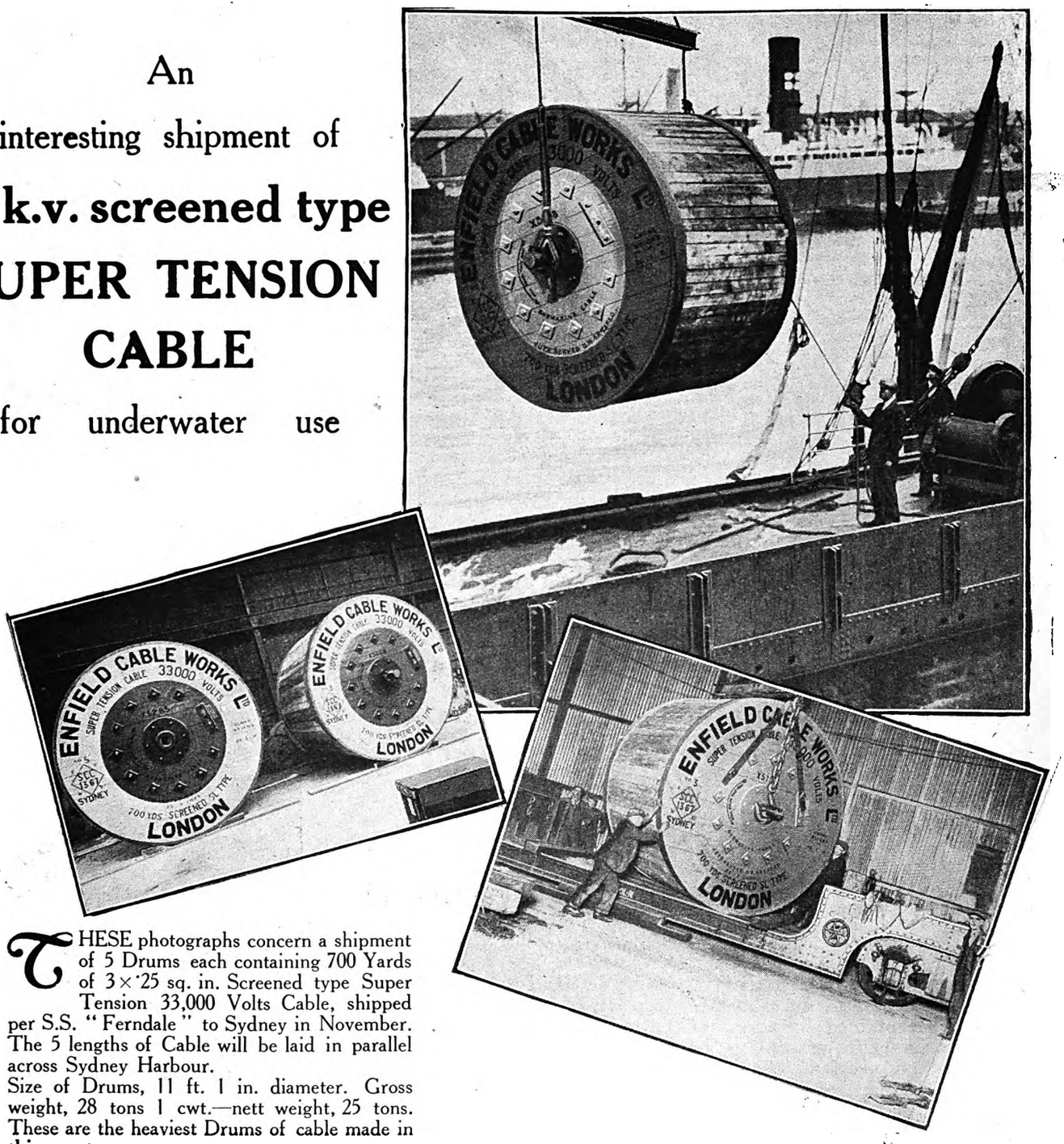
ANOTHER ENFIELD ACHIEVEMENT

An

interesting shipment of

33k.v. screened type SUPER TENSION CABLE

for underwater use



THESE photographs concern a shipment of 5 Drums each containing 700 Yards of 3×·25 sq. in. Screened type Super Tension 33,000 Volts Cable, shipped per S.S. "Ferndale" to Sydney in November. The 5 lengths of Cable will be laid in parallel across Sydney Harbour.

Size of Drums, 11 ft. 1 in. diameter. Gross weight, 28 tons 1 cwt.—nett weight, 25 tons. These are the heaviest Drums of cable made in this country.

THE **Enfield** CABLE WORKS LTD

Telephones: Holborn 0591 (4 lines)

Telegrams: "Enfelcama, Phone, London"

LINCOLN HOUSE, 296-302, HIGH HOLBORN, W.C.1

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"ENFIELD CABLES"

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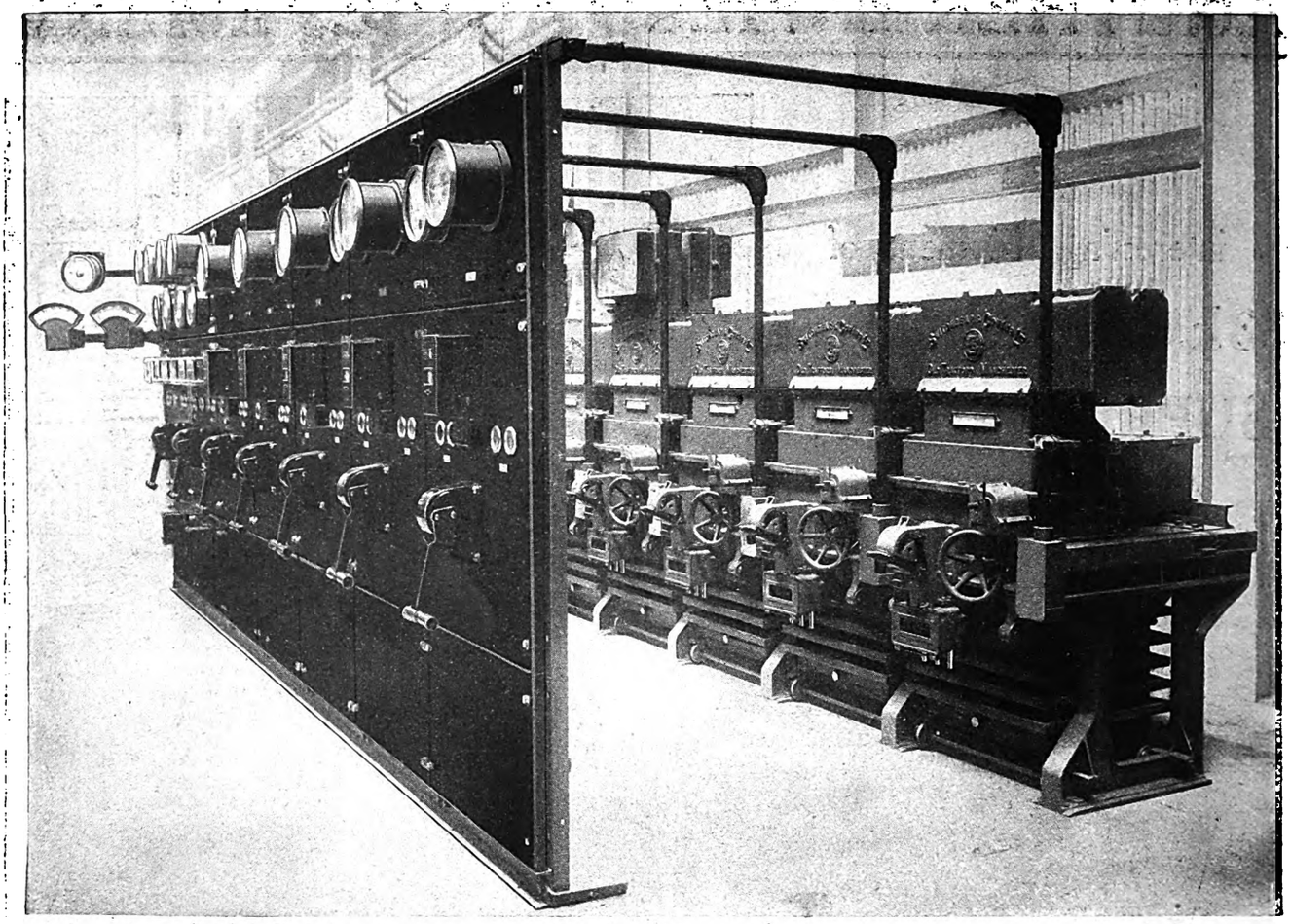


Above: **7 Panel Board of I. I. Switchgear for Sub-Station with 2 panels controlling Incoming Supply from "Grid" and 5 Feeder Panels.**
(Mechanical Operating Rods from Control Panels to Circuit Breakers, not shown).
Right: **Front View of one of the Units of above Board.**

S. & C.
Internal Isolation Switchgear

(British, Dominion and Foreign Patents granted and pending)

Here is a Switchboard with each unit built up of metal-clad, self-contained components and so original in principle as to eclipse all previous efforts in switchgear design and construction.

A non-drawout, non-dropdown circuit-breaker-on-the-floor switchboard, new and exclusive in all its details, from circuit breaker to small wiring.

Heralding the beginning of real switchgear satisfaction, this board with its unique Isolating Principle produced through constant effort to improve and perfect, inaugurates new standards of safety, simplicity and economy in switching operations.

The World's only Complete-on-the-Floor Internal Isolation Switchgear exclusively developed by S. & C., and acknowledged the most notable advance for many years in Switchgear Principle, Design and Construction.

Send for Catalogue Section No. 23.

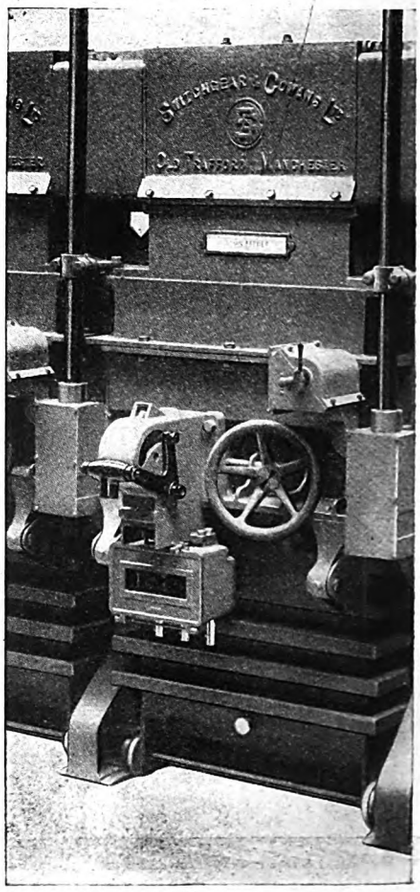
Masters of SwitchCraft

SWITCHGEAR & COWANS LTD
Old Trafford Manchester

SWITCHGEAR AND INDUCTION REGULATORS

LONDON OFFICE: 28, Victoria Street, S.W.1.
District Offices and Representatives throughout Great Britain and Overseas.

D.R.K. 185



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SITUATIONS WANTED—PENNY PER WORD.

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Last day for receiving copy, first post Wednesday morning.

Announcements of this description *must be prepaid*. Replies to Advertisements can be addressed to the offices to be called for, but where these replies are to be sent on to Advertisers by Post, 6d. must be included for postage.

'Phone: CITY 0244 (10 Lines)

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Bouverie House, 154, Fleet Street, London, E.C.4.

Wire: "Benbrotric, Fleet" London.

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THE National Register is an independent institution representing all bodies connected with the Electrical Industry, and grants to contracting firms satisfying its requirements the right to use this sign.

Particulars on application to Secretary, 1, Lincoln's Inn Fields, London, W.C.2.

TENDERS INVITED.

COUNTY BOROUGH OF GRIMSBY.

ELECTRICITY DEPARTMENT.

THE Corporation of Grimsby are prepared to receive Tenders for the manufacture, delivery and complete erection of ONE 10,000 KILOWATT, THREE-PHASE TURBO ALTERNATOR WITH CONDENSING PLANT.

The Specification and Form of Tender can be obtained from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby, upon payment of a deposit of £2 2s. (Two Guineas).

The deposit will only be returned after a *bona fide* Tender has been opened by the Committee, and after the Specification and Form of Tender has been returned intact.

Sealed tenders, endorsed "Tender for Works Plant," must be delivered to the undersigned not later than noon on Thursday, the twenty-third day of January, 1930.

The Corporation do not bind themselves to accept the lowest or any Tender.

S. R. WINDLE,
Borough Electrical Engineer.

Electricity Offices,
Moss Road,
Grimsby.
December 16th, 1929.

COUNTY BOROUGH OF DEWSBURY.

THE Corporation of Dewsbury invite Tenders for the supply, delivery and erection of Rotary Converter Plant (1 500 kWt and 500 kWt).

Specification and Form of Tender may be had on application to R. W. Grubb, Esq., M.I.E.E., Borough Electrical Engineer, Bradford Road, Dewsbury.

Tenders, endorsed "Rotary Plant," and addressed to the undersigned, must be delivered not later than 12 noon, on Monday, January 13th, 1930.

The Corporation does not bind itself to accept the lowest or any tender.

HOLLAND BOOTH,
Town Clerk.

Town Hall,
Dewsbury.
December 19th, 1929.

ELECTRICAL INSTALLATION.

THE Committee of Visitors of the Mental Hospital, Barming Heath, Maidstone, invite Tenders for an electrical installation for lighting, heating, etc., at the above-mentioned hospital.

Electrical energy will be supplied from the mains of the Maidstone Corporation.

Specification, conditions of contract, and tender form may be obtained on application to the Consulting Engineer, Mr. E. E. Hoadley, Corporation Electricity Works, Maidstone.

Plans of the Mental Hospital may be inspected at the office of the Consulting Engineer by appointment.

Applications for specifications must be accompanied by a cheque for two guineas, payable to Mr. E. E. Hoadley.

This sum will be returned on receipt of a *bona fide* tender.

Tenders, in a sealed envelope endorsed "Tender for Electrical Installation," are to be delivered to Mr. H. J. Bracher, 44, Earl Street, Maidstone, before 11 a.m. on Thursday, January 16th, 1929.

The Committee does not bind itself to accept the lowest or any tender.

H. J. BRACHER,
Clerk to the Committee.

44, Earl Street, Maidstone.

NOTICE.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

SCARBOROUGH CORPORATION.

NOTICE is given of the existence of a difference between the above Corporation and the Association relative to the dismissal of a member, which difference has been referred to the National Joint Board.

CONSEQUENT UPON this Dispute, and pending a settlement, MEMBERS OF THE ASSOCIATION ARE ENJOINED TO REFRAIN FROM APPLYING FOR OR ACCEPTING ANY APPOINTMENT WITH THE ABOVE CORPORATION.

W. ARTHUR JONES, A.M.I.E.E.,
General Secretary.

102, St. George's Square,
London, S.W.1.

APPOINTMENTS VACANT.

WANTED.—Skilled Instrument Makers.—Apply in writing, stating experience and wages required, to W. G. PYE AND Co., Granta Works, Newmarket Road, Cambridge.

REQUIRED.—WIRELESS ENGINEER with good experience (in professional capacity) of short wave transmission.—Write, giving full particulars, to Box 158, c/o KNIGHTS, 55, Chancery Lane, W.C.

ASSISTANT Technical Engineer wanted for well-known company in the electrical industry. Good technical knowledge and practical experience necessary. State experience and salary required.—Box A.T.V., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

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ELECTRICAL TESTERS for Trunk Telephone Cable Installation work required shortly by large firm. Starting salary £3 to £4 per week; living allowance 35s. per week home and liberal rate abroad. Write giving qualifications, experience and age.—Box A.T.U., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

TELEPHONE ENGINEERING.—Junior Engineer, with sound training in the fundamental principles of electrical engineering, required for compiling and using designing data on new apparatus. Preferably familiar with telephone circuits.—Apply Box A. T. T., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, E.C.4.

TRAVELLERS wanted to sell the new Fenbo Anti-Dazfo-Electric Car Bulbs. Marvellous seller, good commission. —Apply, FENN, LTD., 3, Great Chapel Street, London, W.1.

ELECTRICAL ENGINEER (qualified) wanted, to take charge of Welwyn Garden City Supply Undertaking, including Transformer Station, distribution and installation work. Rapidly growing industrial and residential load. Present output: three million units per annum. Experience on sales side, as well as technical qualifications, essential.—Write, stating age, qualifications, experience and salary required, to SECRETARY, Welwyn Garden City, Limited, Howardsgate, Welwyn Garden City, Herts.

ENGINEER required for talking film work. University training and experience in the theory and practice of telephone engineering, including high quality valve amplifiers and repeaters, is essential. The applicant should also be a qualified musician with professional experience, which should include conducting small orchestras, and orchestration for straight and jazz music. An intelligent knowledge of dramatic technique, especially as applied to sound films, is also a qualification.—Write, giving fullest details of past experience, age and salary expected, to Box A.U.F., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

MAINS SUPERINTENDENT.

THE Barnes Urban District Council invite applications for this post. Candidates must have had a sound technical training, a thorough knowledge of and experience in H.T. Transmission, Rotary Converter Sub-stations and Low Tension D.C. 3-wire distribution.

The selected candidate will be required to undergo medical examination and to contribute to the Council's superannuation scheme.

National Joint Board's conditions, Class "D," Grade 3.

Applications, in own handwriting, stating age and giving full and concise particulars of training and experience, together with copies of recent testimonials, to be sent to the ENGINEER AND MANAGER, Electricity Works, Mortlake, S.W.14.

COUNTY BOROUGH OF BARROW-IN-FURNESS.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the position of Showroom Salesman. Applicants, who must have had experience in an Electrical Showroom, will be required to deal with Cash Sales, Hire-Purchase Schemes, Demonstrations, Window Dressing, etc. Salary, £200 to £250 per annum, according to qualifications and experience.

LADY DEMONSTRATOR.

Applications are also invited for the position of Lady Demonstrator of Electrical Cooking and Domestic Apparatus. Applicants must have had experience in Demonstration work and possess a Cookery Diploma or equivalent qualification. Salary, £150 to £175 per annum, according to qualifications and experience.

Applications for both appointments, stating age, experience and salary required, and enclosing copies of testimonials, to be addressed to H. R. Burnett, Borough Electrical Engineer, Electricity Works, Barrow-in-Furness.

W. A. CHISLETT,
Town Clerk.

Town Hall,
Barrow-in-Furness.
November 13th, 1929.

ASSISTANT Electrical Designer required, with experience of direct current design up to 300 kW; a.c. experience an advantage.—Apply, stating age, training and salary required, with copies of testimonials, to Box A.U.C., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

ASSISTANT required in design office. Applicants must have technical college training and workshop training and some practical experience in a design office.—Apply in writing, stating experience, training and salary required, to Box A.U.D., THE ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4

TRAVELLER required for Manchester district; experience in the sale of C.M.A. wires and cables an advantage.—Write, giving experience, age and salary required, to Box A.U.H., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

ENGINEER'S Draughtsmen wanted for electro-mechanical instruments. Sound modern production methods backed by experience. Knowledge of telegraph-telephone practice desirable. Good prospects for right men.—Write, giving fullest particulars, to Box A.U.G., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

METROPOLITAN-VICKERS ELECTRICAL COMPANY, LTD., Trafford Park, Manchester, requires a Designing Draughtsman for switchgear. Must be neat, quick and accurate, and have had experience in the designing of switchgear for all voltages. State training, experience, and salary required.—Write to Box A.U.E., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

COUNTY BOROUGH OF WEST HARTLEPOOL.

APPOINTMENT OF BOROUGH ELECTRICAL ENGINEER.

APPLICATIONS are invited from qualified Electrical Engineers, who must have sound commercial ability and experience, for the position of Borough Electrical Engineer, upon forms to be obtained from me, which must be delivered duly completed and endorsed "Borough Electrical Engineer," at the Municipal Buildings, West Hartlepool, not later than Saturday, January 11th, 1930.

The salary, which will be in accordance with the National Minimum Scale of Salaries for Chief Electrical Engineers of authorised Electricity Supply Undertakings, amounts to £1,125 for the current year.

The person appointed will in all probability be appointed to the position of Transport Manager, which would carry with it an additional salary of £150 per annum.

Canvassing directly or indirectly will be a disqualification.

HAROLD W. STANTON,
Town Clerk.

Municipal Buildings,
West Hartlepool.
December 20th, 1929.

BOROUGH OF WORKINGTON.

ELECTRICITY DEPARTMENT.

APPLICATIONS are invited for the following:—

(1) PLUMBER CABLE JOINTER, rate in accordance with the D.J.I. Councils Schedule, at present 1s. 5.86d. per hour. Applicant must have had previous experience in Jointing of all classes of L.T. and H.T., Pilosta Cables and service work.

(2) METER TESTER AND REPAIRER (Mechanician)—rate in accordance with D.J.I. Councils Schedule, at present £3 8s. 11d. for a 47-hour week, subject to deductions for Superannuation. Applicants must have had previous experience in the repair and calibration of all types of A.C. meters, including Pre-payment meters.

The successful candidate will be required to pass a medical examination and must not be over 35 years of age.

Applications endorsed "Plumber Cable Jointer" or "Meter Tester" giving age, details of previous experience and enclosing copies of three recent testimonials, should be sent to the undersigned not later than noon on Saturday, December 28th.

WM. A. PARKER,
Engineer and Manager.

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TRAVELLER required for Birmingham district; experience in the sale of C.M.A. wires and cables an advantage.—Write, giving age, experience and salary required, to Box A.U.I., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

TRAVELLER required for Liverpool district; experience in the sale of C.M.A. wires and cables an advantage.—Write, giving age, experience and salary required, to Box A.U.J., THE ELECTRICIAN, Bouverie House, 154, Fleet Street, London, E.C.4.

ASSISTANT DIVISIONAL ENGINEER, TELEGRAPHS, FOR THE INDIAN POSTS AND TELEGRAPHS DEPARTMENT.

THE Secretary of State for India in Council will select one candidate for appointment to this service in 1930. The selected candidate will be required to undergo a period of preliminary training in this country before appointment. Every candidate must be an European British subject of non-Asiatic domicile.

Candidates must not be more than 24 years of age on the 1st January, 1930, but preference will be given to candidates who are not more than 23 years of age on that date.

Every candidate must have (1) obtained a degree, diploma or other equivalent distinction in Electrical Engineering from any University or Institution of University standing in the United Kingdom, and (2) spent at least one year on practical electrical engineering work.

Applications must reach the India Office not later than 31st January, 1930. Printed forms together with information regarding the conditions of appointment may be obtained from the Secretary, Services and General Department, India Office, Whitehall, S.W.1.

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APPOINTMENTS WANTED.

HONOURS Physics Graduate (24), 2 years electrical engineering seeks business opening.—B.Sc., 48, West End Lane, N.W.6.

BROCHURE Writing, Catalogue Compilation or similar work desired (London area) by advertiser with electrical, wireless and journalistic experience.—ROBERT, 16, Edgar's Court, Welwyn Garden City, Herts.

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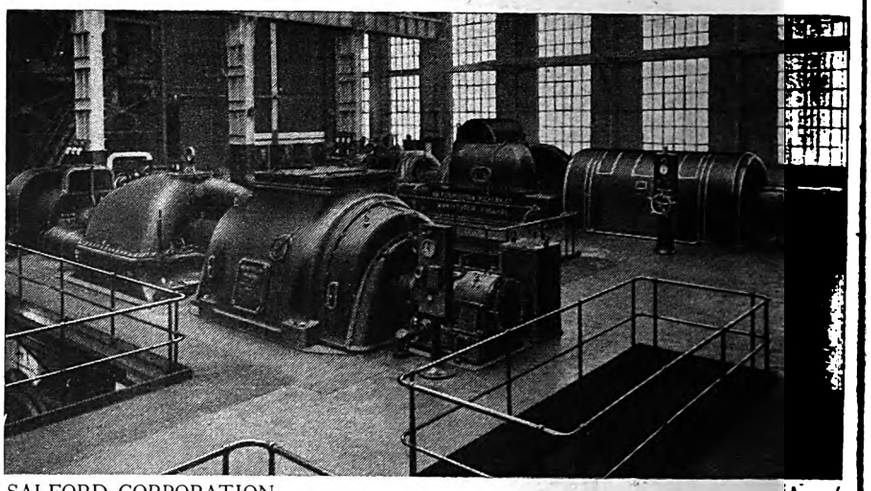

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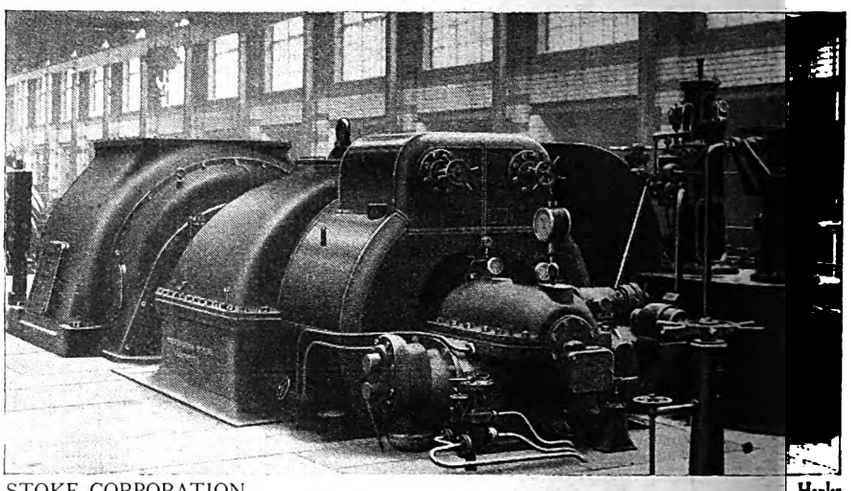

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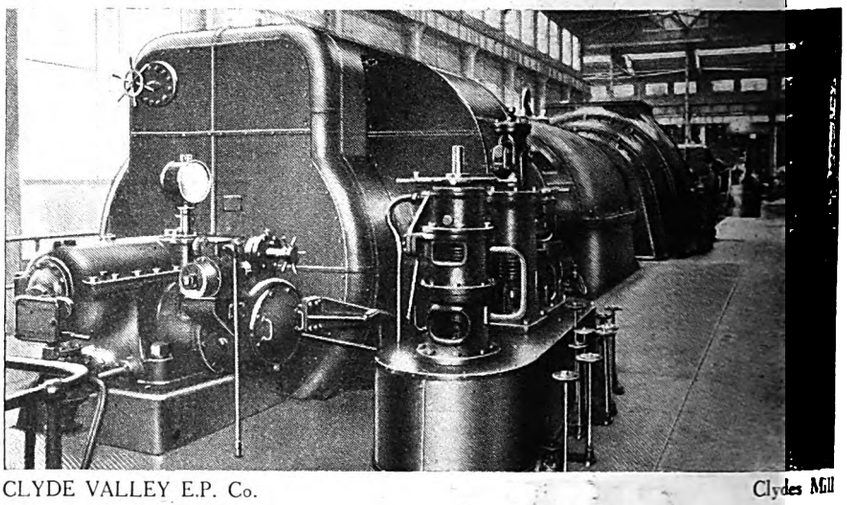

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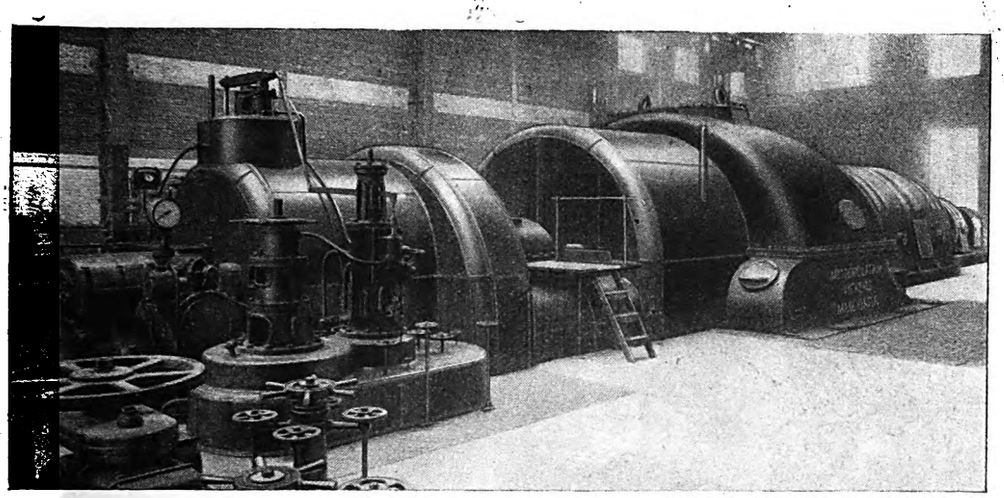

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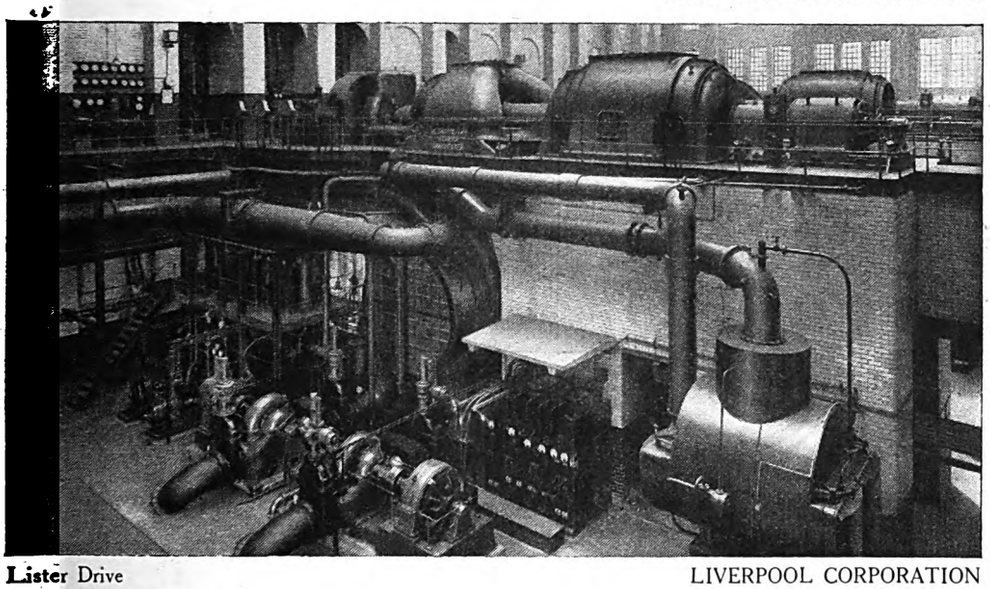

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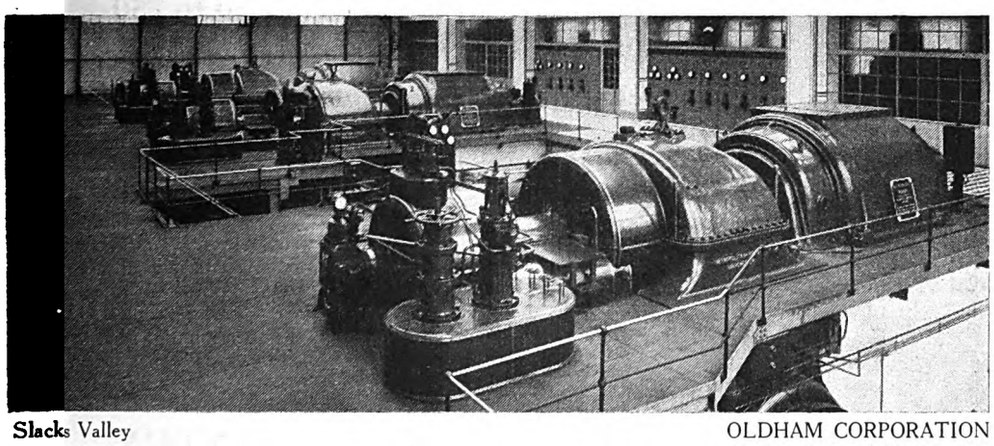

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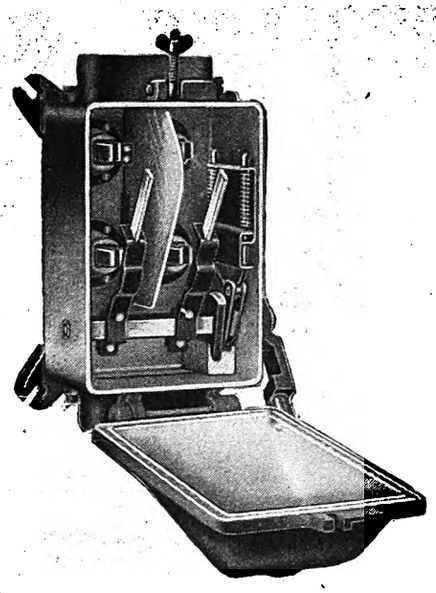

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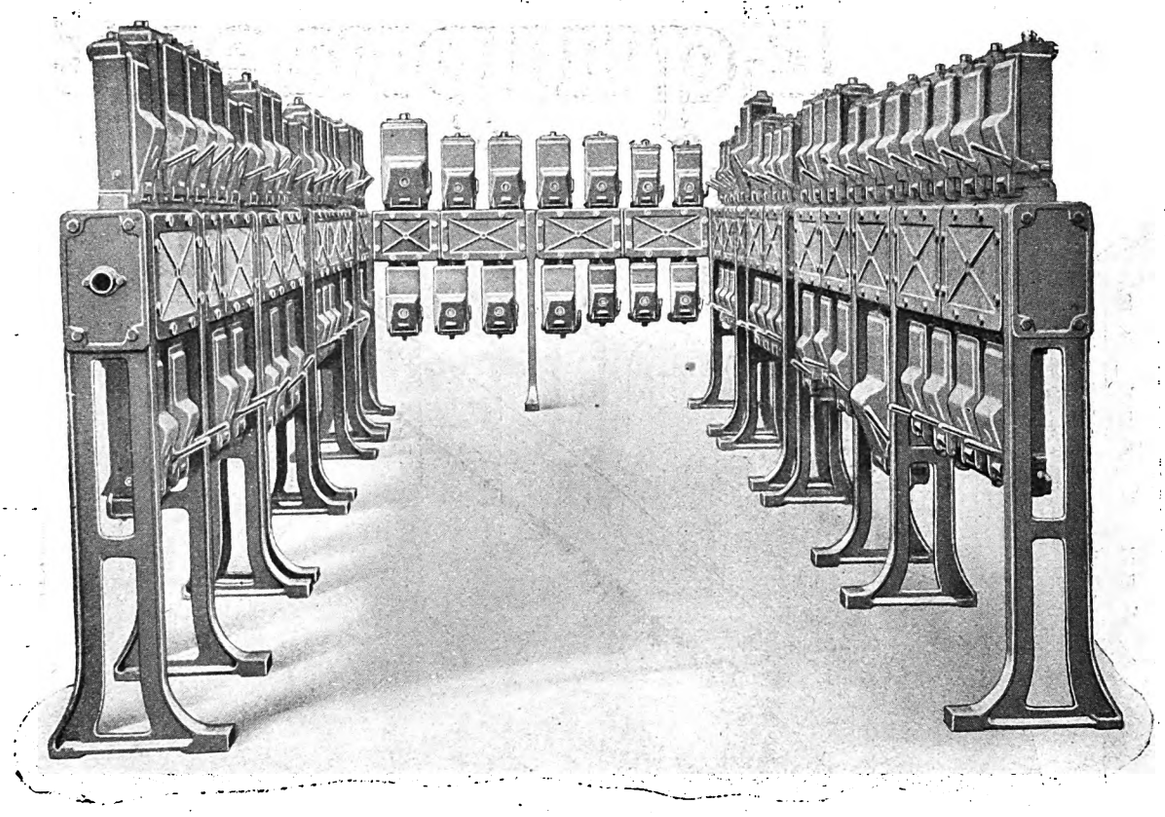

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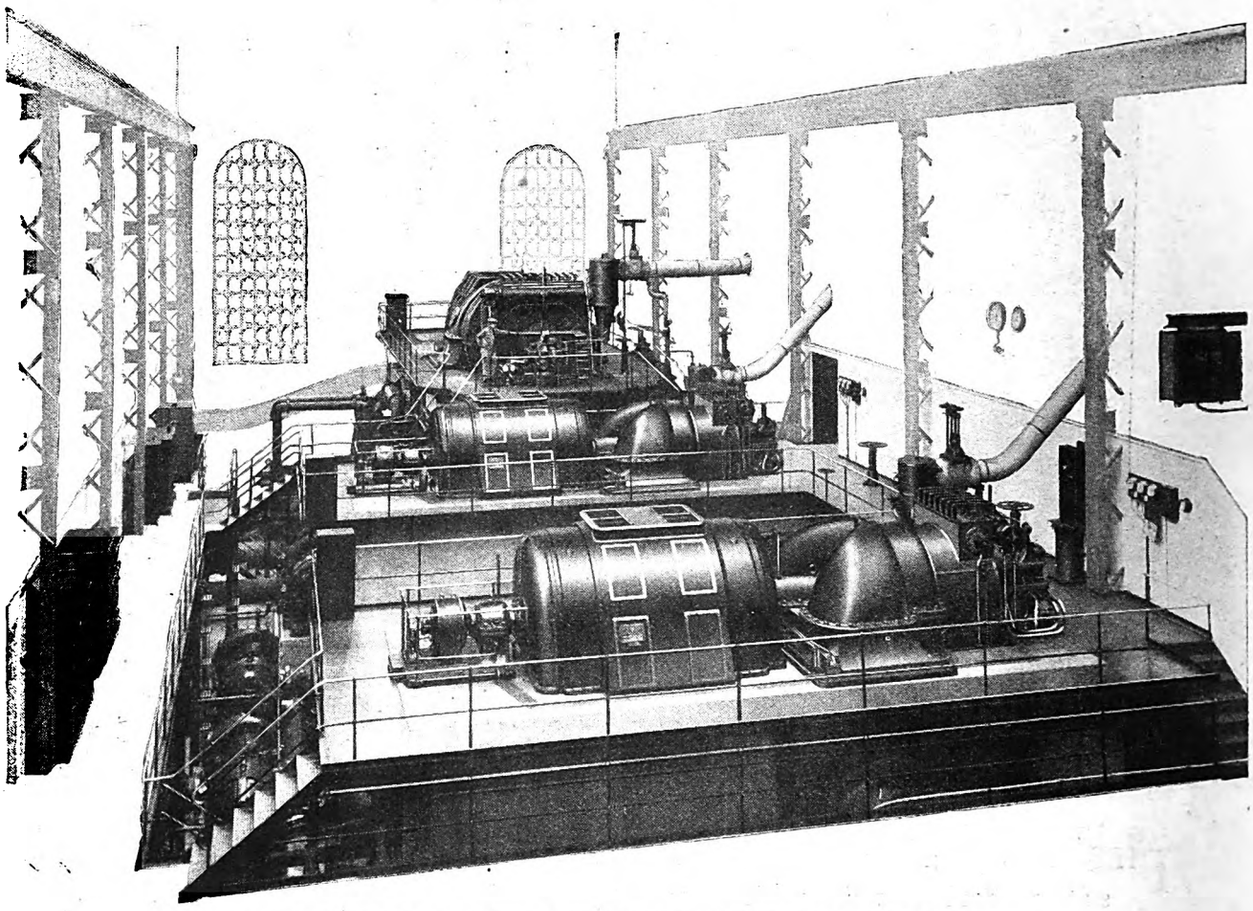

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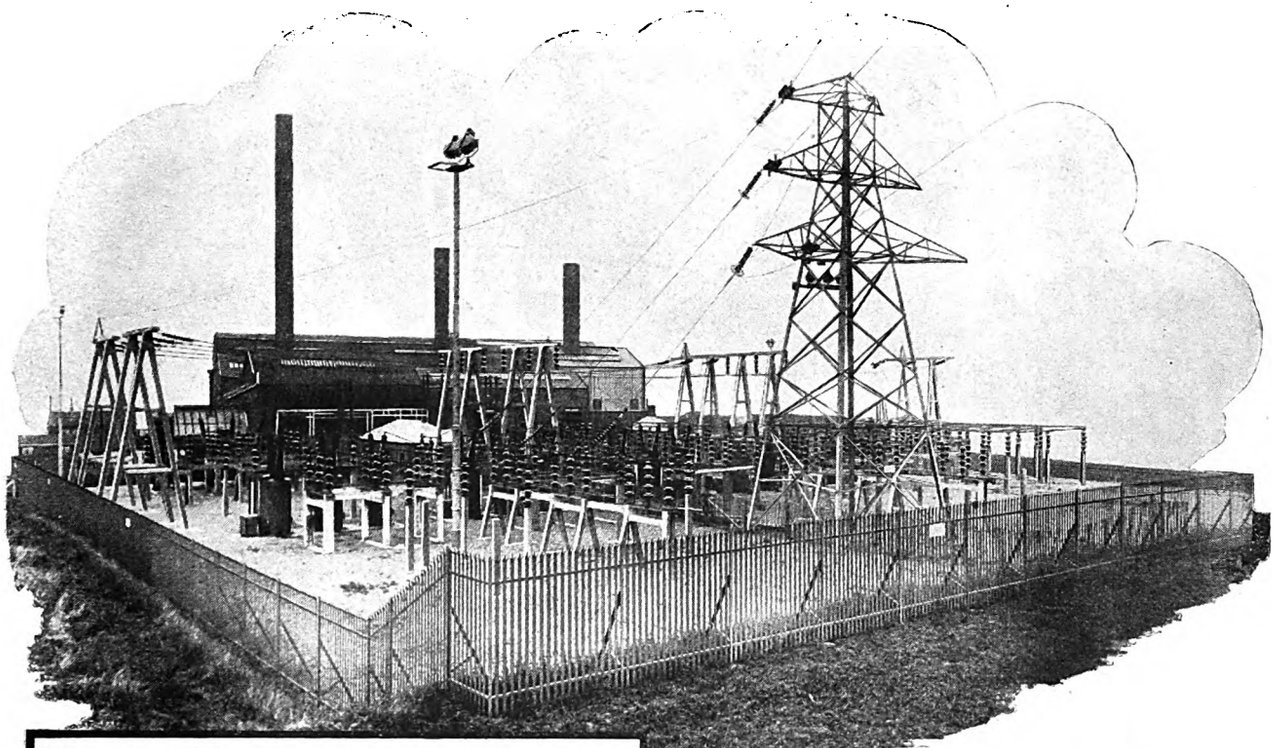

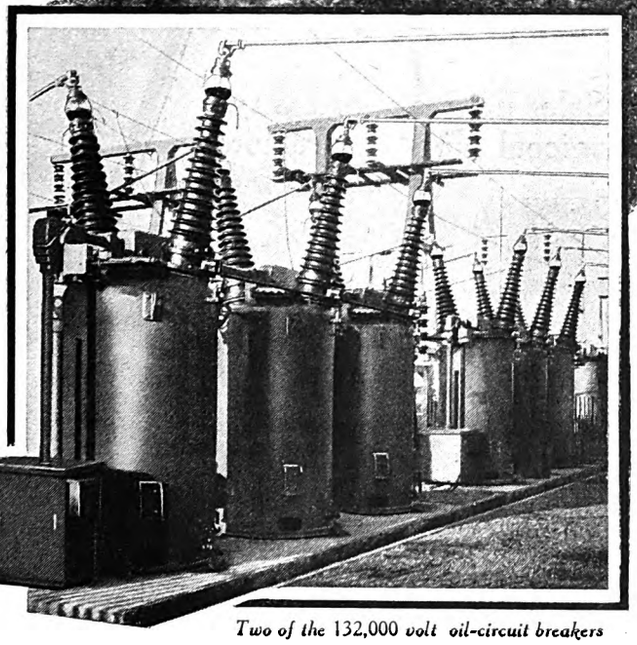

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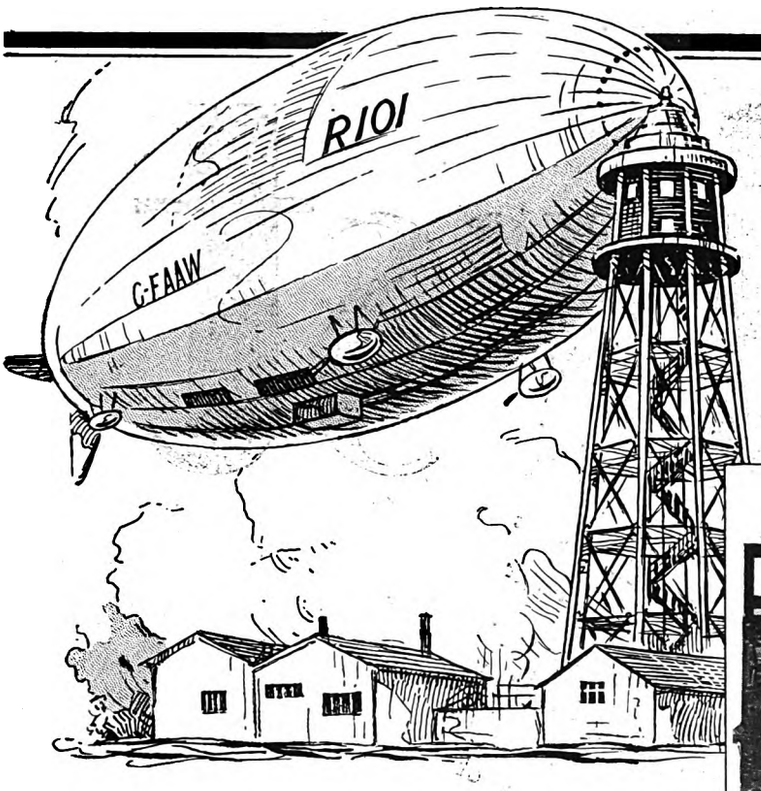

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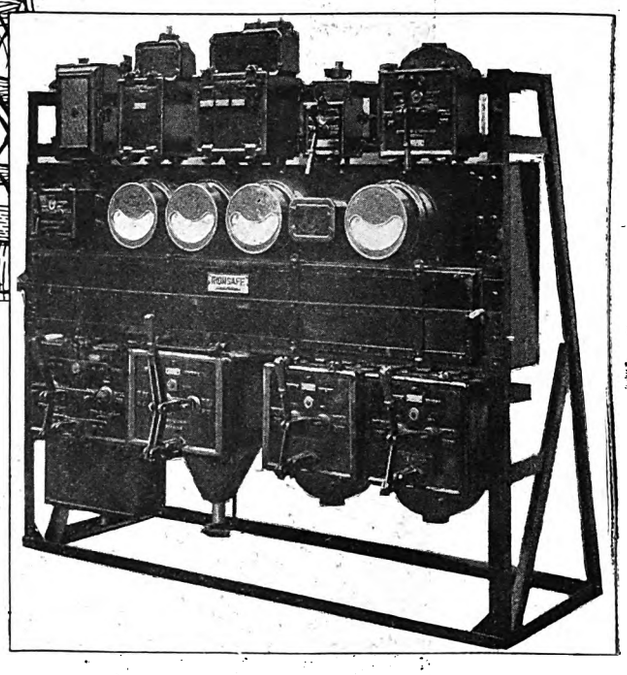

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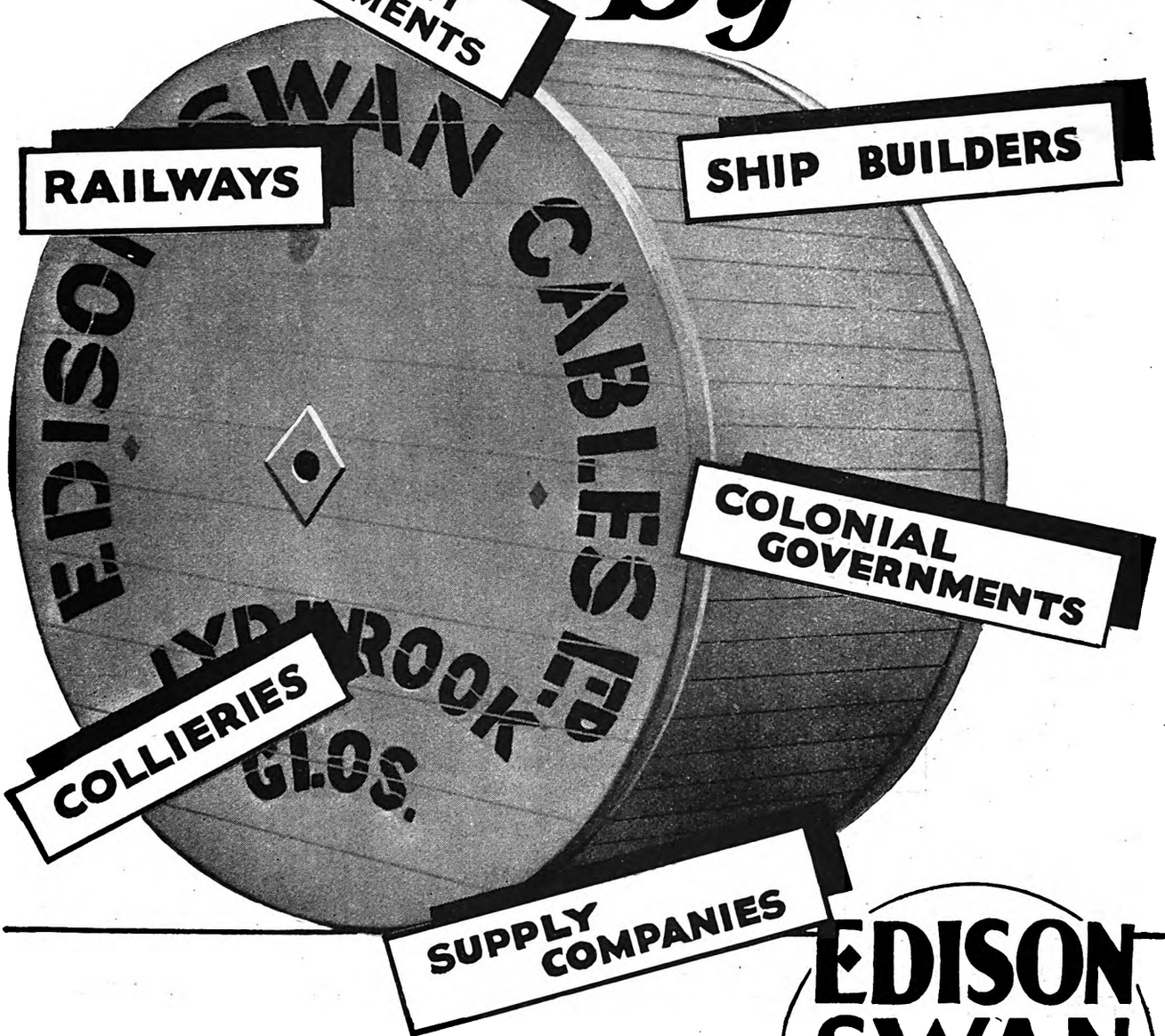

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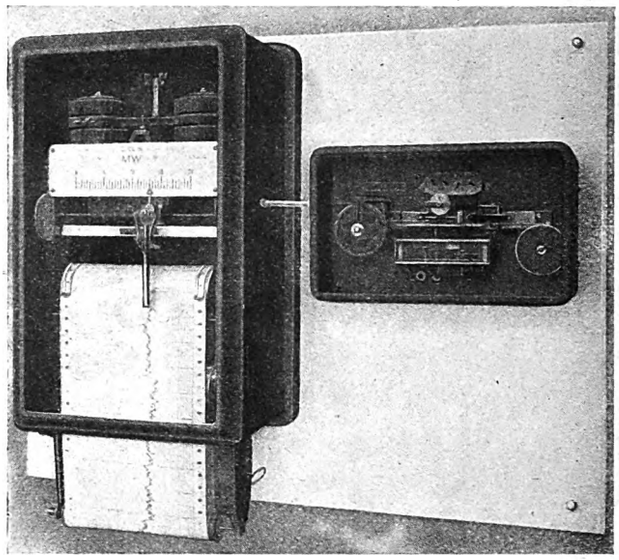

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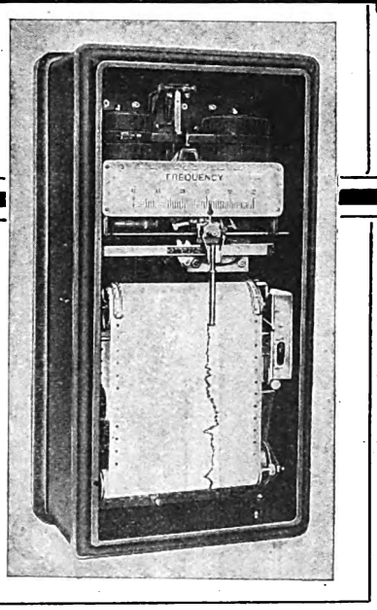

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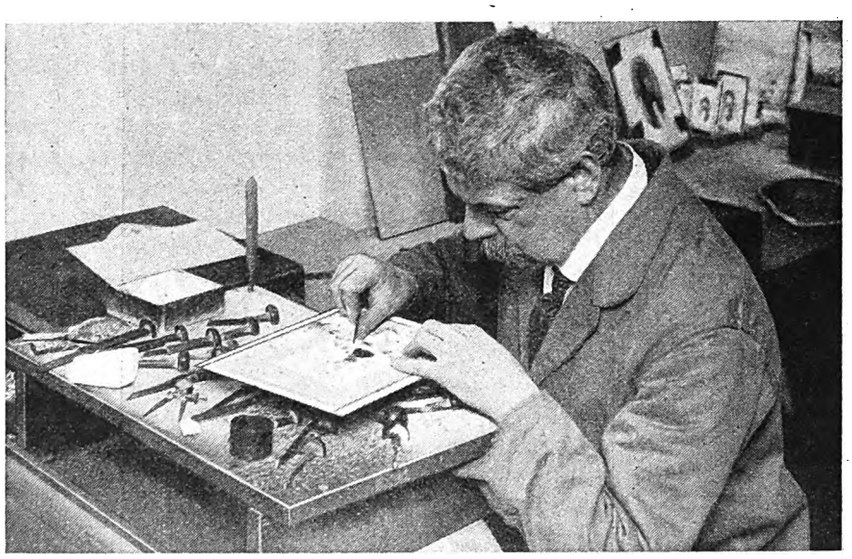

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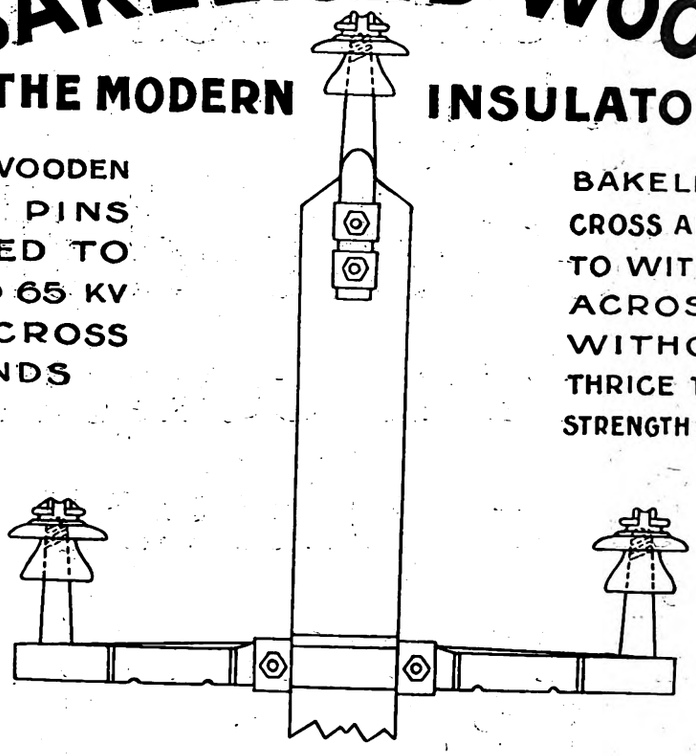

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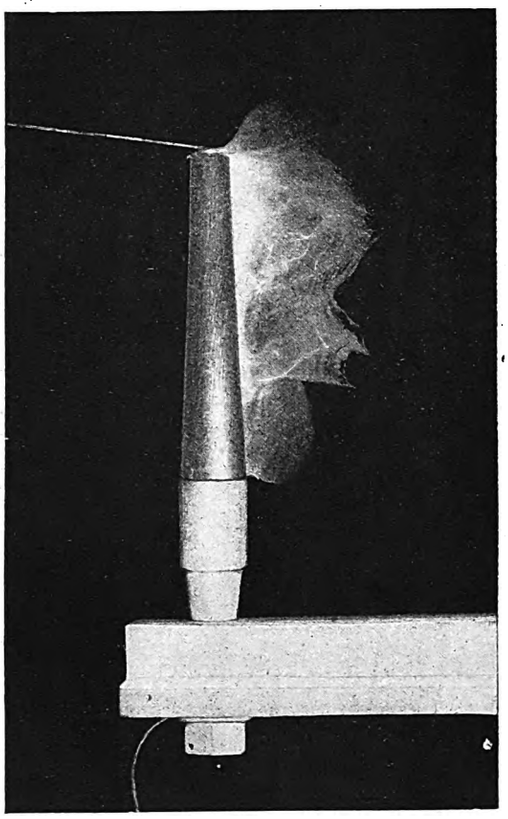

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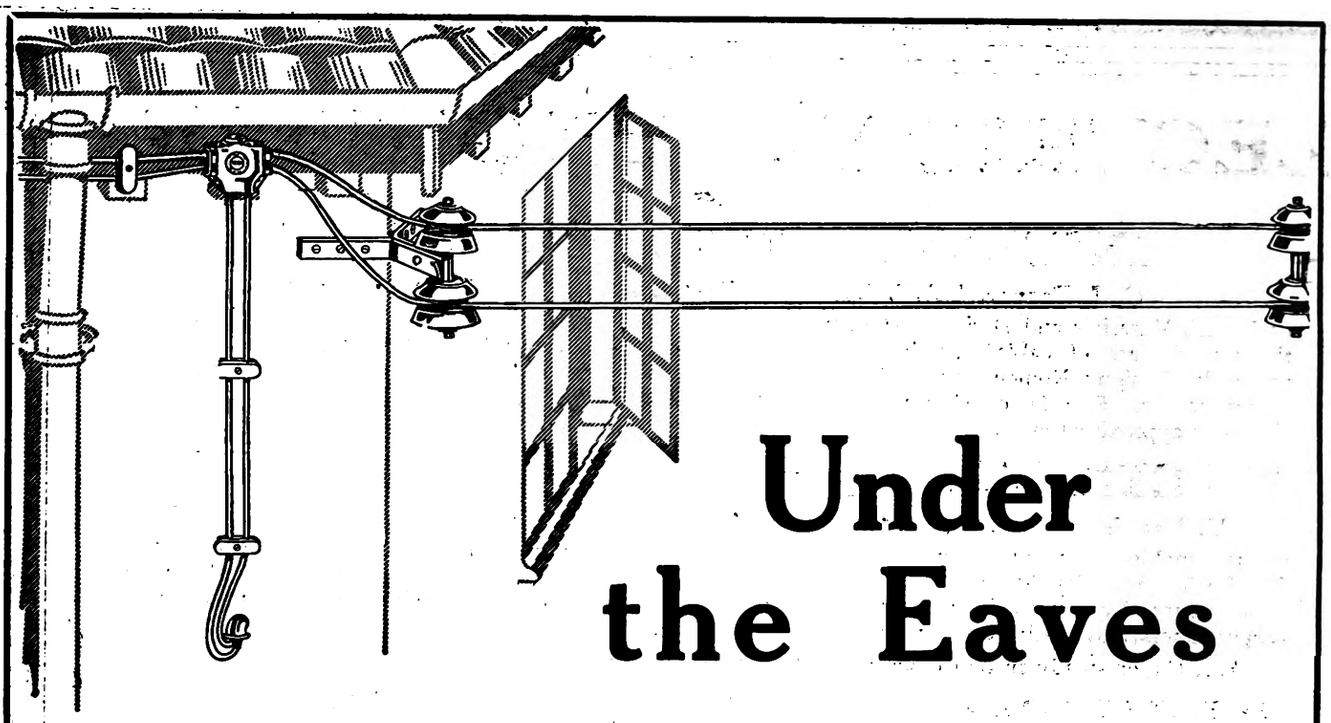

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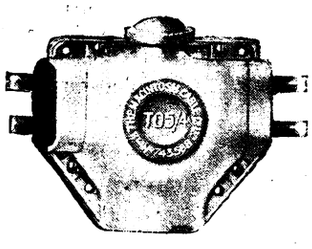

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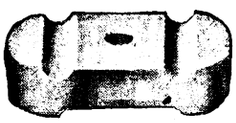

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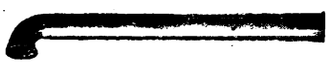

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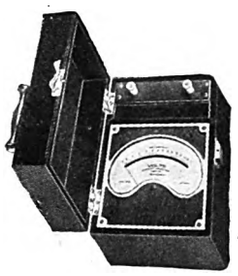

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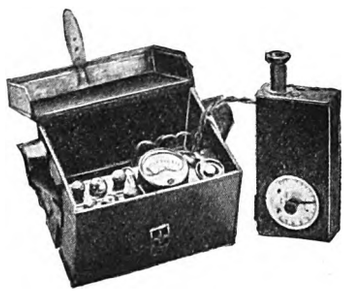

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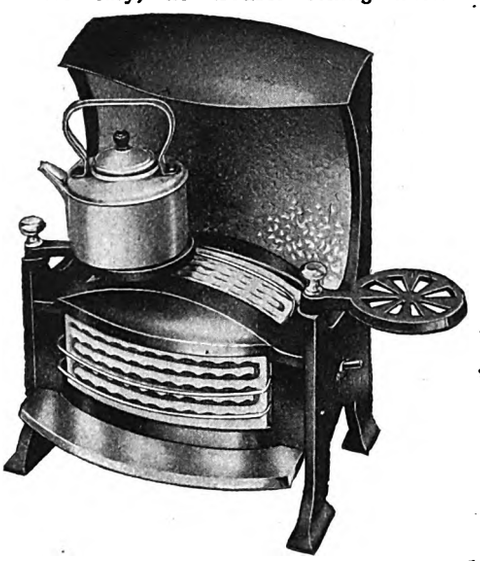

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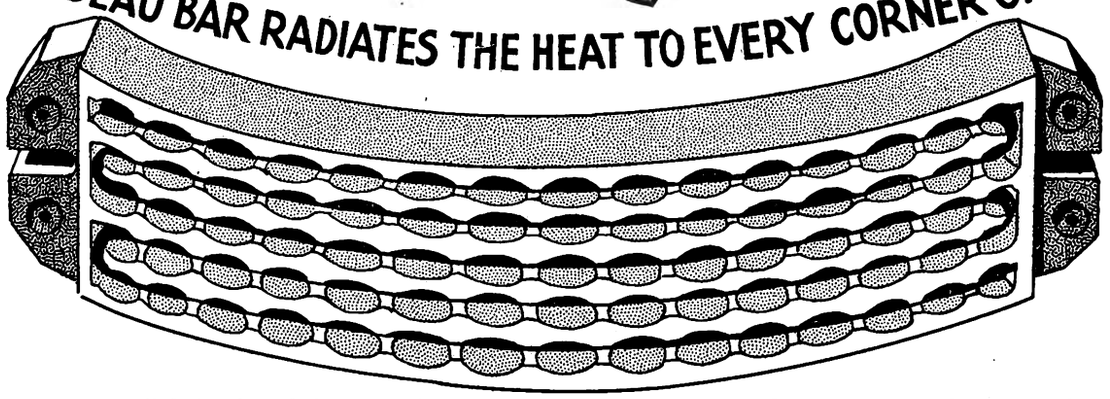

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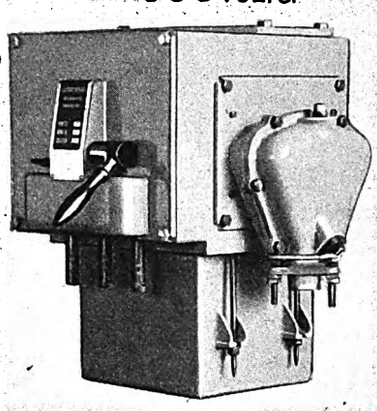

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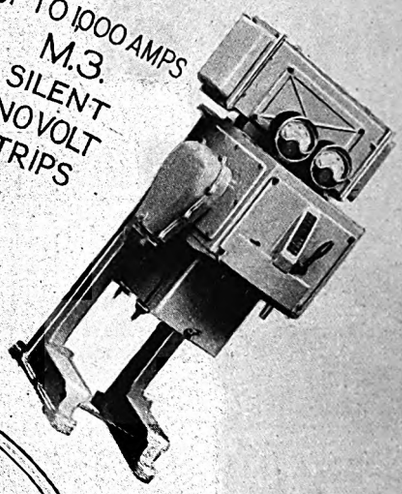

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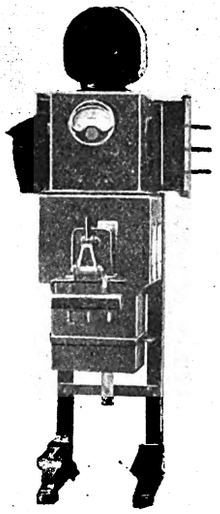

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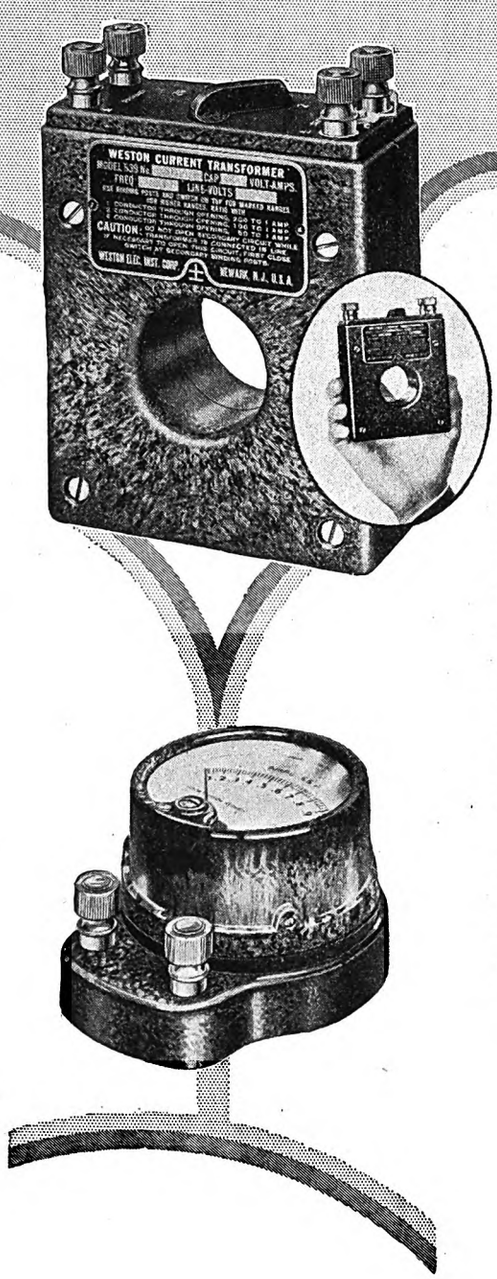

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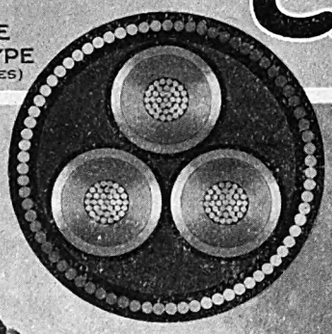

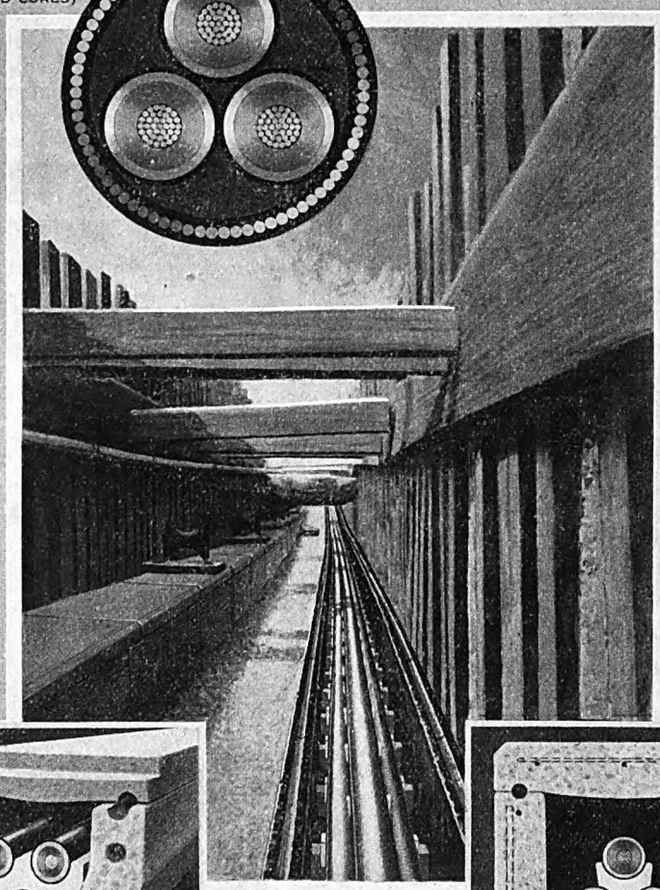

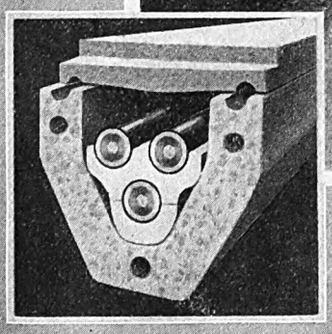

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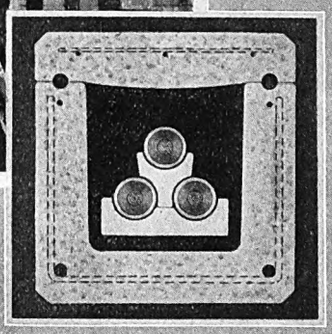

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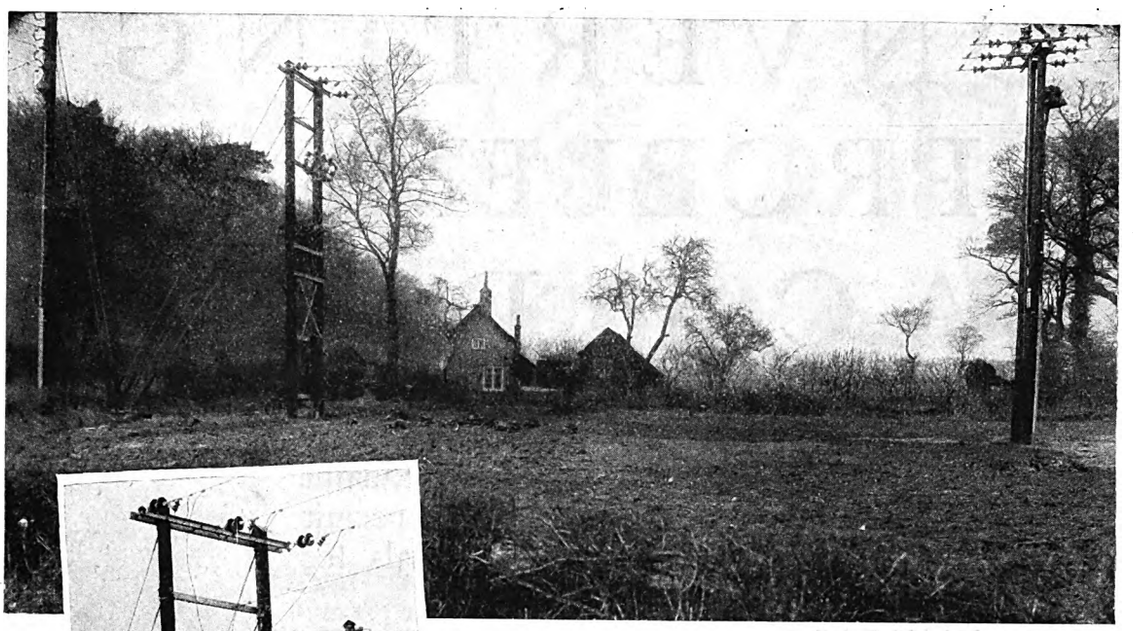
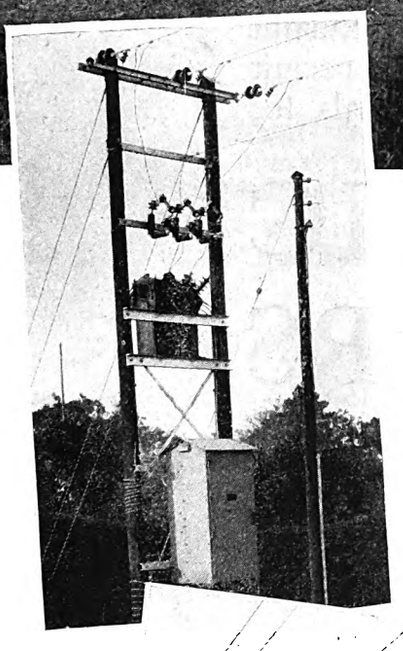
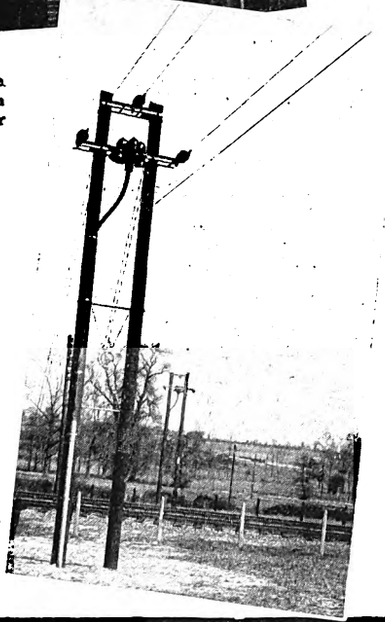




Transformer Pole sub-station with L.T. Cubicle near ground level.



Terminal Poles either side of railway, cable laid under track.

Through nine Villages

East Suffolk, linked up and supplied with light, heat and power. Starting from Melton two Henley 11,000-volt lines run across country to Leiston, Hollesley, Ufford, Orford, Wickham Market, Saxmundham, Eyke and Thorpeness.

At each village the supply is stepped down to 400/230-volt. The top illustration shows a typical example. The transformer pole sub-station can be seen on the centre left, the 11,000-volt air break on the extreme right, whilst the outgoing L.T. distribution terminal pole, taking the supply to the village, can be seen on the extreme left.

Consulting Engineers: G. V. Twiss and Partners, Westminster

HENLEY

OVERHEAD LINES

We are indebted to The East Suffolk Electricity Distribution Co., Ltd., for permission to reproduce these photographs.

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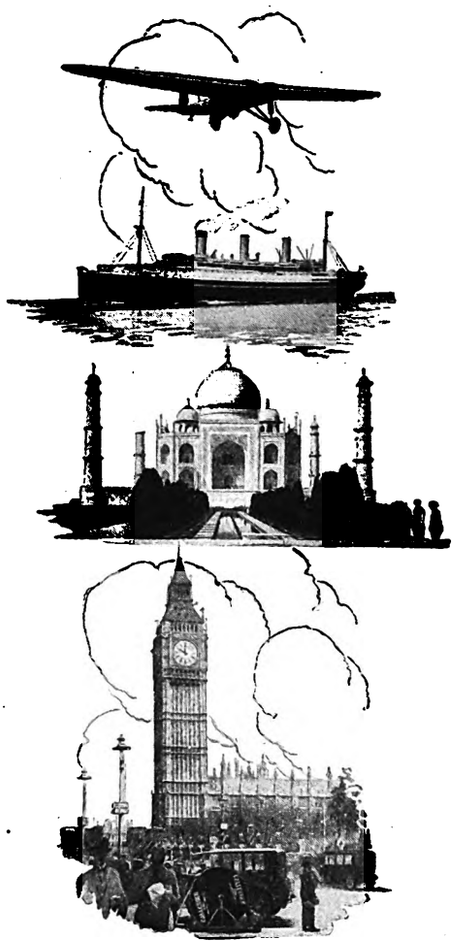

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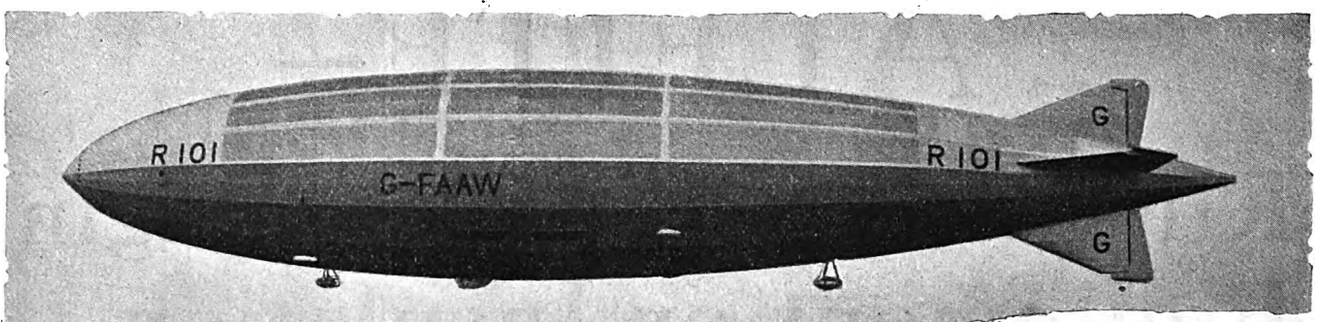

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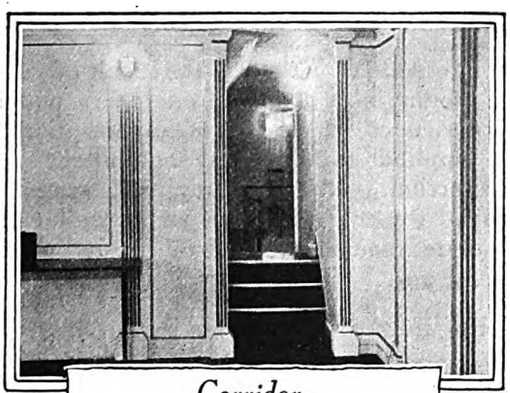

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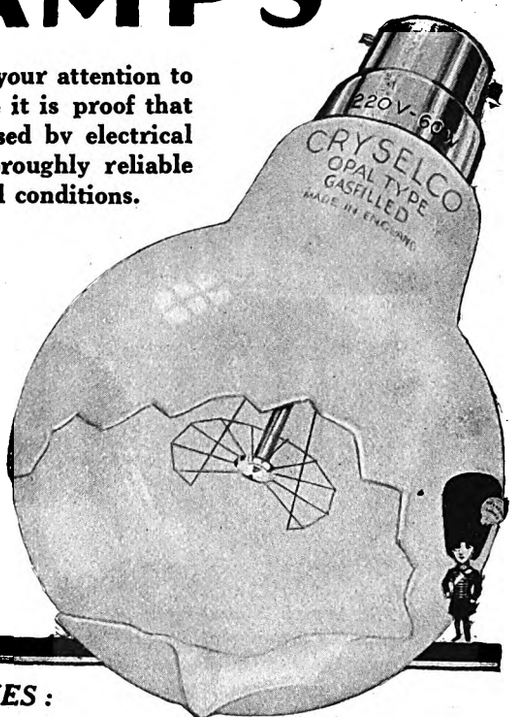

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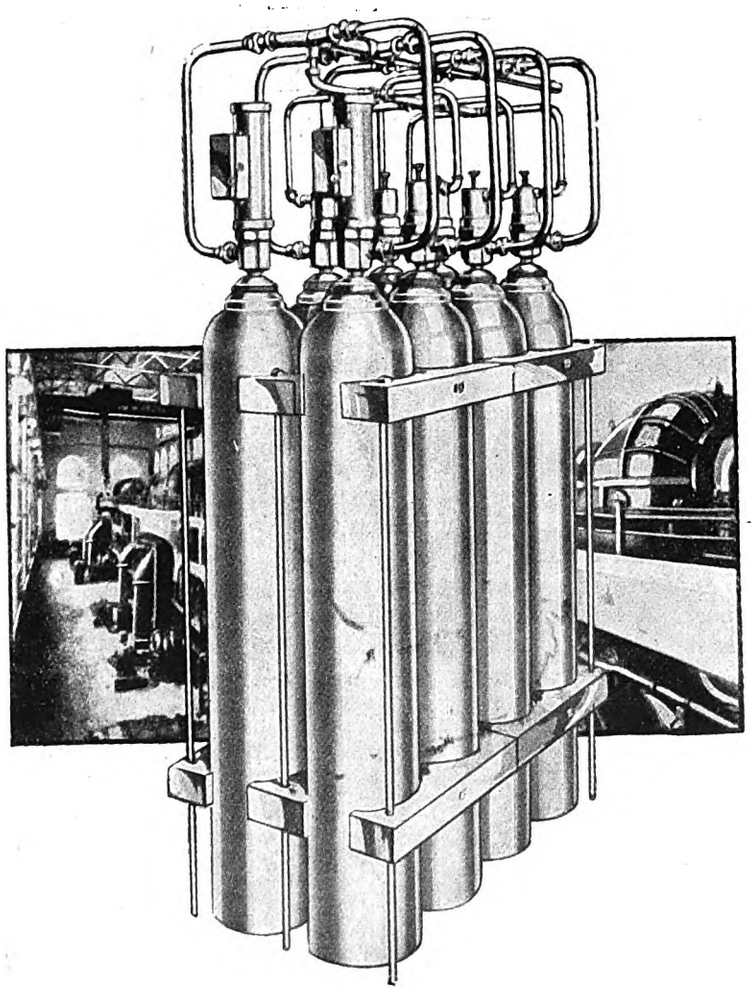

The ALFITE *System is simple, yet so rapid in extinguishing action that* all fires are small fires. *Remote control, either automatic, semi-automatic, or manual, floods every recess, crack, and opening with harmless inert* ALFITE *Gas in which fire cannot live.*

HOW long after a fire is extinguished will your equipment be out of use? How much damage to insulation will be caused by the extinguishing agent itself? Putting out fires in either Rotating or Control equipment is only part of the story!

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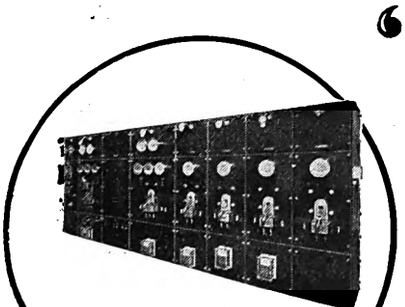
Every year, faults in our Social system—that have long been regarded as inevitable and in the natural order of things—are swept away by the pressure of publ c opinion, guided by the results of scientific investigation, and one by one our hopes of **better** things are realised.

There are faults—dangerous and costly faults, many of which it is impossible to detect in the Laboratory—in the material that was for long regarded as inevitable for Switch Panel purposes, but "Sindanyo," the **scientific** product, has rendered the taking of further risks not only unnecessary, but **wrong.**

When can you see one of our Engineers in connection with this question?

Please Enquire for Brochure No. 17



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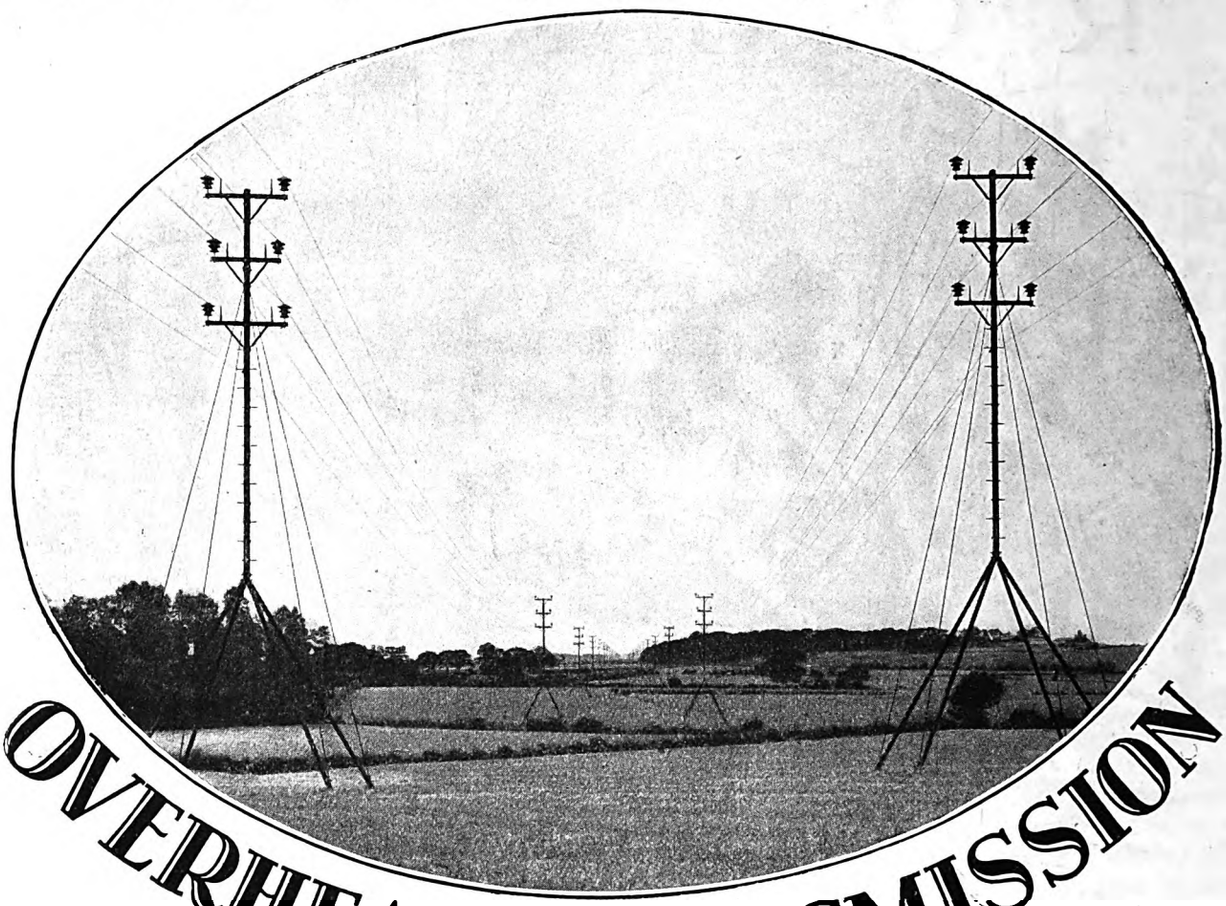

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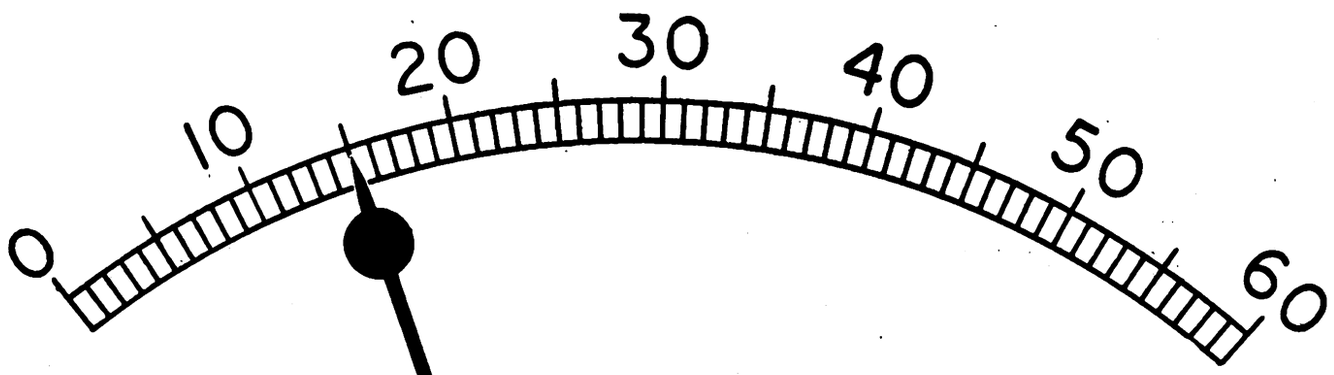

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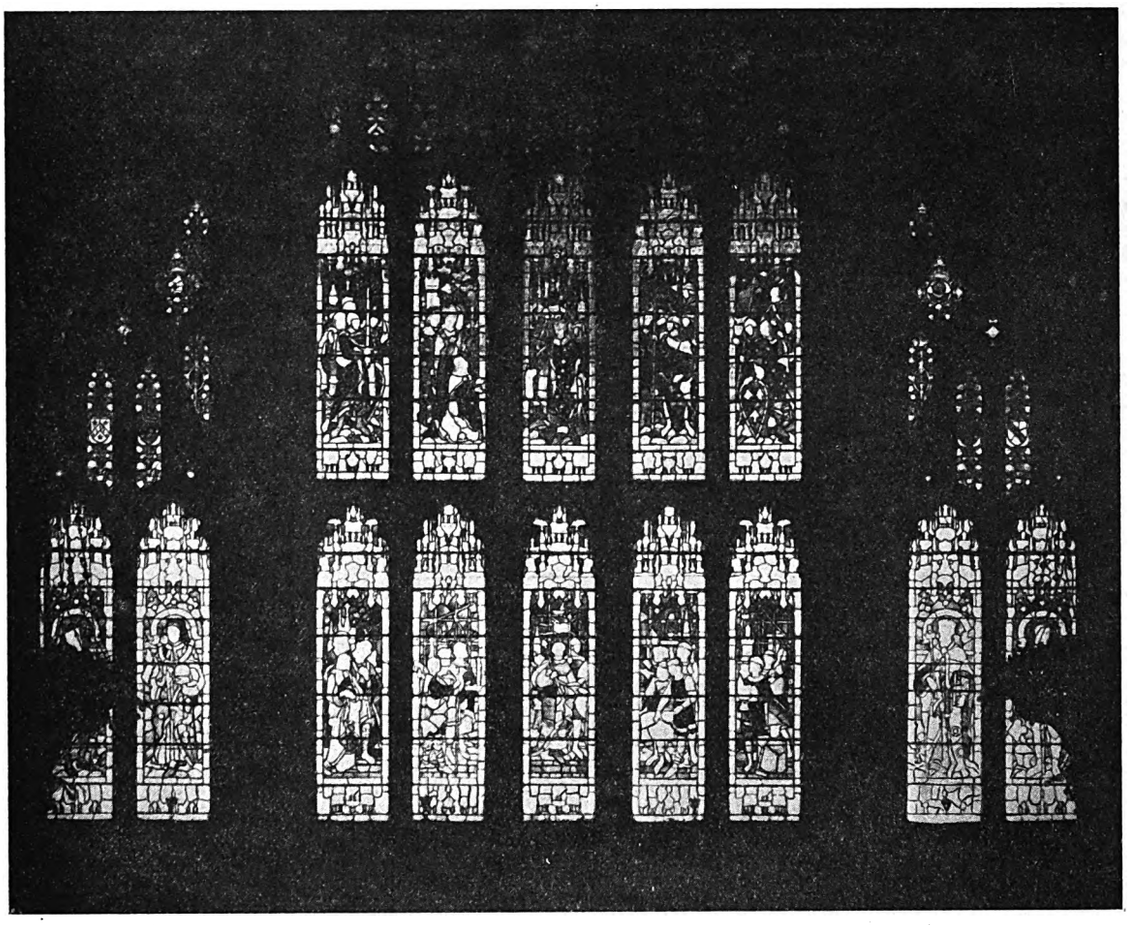

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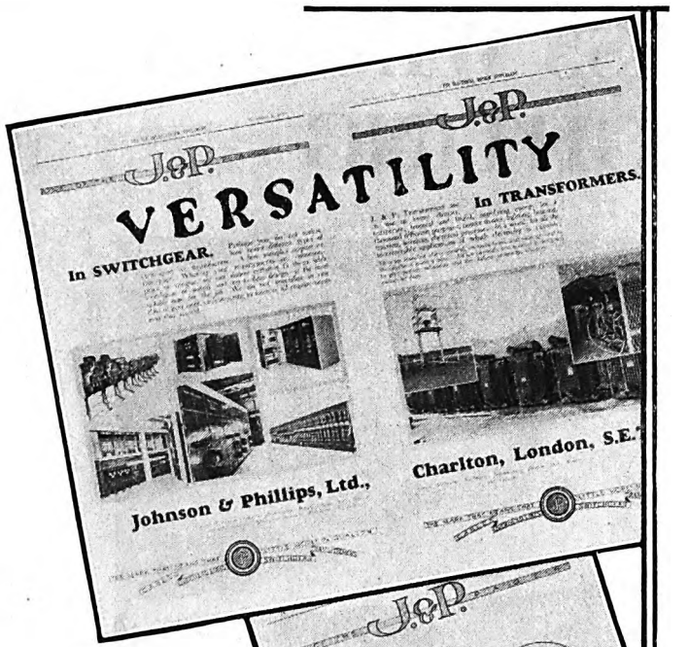
ONE OF THE J.&P. PAGES

A J.&P. Review



The occasion of "The Electrician" Annual Review gives us an opportunity of parading before you a few J. & P. announcements which you have seen during 1929, but which we do not want you to forget. Please do not forget, either, to send us your enquiries when you are in the market for Cables and Cable Boxes, Overhead Lines, Transformers, Switchgear and Instruments. You will be glad you remembered.

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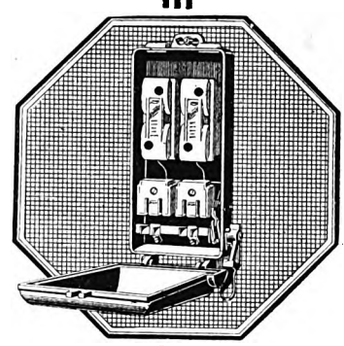
M·E·M

ARMS WITH SECURITY



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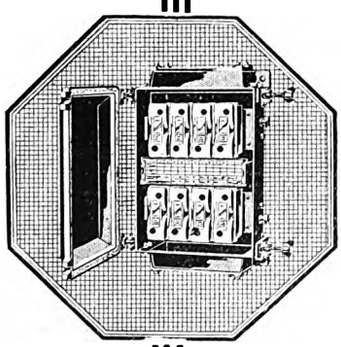

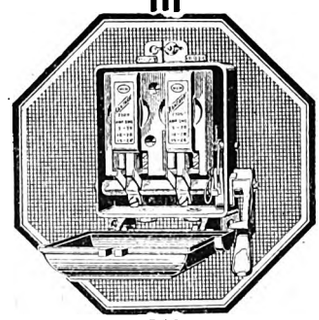

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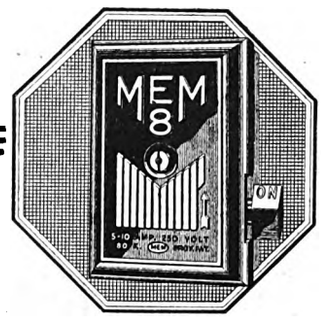

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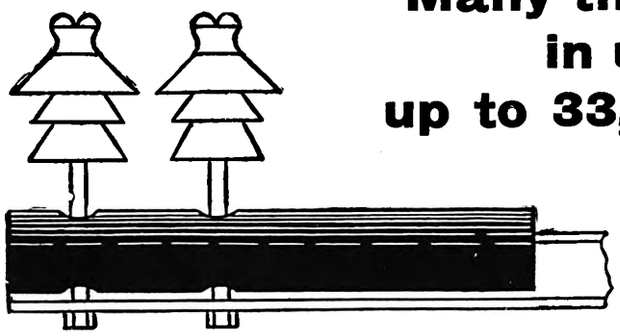

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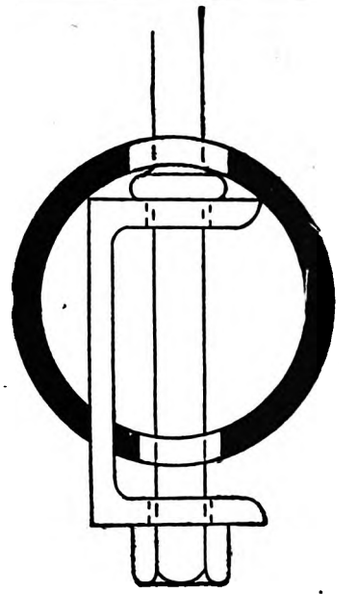

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Sample.	Volts at Puncture.	Average.
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,, 5	30,000	
,, 6	29,400	

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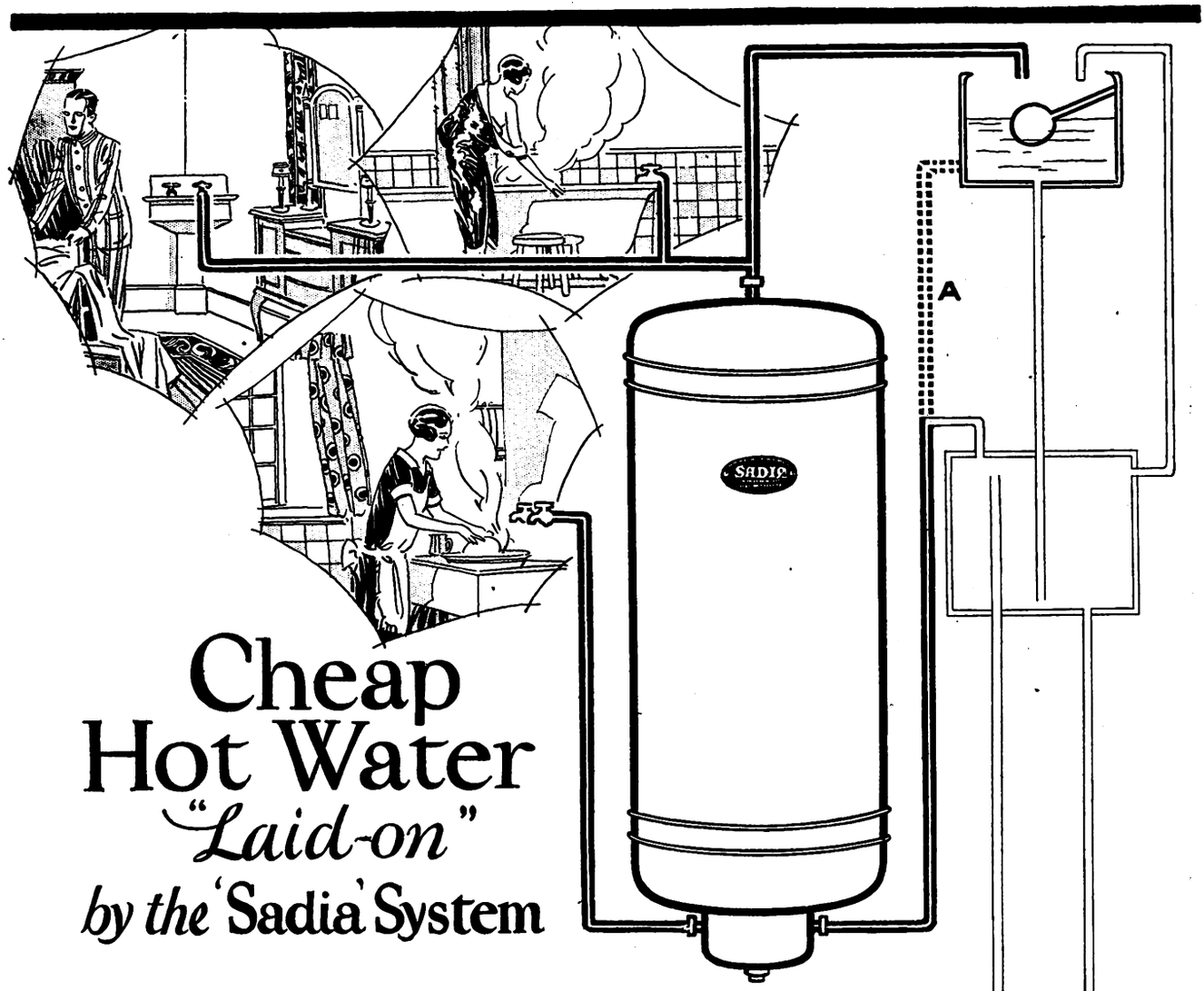

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Sizes in stock from 1½ to 33 gallons. Our showrooms are yours for demonstration. Write for illustrated list H.S.2

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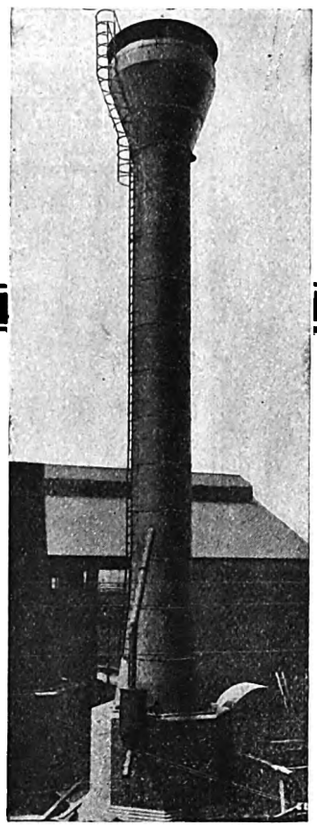

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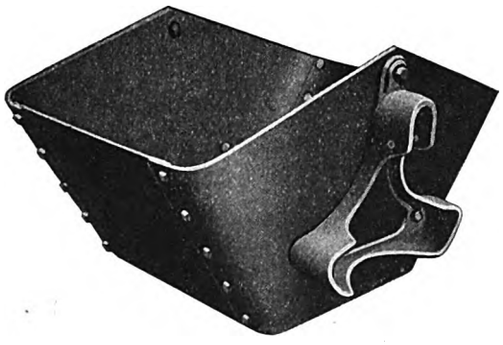
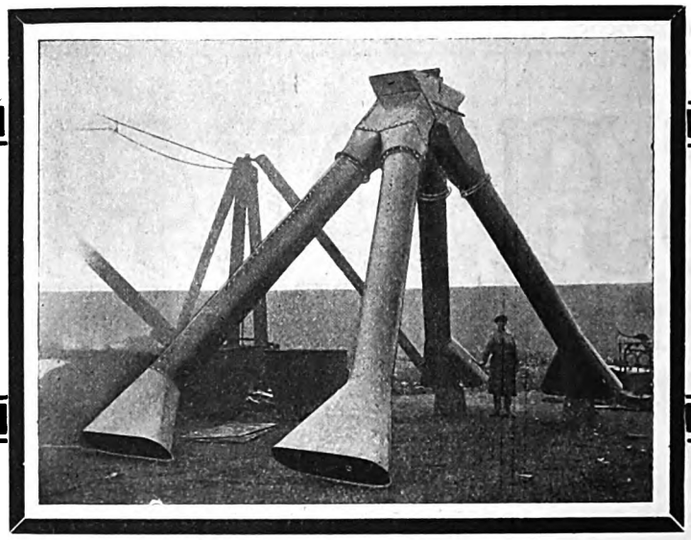


RIVETTED CONVEYOR BUCKETS



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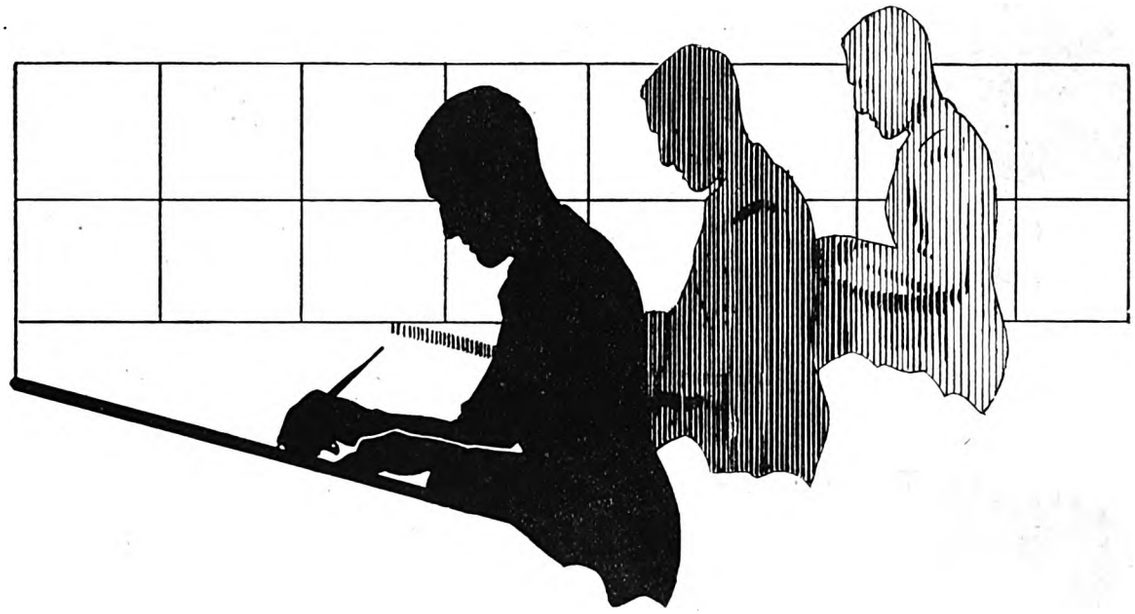

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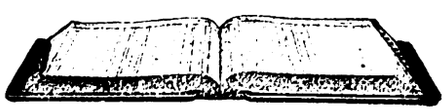

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Branches—BELFAST: 48, Upper Church Lane. BIRMINGHAM: 34-35, Imperial Buildings, Dale End. BRISTOL: 54-56, Victoria Street. CARDIFF: 16 & 17, Hills Terrace. GLASGOW: 139a, St. Vincent Street. LEEDS: 68, Albion Street. MANCHESTER: 9, South Street. NEWCASTLE: Milburn House. NOTTINGHAM: 35-39, South Sherwood Street.

Factories in Austria, Czecho Slovakia, Hungary and Poland.
Write for Motor Lamp Lists. Tungsram Radio Valves now available.

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Table Instrument and other Bakelite Moulded Parts used by Burovox Limited, Craven House, Kingsway, W.C.2

Bakelite Mouldings are Used to Insulate and Beautify Burovox Telephones

BUROVOX LIMITED have found Bakelite Mouldings ideal, not only for the purpose of insulation, but because of the durable and pleasing finishes obtained.

Burovox Telephones are installed in homes, on motor-cars and on liners, and to meet modern requirements the mouldings are made in various colours to match the scheme of decoration.

Bakelite Mouldings always remain the same—the finish does not change and the high polish never wears off.

Bakelite Engineering Service

Eighteen years of experience in the development and manufacture of Bakelite Synthetic Resin Products enables Bakelite Limited to offer the co-operation of their Engineers and laboratories in investigating the possibilities of these products for new applications.

Write for Booklet B.2 dealing with Bakelite Moulding Materials

BAKELITE LIMITED, 68 VICTORIA STREET, LONDON, S.W.1

Works: Birmingham and Darley Dale (Est. 1910) (Est. 1921)

Telephone: Victoria 5441 (4 lines)

TREFOIL REG^D TRADE MARKS **BAKELITE** TREFOIL REG^D TRADE MARKS

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BRITISH PORCELAIN CO., LTD.

BRITISH MADE INSULATORS

as used for

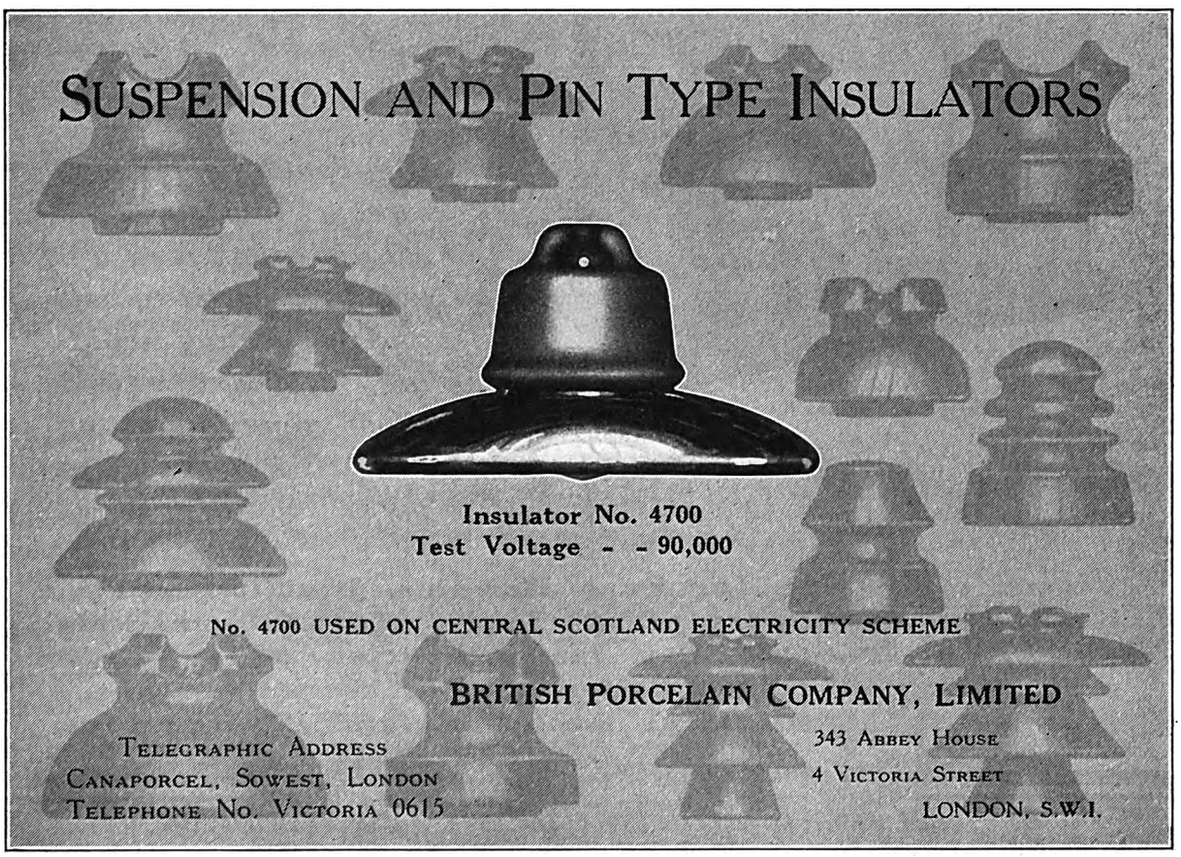
NATIONAL GRID SCHEME

The following lines in Great Britain have recently been equipped with

Insulator No. 4700

132 KV. lines Central Electricity Board
33 KV. lines Central Electricity Board
66 KV. lines Newcastle Electric Supply Company, Limited
66 KV. lines Yorkshire Electric Power Company, Limited

British Raw Materials.



British Labour.

Please note new Address:—

ARTILLERY HOUSE, ARTILLERY ROW, LONDON, S.W.1

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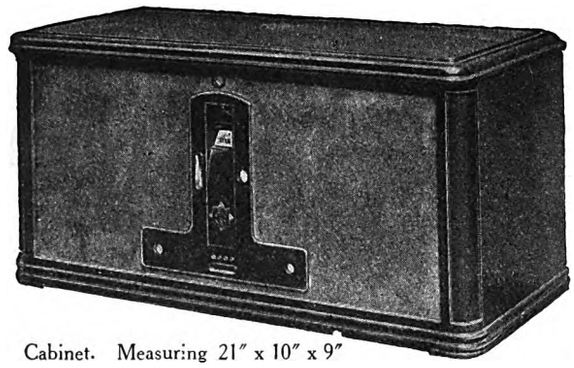
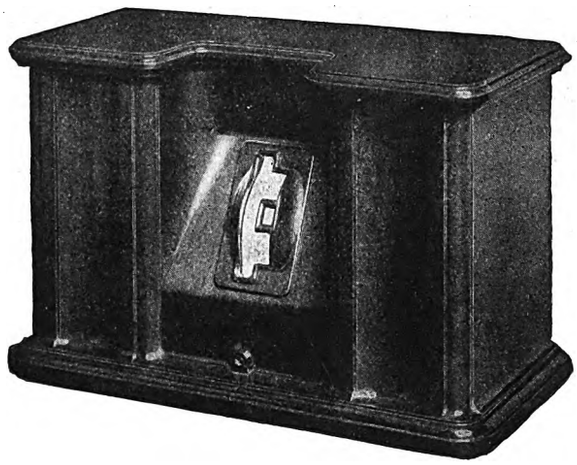
DON'T EARTH
INSULATE!



Cabinet. Measuring 21″ x 10″ x 9″



Cabinet. Measuring 10″ x 6½″ x 5″

We are suppliers of Moulded Articles in Insulating Materials specially suited to the Electrical Industry, e.g., Mouldings for Arc-Shield Work, &c., &c.

We are specializing in the supply of LARGE Mouldings in TRO-LITE, BAKELITE and several other materials with special properties covering the requirements of all industries.

We would be glad to receive inquiries for Mouldings, or we will be pleased to call and discuss any moulding proposition and show you interesting samples of work carried out.

Let us quote you for Fuze Handles, Junction Boxes, Bases and Insulators of all Types. Our illustrations show but two of the many articles of a Large nature carried out in Bakelite. Our Works are specially equipped for large mouldings and great output.

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Telephone: CLERKENWELL 2874-5

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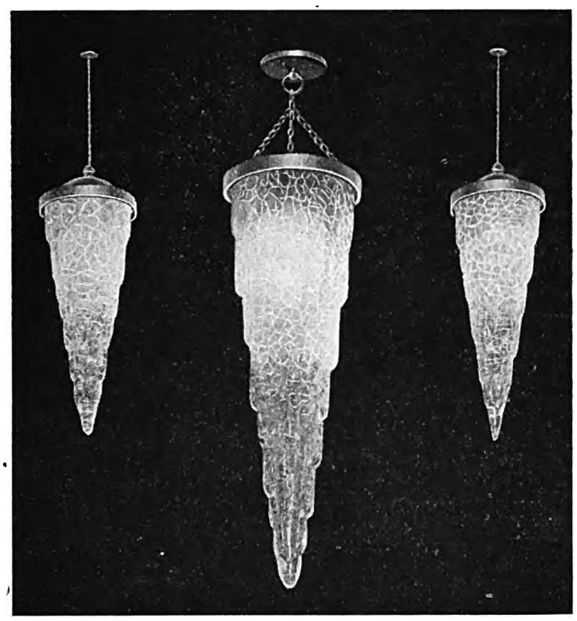
ASCHER'S CUT GLASS FITTINGS



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THE ICICLE - SHADE

Wonderful effects can be obtained by the arrangement of the various sizes of the Icicle Shade, for example, the 24-in. Icicle Shade surrounded by circles of the smaller sizes make a wonderful centre piece for Dance Hall and Theatres, etc., while the Icicle Ceiling Bowl with three or four small Icicle Shades make a very dainty fitting for a drawing room.

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Made in the following sizes:

ICICLE SHADES, 9½ins., 14ins. 18ins. 24ins. in length
ICICLE CEILING BOWLS, 10ins. 12ins. 14ins. diameter

Best CRYSTAL CUT GLASS TABLE STANDARDS & CEILING BOWLS

Manufactured of first quality lead crystal glass and stocked in all sizes and designs. Make a point of stocking these quick selling lines this season.

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LIBERAL DISCOUNTS.

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MANCHESTER SHOWROOMS:

H. G. ASCHER • LTD. 4-8, ACOMB STREET, C-on-M. **MANCHESTER**

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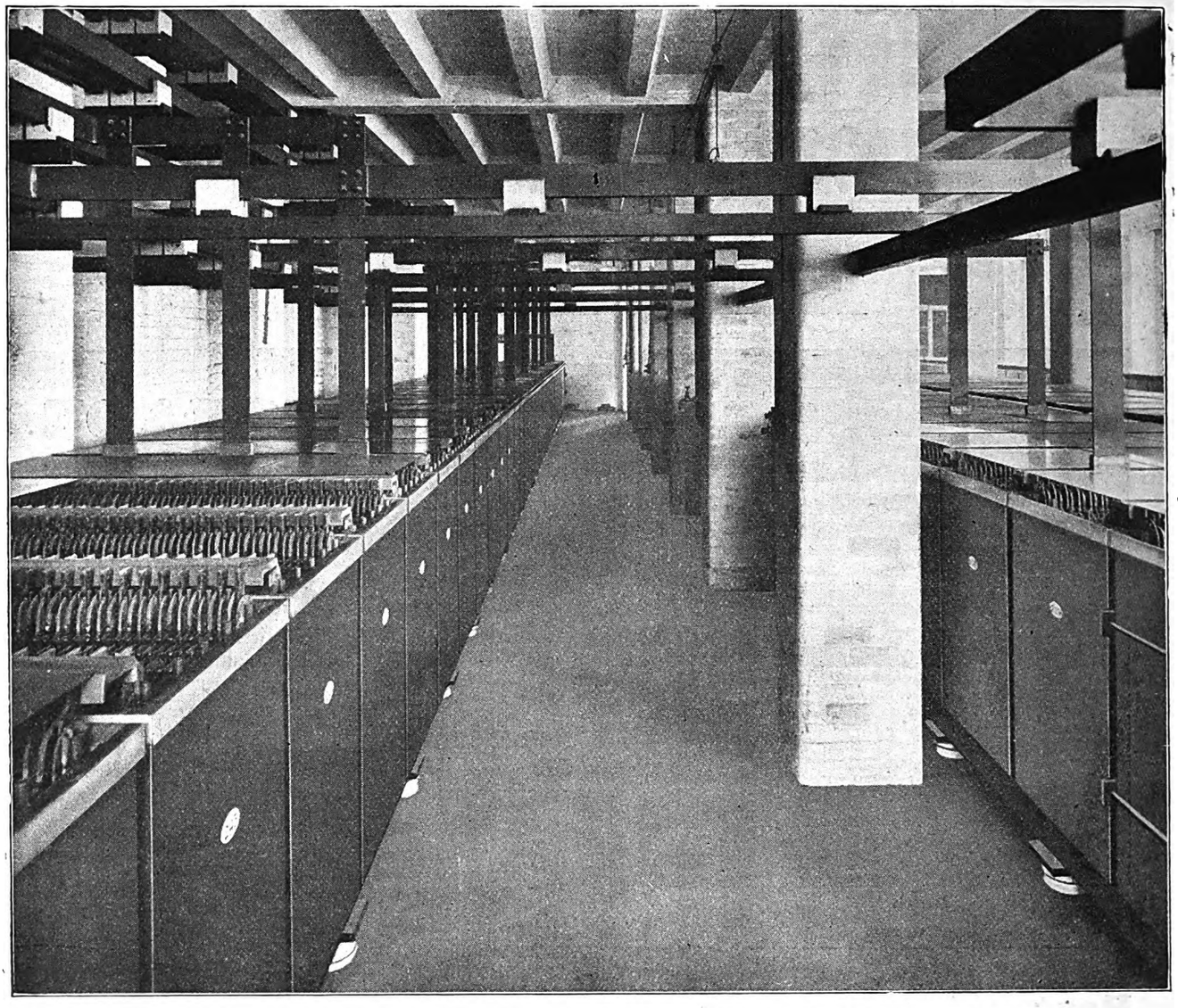

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Tudor

TUDOR BATTERIES ARE DESIGNED TO GIVE RELIABILITY OF SERVICE

FULL PARTICULARS OF ANY BATTERIES SENT ON REQUEST.

Advt.

The Tudor Accumulator Co., Ltd., 2, Norfolk Street, Strand, London, W.C. 2. Phone: Temple Bar 3308.

M.C. 182

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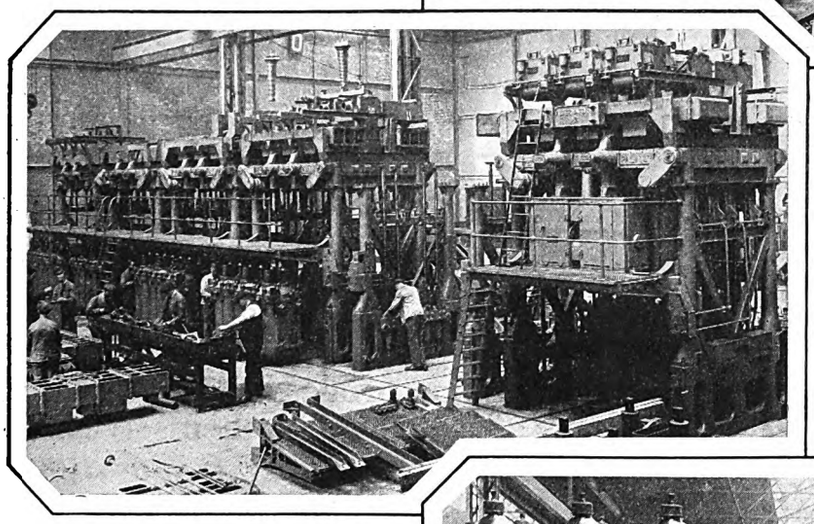
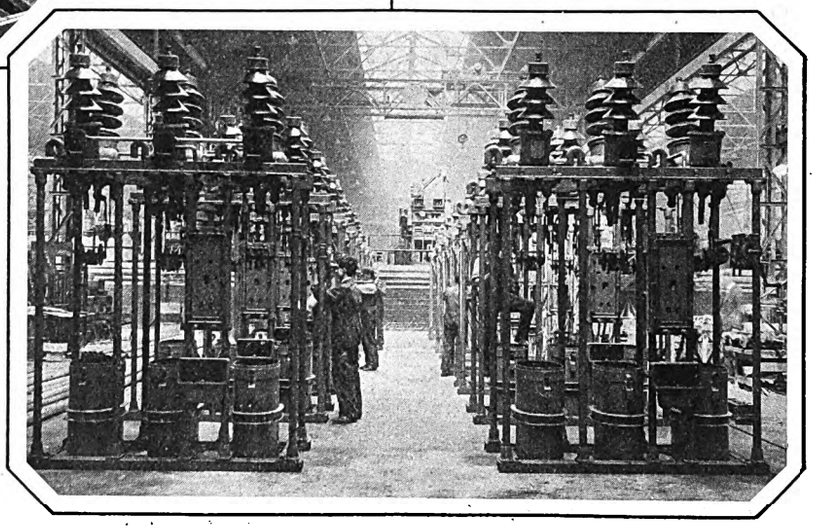
GLIMPSES OF OUR FACTORY

General View of heavy metal-clad switchgear bay showing units in course of construction.



Part view of erection bay for super power station metal-clad units.



General view of one of the erection bays for outdoor switchgear.

FERGUSON, PAILIN LTD.

HIGHER OPENSHAW, MANCHESTER

Telephone: Droylsden 1301 (Private Branch Exchange). Codes: ABC 6th, Bentley's, Marconi, Beama. Telegrams: "Tension, Manchester."

LONDON:
Bush House, Aldwych, W.C.2
Telephone: Temple Bar 9347

AUSTRALIA:
MARRICKVILLE, Sydney,
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SOUTH AFRICAN AGENTS:
Dowson & Dobson, P.O. Box 6468,
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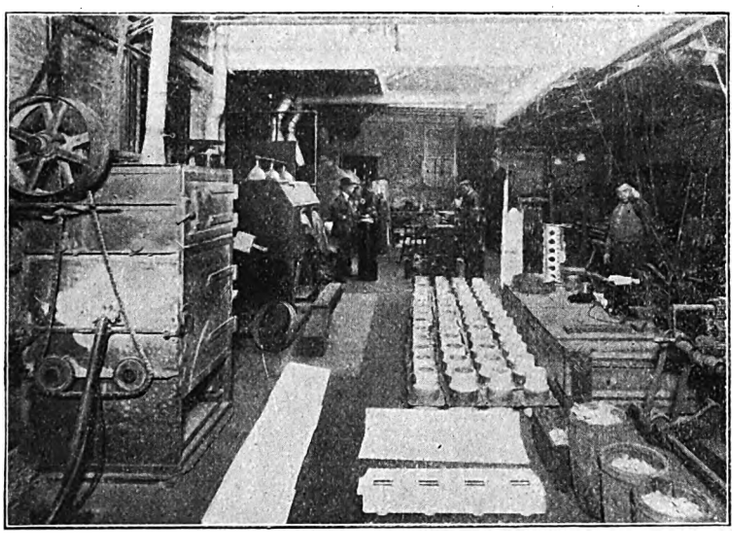
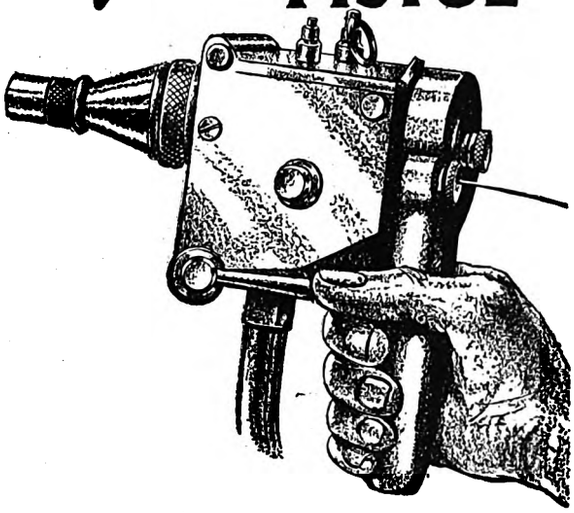
METAL COATING



INTERIOR OF METAL COATING SHOP. High Tension Insulators coated inside with Aluminium or Tin to break down Corona Discharge. Without coating, Corona showed at 6,000 volts; after coating, Corona was not present at 16,000 volts.

by the IMPROVED PISTOL



for Permanent Protection!

This process has many applications in the Electrical industry as by its means Coatings of any metal can be applied to such substances as Glass, Rubber, Celluloid, Wood, Paper, in addition to all metals.

Internal as well as external surfaces can be covered with equal effectiveness.

Evidence as to the utility of the metals coating process is supplied by the following selected list of firms who have already availed themselves of the process. Many of these firms have adopted the process as a permanent feature of their work. Those marked * have purchased the necessary plant to operate the process, under licence, on their own premises.

*A.E.G., Berlin.
*American Resistor Co., U.S.A.
*Robt. Bosch, A.G., Stuttgart.
British Electric Federation.
*British Thomson-Houston Co., Ltd.
Chamberlain & Hookham, Ltd.
*Electric Service Supplies Co., U.S.A.
Electro Mechanical Brake Co.
English Electric Co., Ltd.
Ferranti Ltd.
*General Electric Co., U.S.A.
*Gutta Percha Co. (Transatlantic Cable Co.)
W.T.Henley's Telegraph Works Co.Ltd.
*Hewettica Electric Co. (Westinghouse)
India Rubber, Gutta Percha & Telegraph Works Co., Ltd.
Metropolitan-Vickers Electrical Co., Ltd.
*National Carbon Co., Inc., U.S.A.
New Switchgear Construction.
St. Helens Cable & Rubber Co., Ltd.
Shropshire, Worcestershire & Staffordshire Electric Power Co.
Siemens Bros. & Co., Ltd.
*Siemens und Halske, A.G., Berlin.
*Siemens-Schuckert, A.G., Berlin.
Simplex Conduits, Ltd.
*Stackpole Carbon Co., U.S.A.
*Toledo-Edison Co., U.S.A.
*Westinghouse Electric & Manufacturing Co., U.S.A.
*Westinghouse Lamp Co., U.S.A.

METALS COATING CO., Ltd.

22 BIRCHIN LANE, LONDON, E.C.3

In association with:

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The Metals Coating Co. of America, Inc., PHILADELPHIA, U.S.A.
Metallisator A. G., BERLIN.
Metallisation, Ltd., DUDLEY.
Metallisator A. G Altona Works, HAMBURG.

The Metals Coating Co., Ltd., is a Public Company with an issued capital of £125,000 divided into 500,000 shares of 5s. each. The company's shares are dealt in on the London Stock Exchange.

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SUPER NICKEL

are the world's standard for quality and durability.

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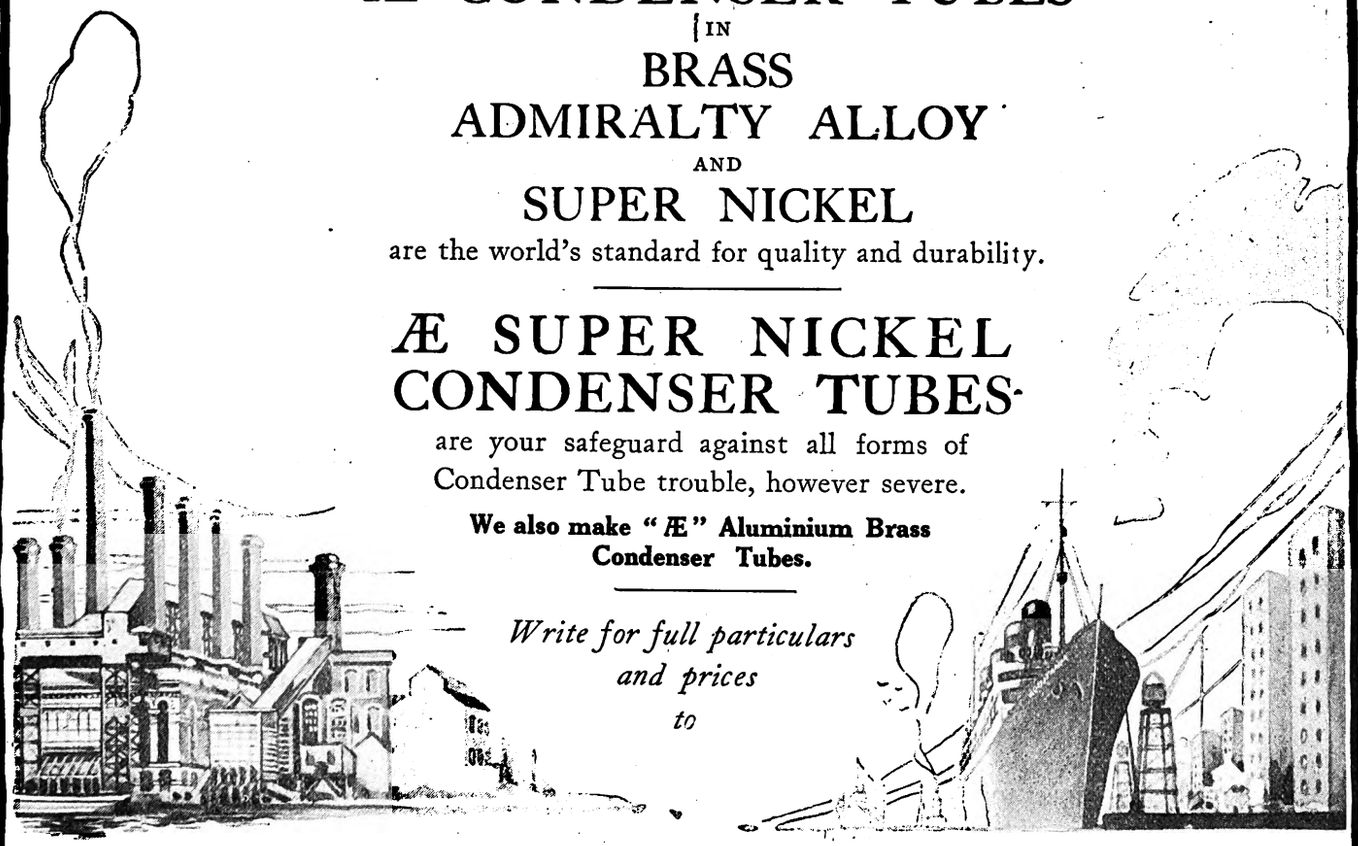
are your safeguard against all forms of Condenser Tube trouble, however severe.

We also make "Æ" Aluminium Brass Condenser Tubes.

Write for full particulars and prices to



ALLEN EVERITT & SONS LTD.

ESTABLISHED 1769

KINGSTON METAL WORKS
SMETHWICK BIRMINGHAM

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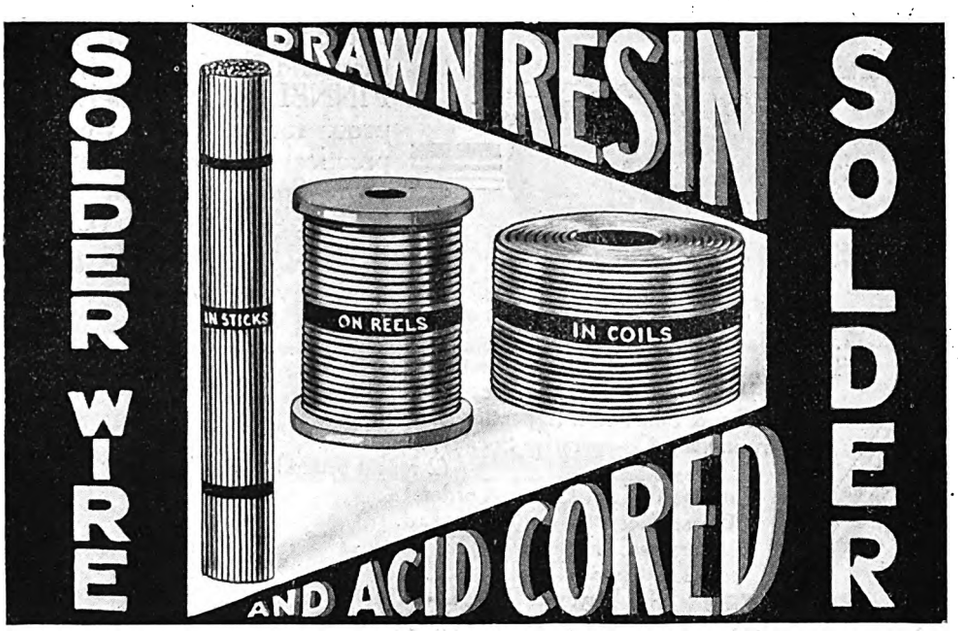
MADE BY A FIRM WITH 40 YEARS' EXPERIENCE



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"FINNELL SYSTEM"

OF ELECTRIC SCRUBBING, WAXING and POLISHING

will save you TIME & MONEY

If the fact that the following, amongst thousands of others, are using FINNELL equipment is not sufficient proof for you, may we give you a practical demonstration on your own floors, without COST OR OBLIGATION ON YOUR PART?

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Hackney Borough Council—Electricity Dept.
Preston Borough Council—Electricity Dept.
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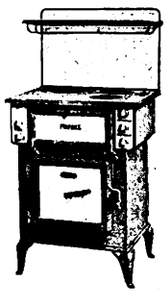
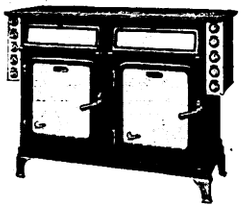
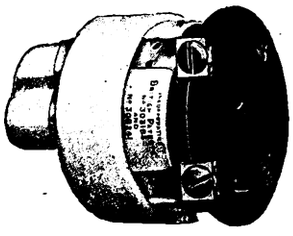
A Happy and Prosperous New Year To Everyone from The Manufacturers of



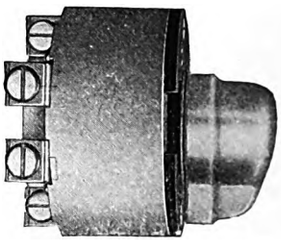
DIAMOND H SWITCHES

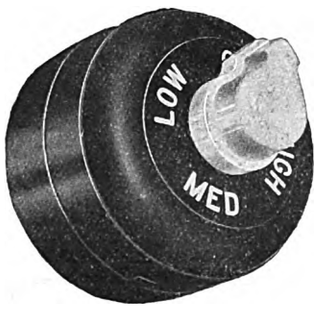


Any woman who has laboured with the coal scuttle, the wood pile, or has experienced the vagaries of gas, will welcome, happily, the clean, *dependable, instantly controllable* electric cooker. What makes a more acceptable Christmas gift than this?



Making electric cookers dependable and *instantly controllable* was the job of DIAMOND-H engineers—they perfected the reciprocating switch that gives three degrees of electric heat at a twist of the wrist; they provided the electric cooker manufacturer with the one thing that makes his product a possible fixture in every wired home in the land—*the switch.*





A good switch makes a good cooker—and more good electric cookers will be sold as Christmas gifts this year than ever before. Most of them will be DIAMOND-H equipped.

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COMPANY
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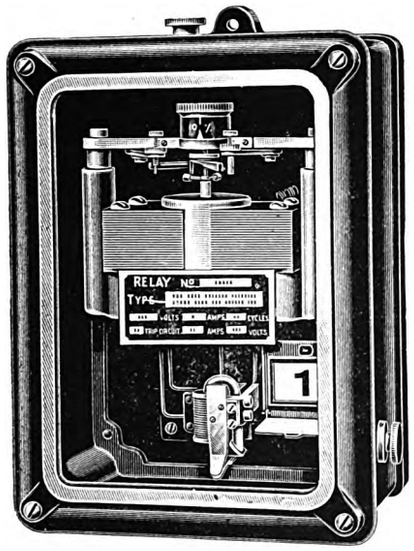
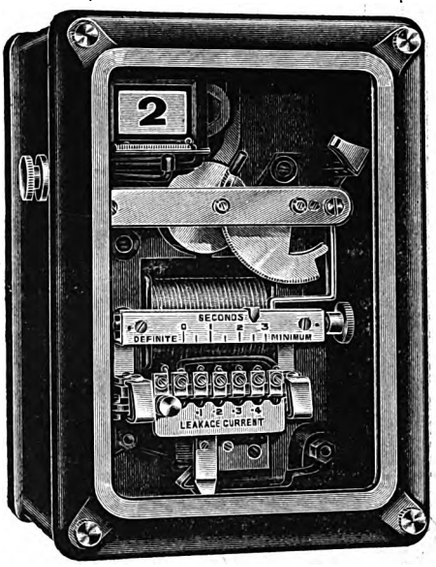
N·C·S

INSTRUMENTS AND RELAYS



ARE ESSENTIAL TO PROGRESS



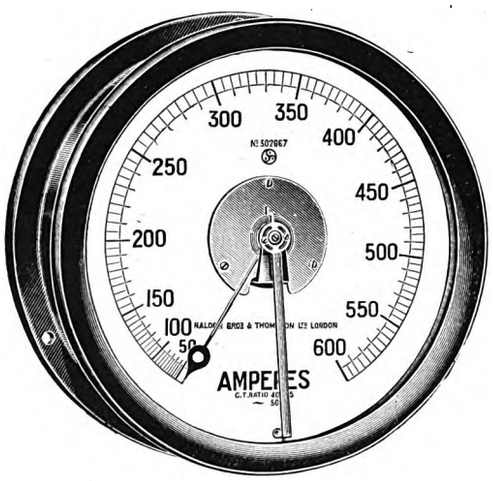
REVERSE (DIRECTIONAL) RELAY
for A.C. systems.

WILL OPERATE even if the Voltage collapses practically to zero with a REVERSAL in direction of current flow only and under no other conditions.

WILL NOT OPERATE with a current flowing in the FORWARD direction under any conditions of LOAD and POWER FACTOR.

LOW V.A. CONSUMPTION $\frac{1}{50}$ of that of other forms of REVERSE RELAYS.

INSTANTANEOUS or DELAYED OPERATION according to requirements.



INDUCTION TYPE
AMMETERS, VOLTMETERS, WATTMETERS.
B.S. 1st Grade.

IMPROVED OVERLOAD RELAY

Inverse with adjustable definite minimum time characteristics.

Operating CURRENT and operating TIME settings. can be set independent of one another

Time intervals as low as 0·35 seconds can be employed with certainty of SEQUENTIAL TIME DISCRIMINATION.

LOW V.A. CONSUMPTION combined with robust construction.

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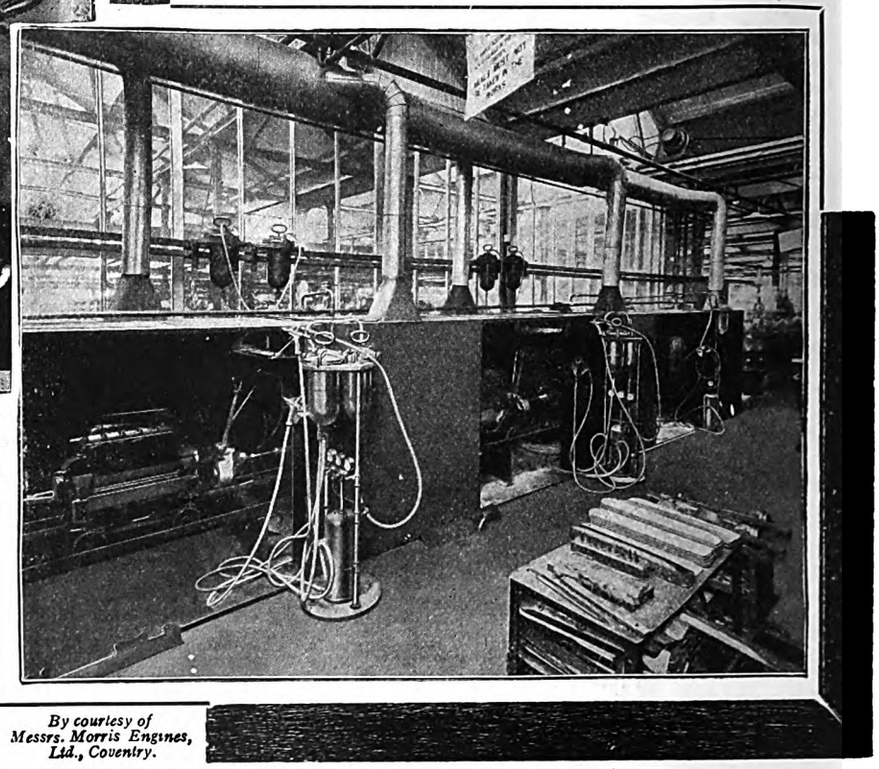
By courtesy of Messrs. S.G. Brown, Ltd., Acton.



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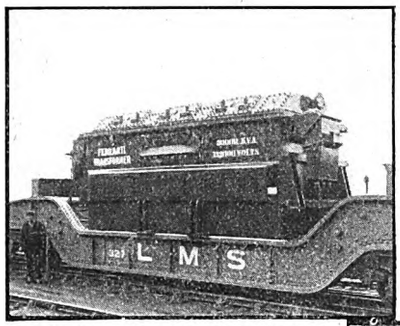
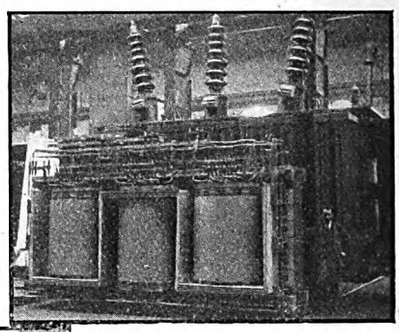
TRANSFORMERS SUPPLIED IN CONNECTION WITH THE SCOTTISH GRID SCHEME

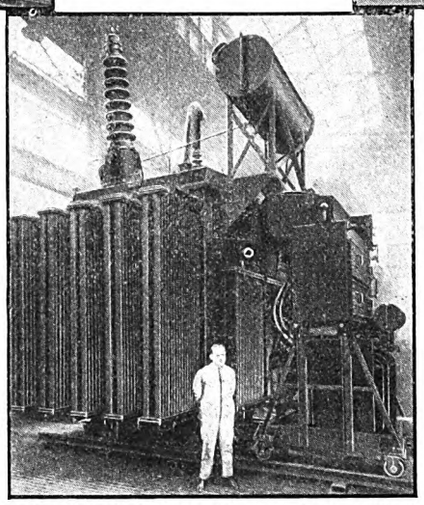


A 30,000 KVA., 132,000 VOLTS TRANSFORMER FOR THE SCOTTISH GRID SYSTEM LOADED ON RAILWAY TRUCK READY FOR DESPATCH FROM HOLLINWOOD.

WITH ACKNOWLEDGEMENTS TO MESSRS. FERRANTI LTD.



132 KV., 15,000 KVA., 3 PHASE 50 CYCLES, ENGLISH ELECTRIC TRANSFORMER WITH ON-LOAD TAP-CHANGING EQUIPMENT FOR THE CENTRAL SCOTLAND ELECTRICITY SCHEME WITH ACKNOWLEDGEMENTS TO THE ENGLISH ELECTRIC COMPANY LTD.



20,000 KVA., SINGLE PHASE 50 PERIOD SHELL TYPE BEING ONE OF SIX UNITS TO FORM TWO 60,000 KVA 132,000/20,000 V. 3 PHASE BANKS. WITH ACKNOWLEDGEMENTS TO THE METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

Manufacturers of

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Manufactured by

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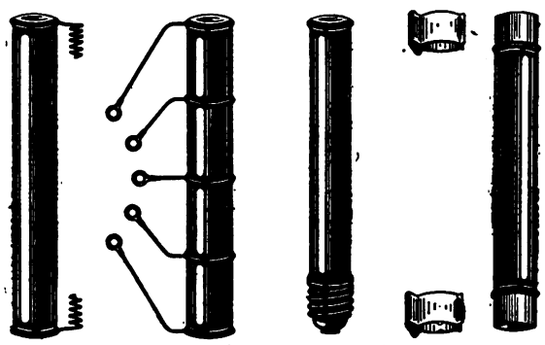

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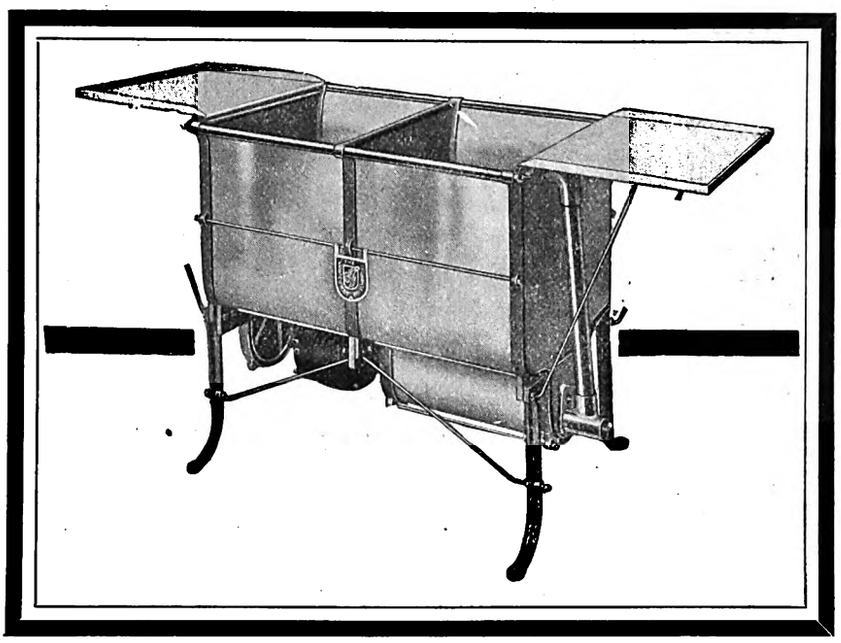

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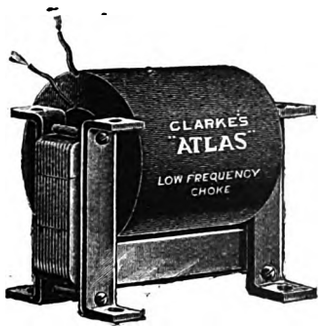

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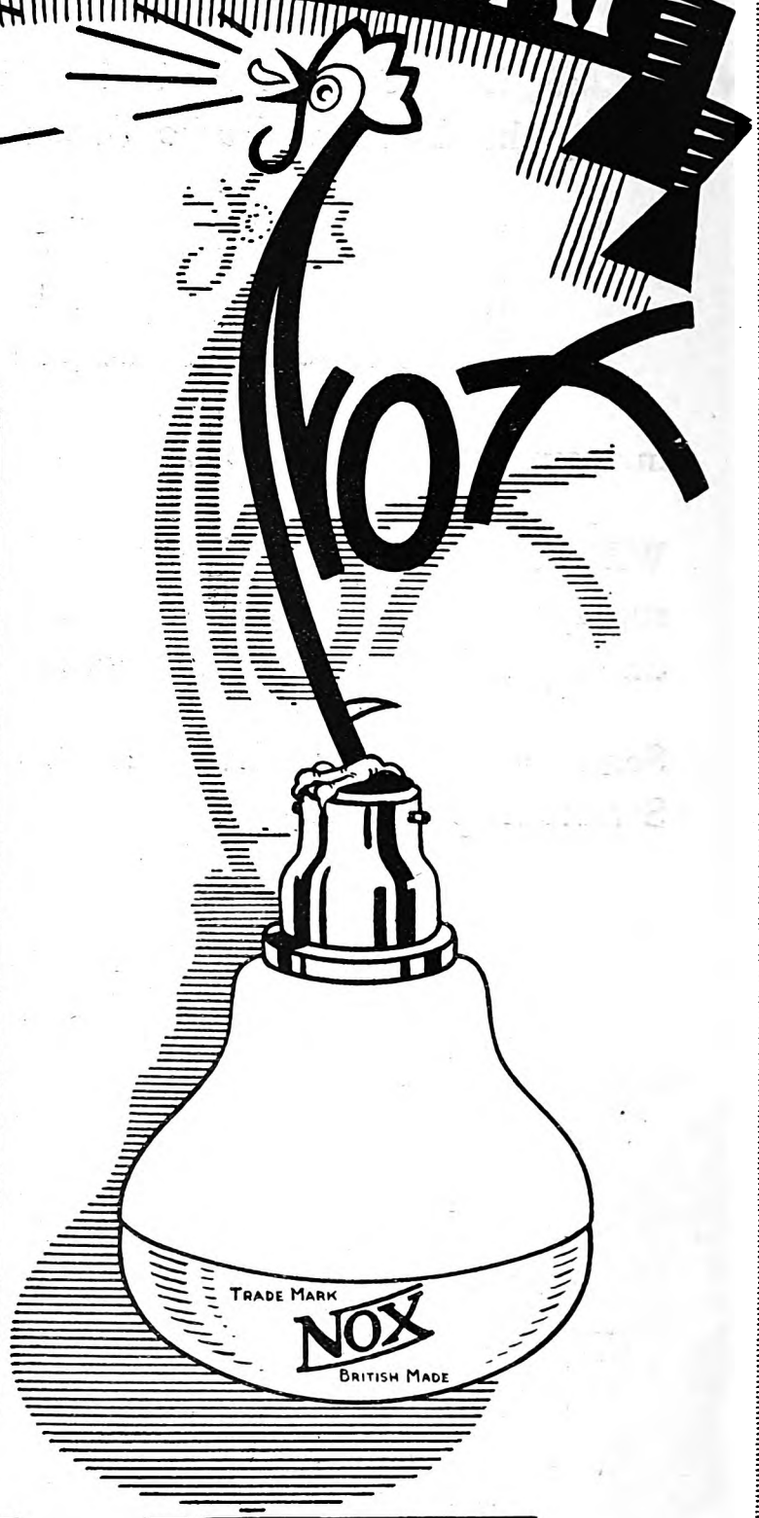

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Announcing a New

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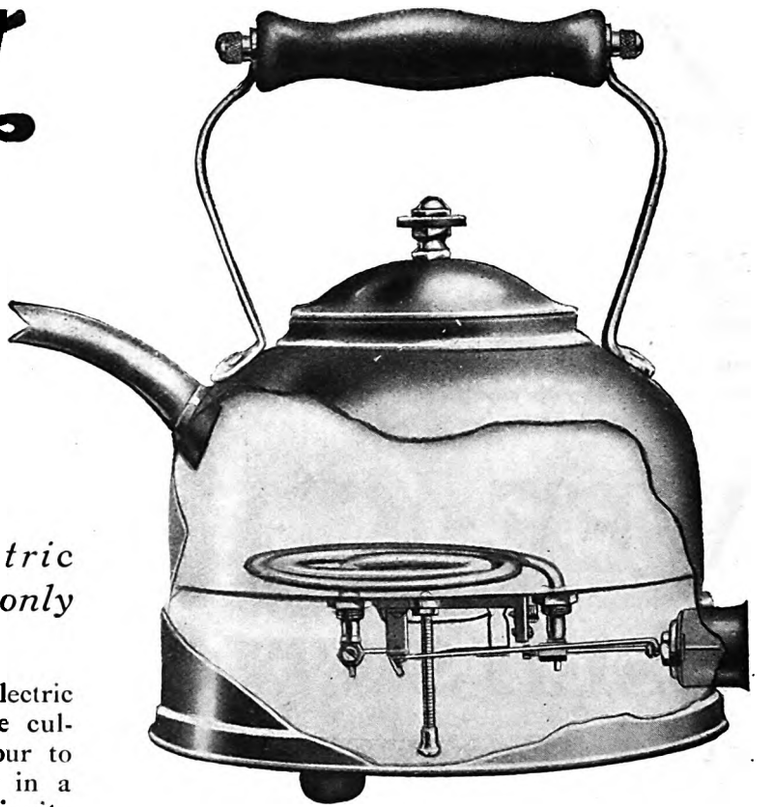
SUPER-AUTOMATIC

Electric Kettle

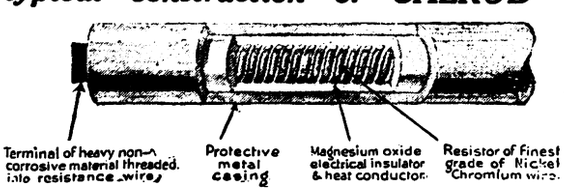
with the CALROD Element



The CALROD Electric Heating Element—Used only in Hotpoint Products

THE patented CALROD Electric Heating Element represents the culmination of a lifetime endeavour to perfect electric heat. Particularly in a domestic electrical convenience continuity of service under all sorts of conditions is of paramount importance. It builds customer appreciation of the convenience and dependability of electric service. Thus, it creates goodwill for the Electrical Contractor and the Central Station.

This sectional view shows the typical construction of CALROD



Hotpoint Super-Automatic Thermal Protector Prevents Overheating

IF the kettle should be forgotten and allowed to boil dry, or if the current should be switched on before water has been added, the Super-Automatic Thermal Protector automatically breaks the circuit before any damage is done. When the kettle cools again the switch automatically closes, but if the kettle is still dry the switch opens again immediately. This cycle of operation will be repeated without damage to the kettle, for an indefinite time, or until such time as water is put in the kettle or the plug is disconnected. This Super-Automatic Thermal Protector is an exclusive Hotpoint feature.

This Kettle is only suitable for use on A.C. Circuits

PRICES

	Polished Copper	Nickel Plate
2 pint -	£1 16 6	£2 0 0
3 pint -	£2 0 0	£2 3 6

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The Hotpoint Electric Appliance Co., Ltd.

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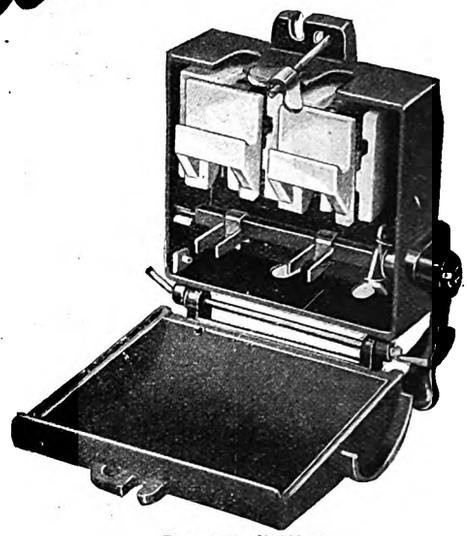

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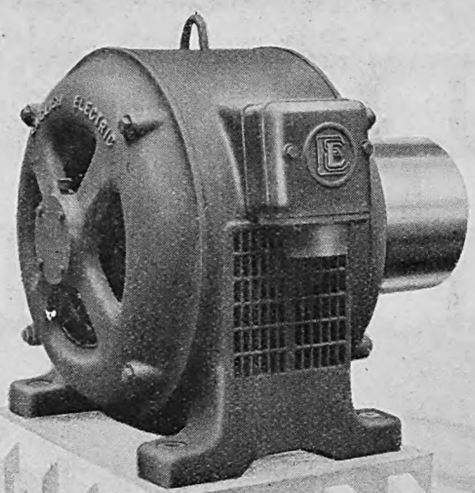

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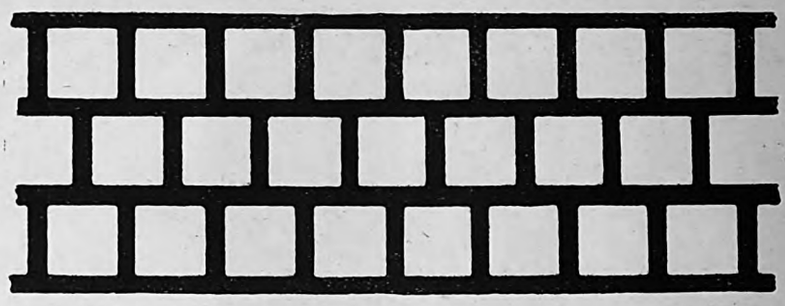

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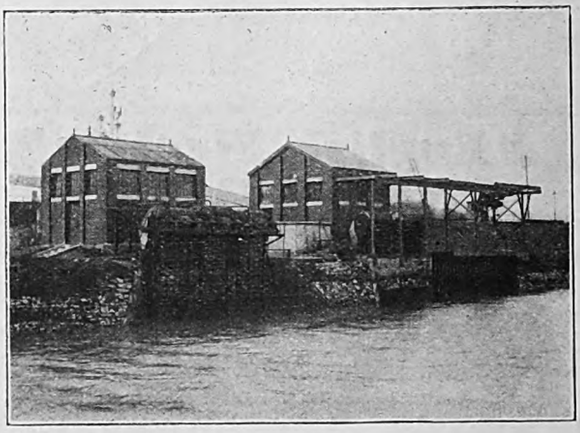

Screening Plant at Newton Abbot Power Station, Torquay

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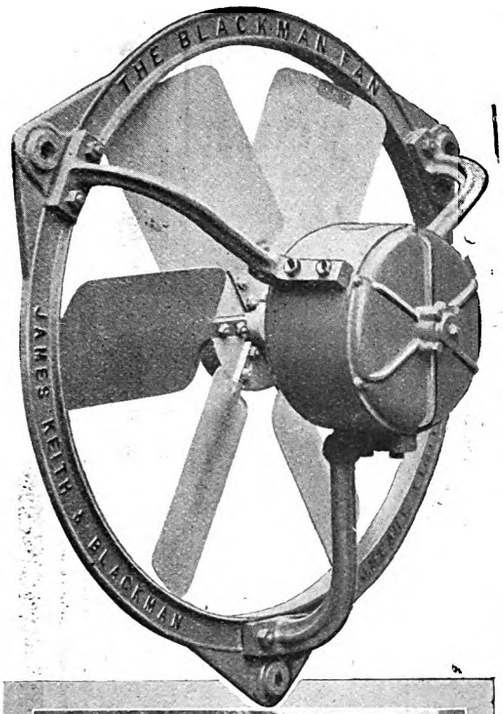

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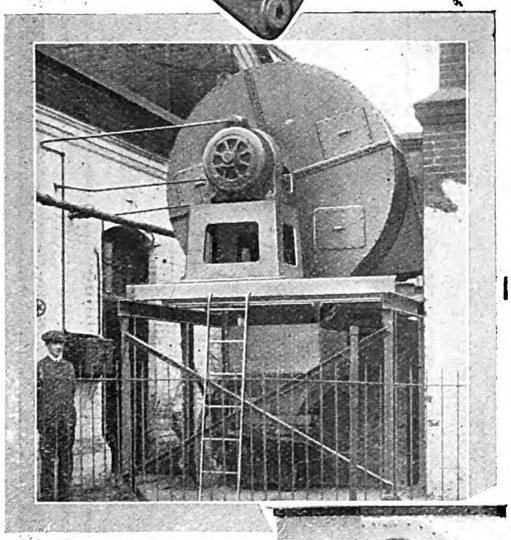

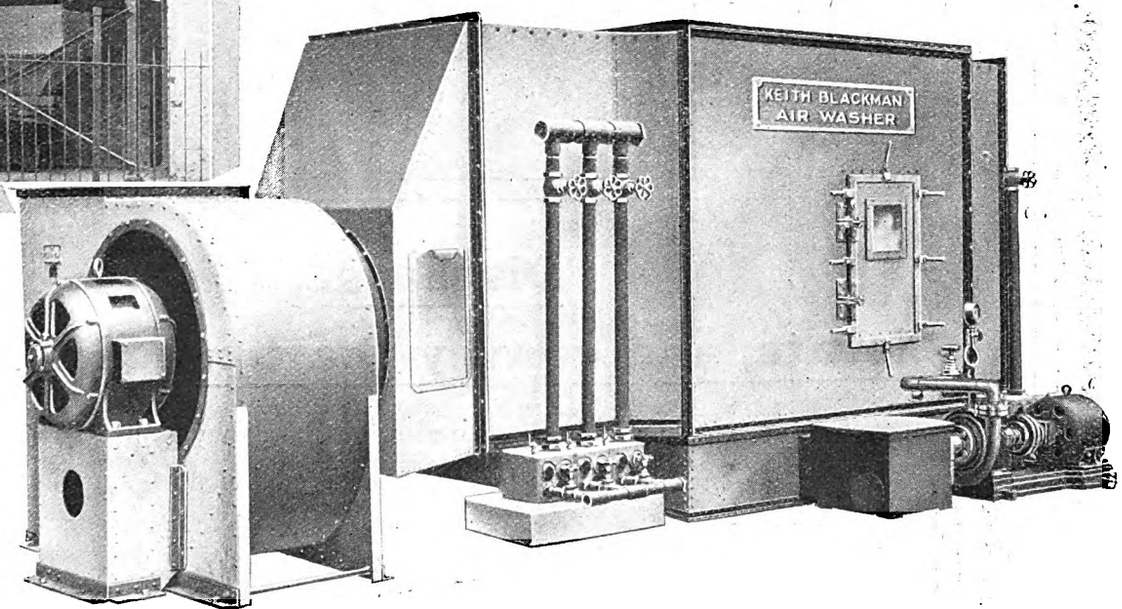

(*Top*)
Typical "Blackman" Patent Streamline Fan.

(*Centre*)
"K-B" Patent Dust-arresting and Induced Draught Fan.

(*Bottom*)
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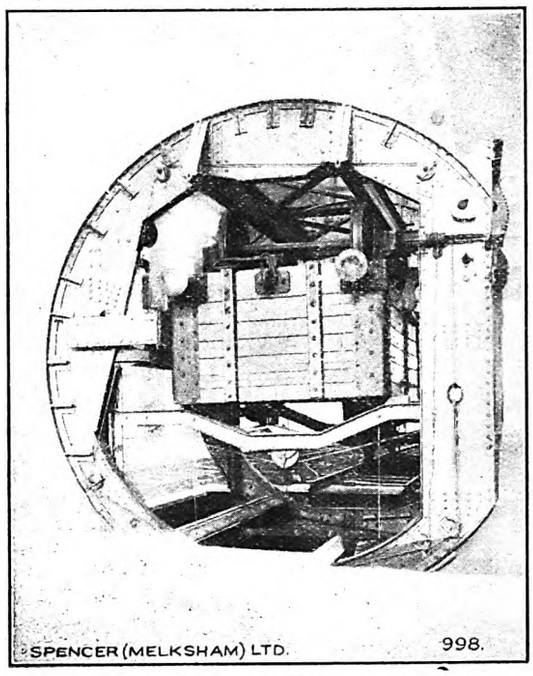

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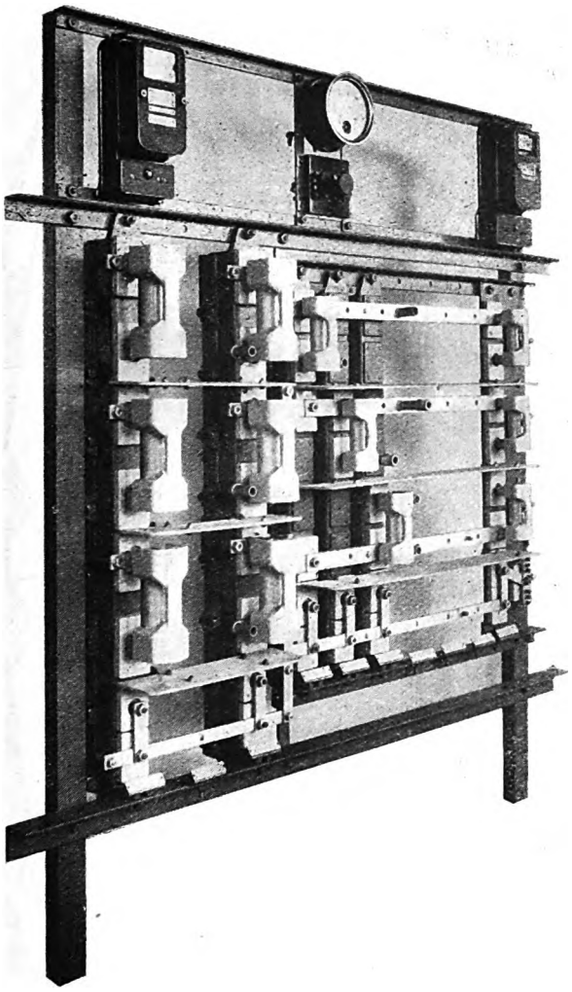

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This is FABLE

As a huge Ox was grazing in a meadow an envious Frog stood gaping at him. Said he—"See if I don't make myself as big as the Ox." So he went swelling on till, in conclusion, he forced himself and burst.

·ÆSOP·

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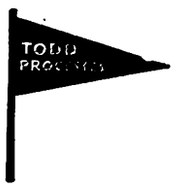

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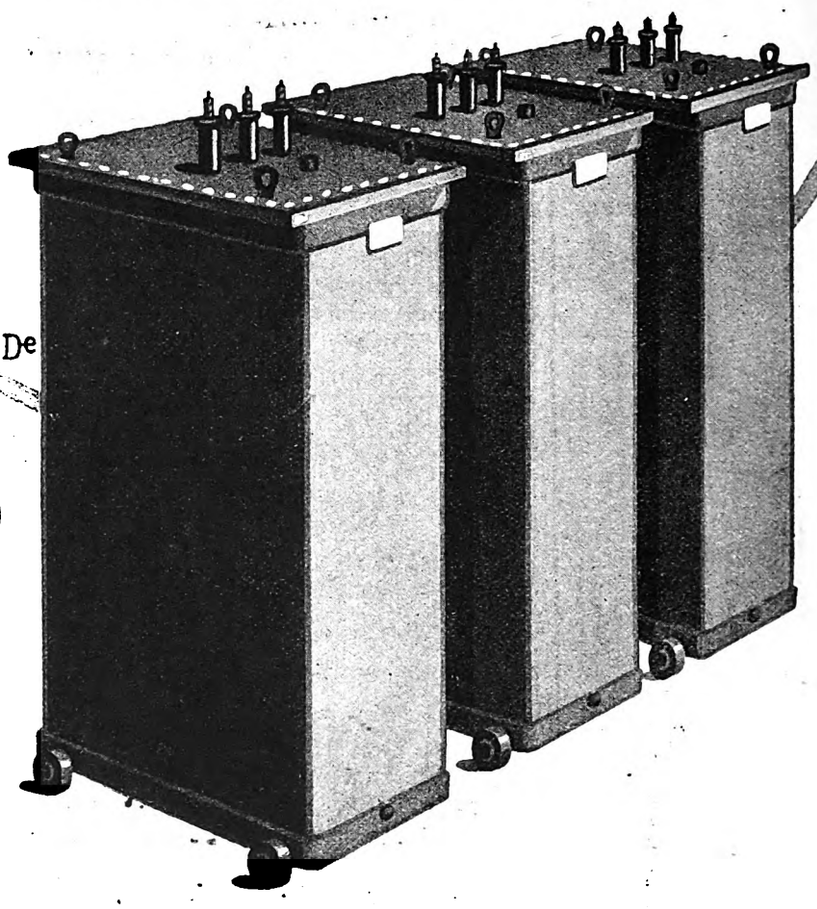

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THE BRITISH INDUSTRIES FAIR 1930 will be held at

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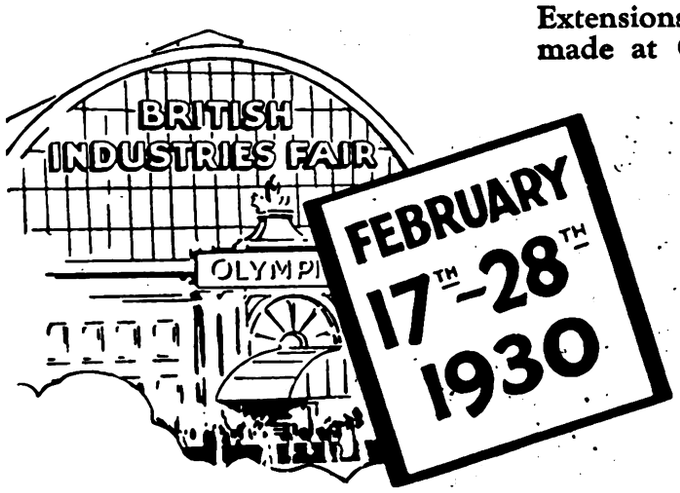
Every Trade Buyer and Merchant should visit the Fair!

Extensions and improvements have also been made at CASTLE BROMWICH where, as in previous years, the machinery and engineering exhibits and allied trades will be displayed.



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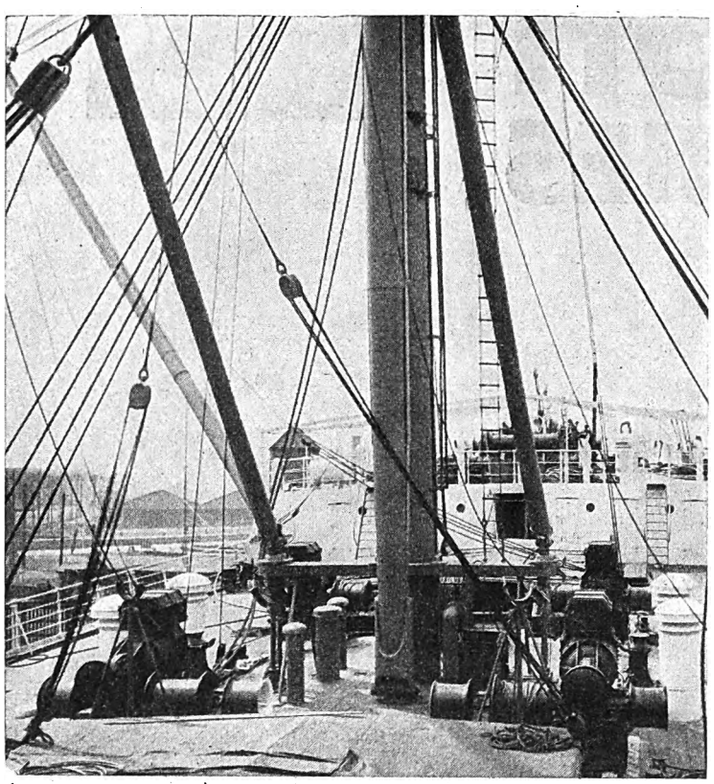
SMOOTH OUT FLUCTUATING LOADS



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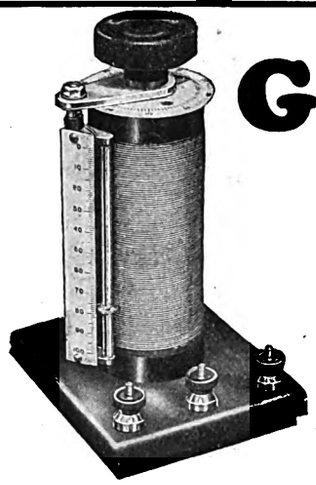

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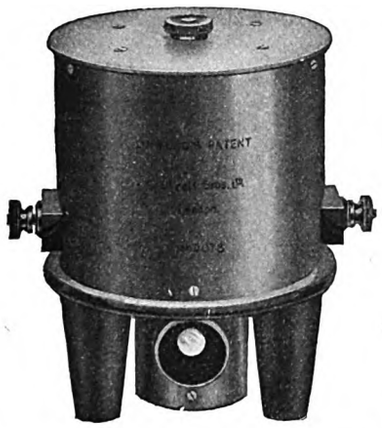

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"OG"	Galvanometers, "Onwood" pattern.
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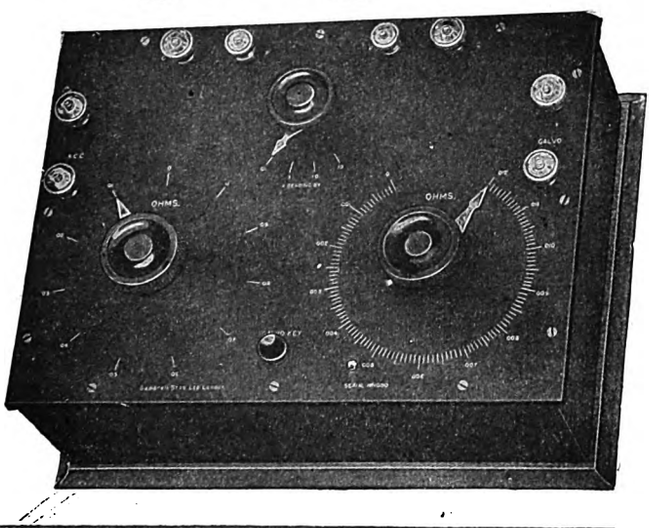
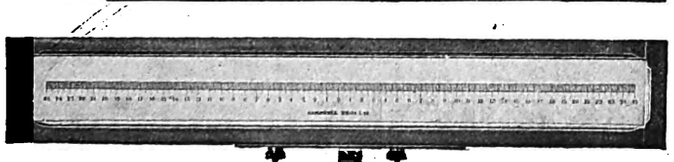
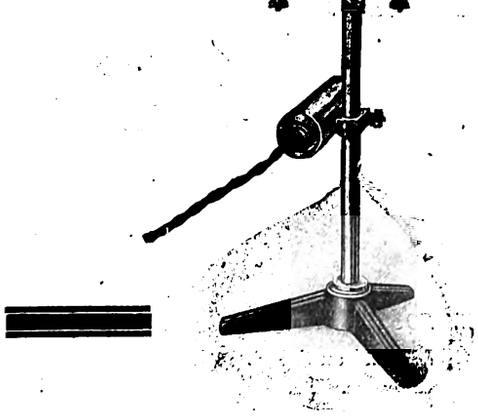
"C"	Condensers, Standard and Secondary.
"ED"	General catalogue of educational apparatus.







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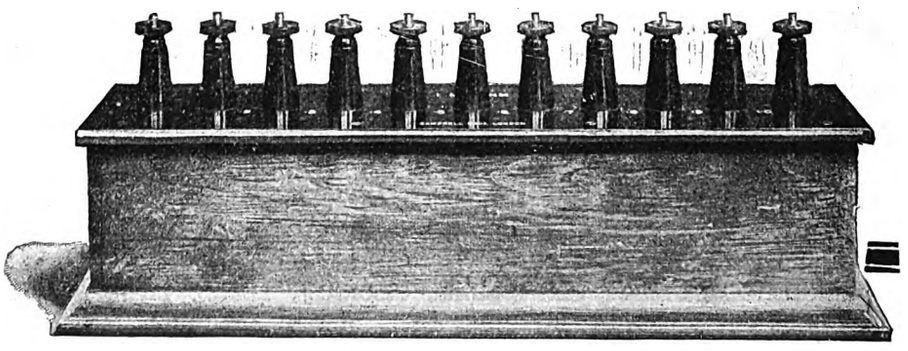
Telephone: PUTNEY 3641-2.
Telegrams: "GAMBREUM, WANDS, LONDON."



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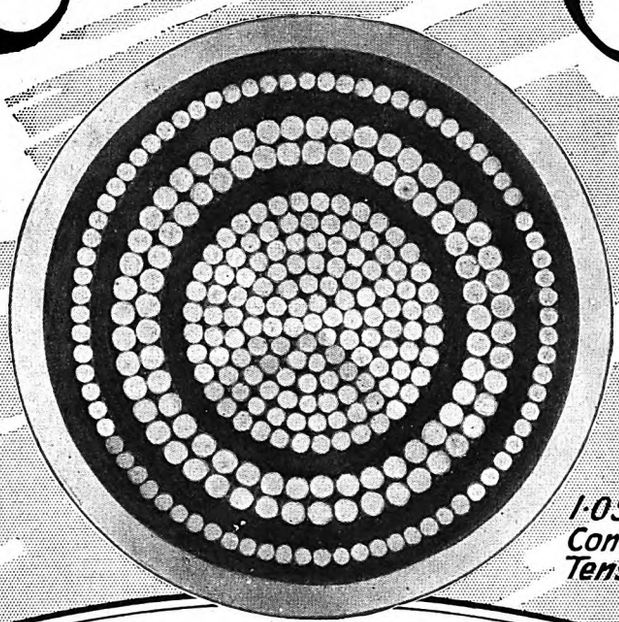
Standard

CABLES for



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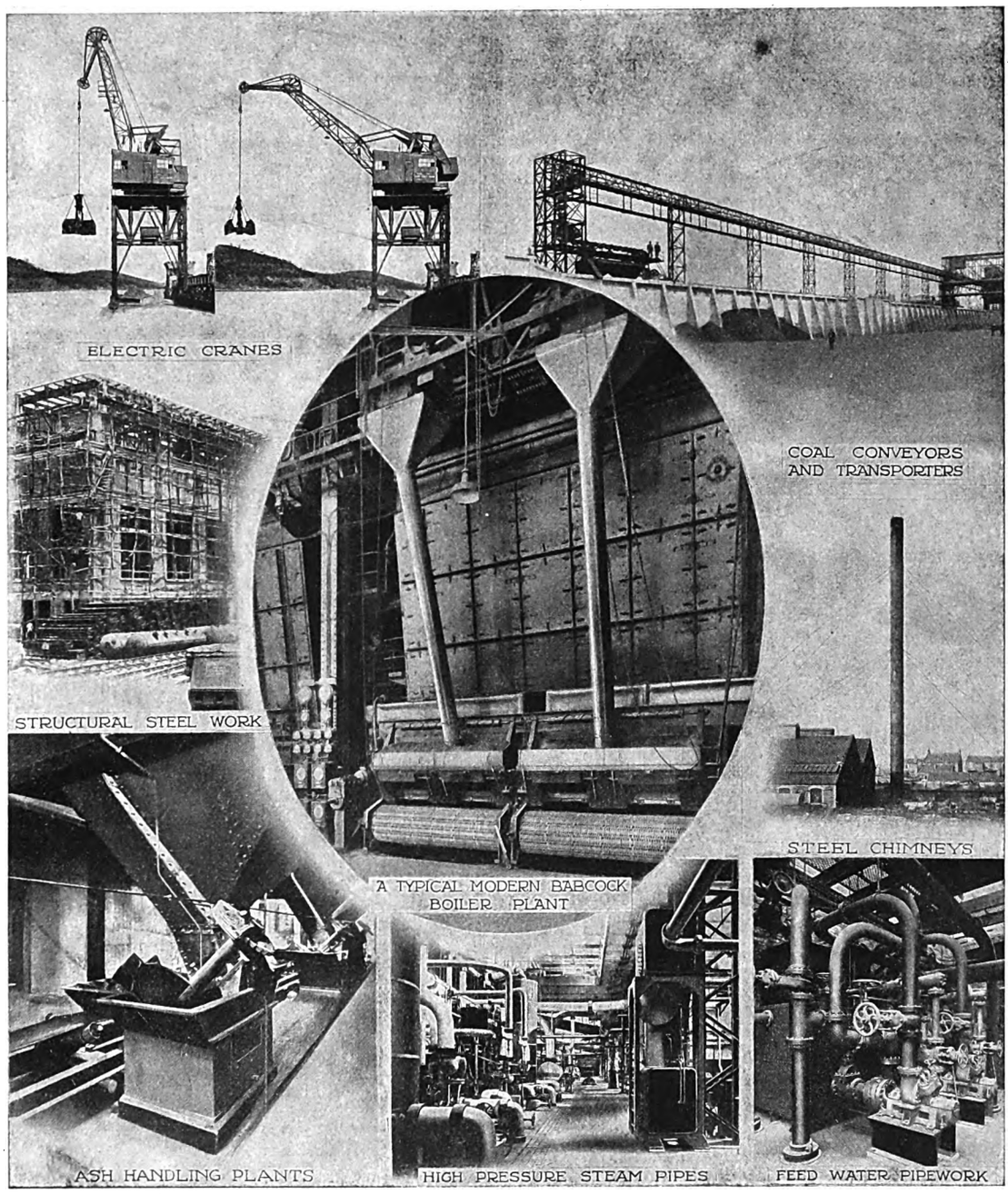
"BABCOCK" PRODUCTS



Babcock & Wilcox Water Tube Boilers are constructed for all pressures up to 1,500 lbs. per sq. in., and in all sizes up to evaporative capacities of 800,000 lbs. per hour. The "Babcock" Boiler is suitable for every condition of service both for land purposes and also for Marine Work.

Babcock & Wilcox Ltd. also manufacture every type of furnace equipment, including mechanical stokers, oil and gas firing, pulverized coal plants and low temperature distillation apparatus. The Company are able to manufacture and supply complete steam raising equipments of any magnitude. Estimates and separate Catalogues on application.

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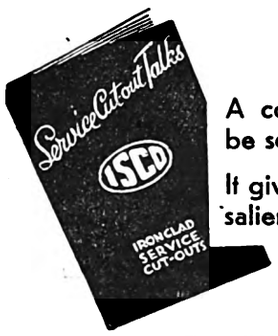
the "Floating Terminals" ensure perfect electrical contact over the full surface area between the Fuse and Circuit Terminals.

In the 60/120 amp. ISCO, for example, the contact area of each terminal (·86 sq. inch) gives a current density of only 70 amps. per. sq. inch.

This conservative rating results in ISCO Cutouts keeping cool under full load conditions, besides ensuring an increased length of service.



A copy of this Booklet will be sent Post Free on request

It gives full details of all the salient features of ISCO Cutouts

Big leads lead to big loads

STANDARDIZE THE 60 AMP. SERVICE

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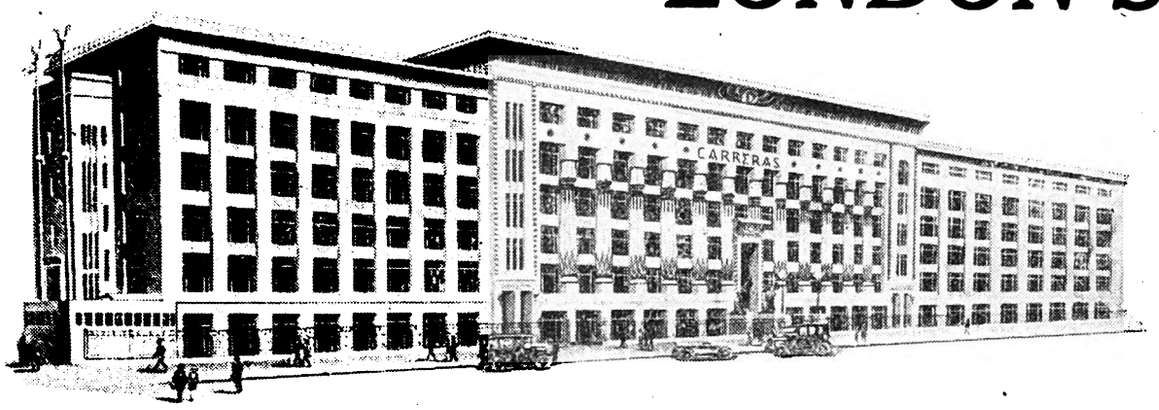
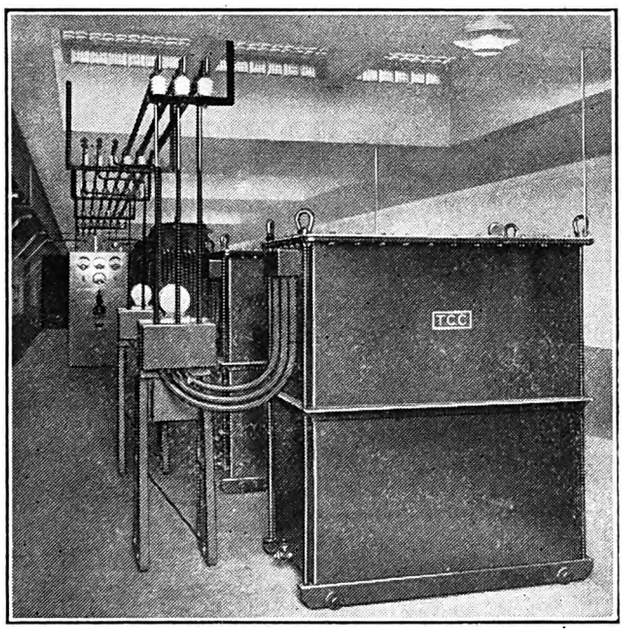


LATEST WONDER FACTORY



The T.C.C. Installation at CARRERAS Big Factory.

is equipped with a

T.C.C.

STATIC CONDENSER INSTALLATION

AS is well known, Carreras factory at Mornington Crescent is equipped with all the most modern machinery and apparatus. It is significant that in this wonder factory is to be found the installation of T.C.C. Static Condensers, products of The Telegraph Condenser Co., Ltd., as illustrated on the left.

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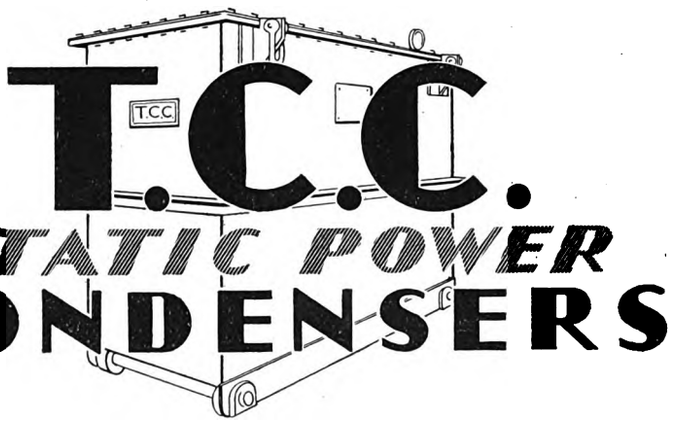

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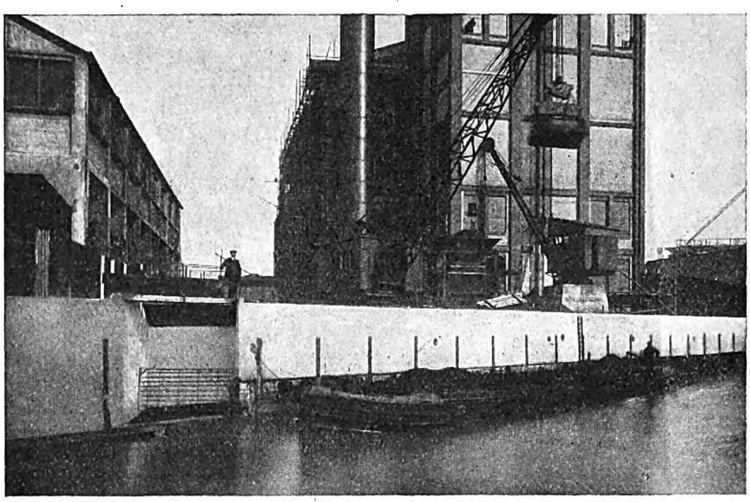

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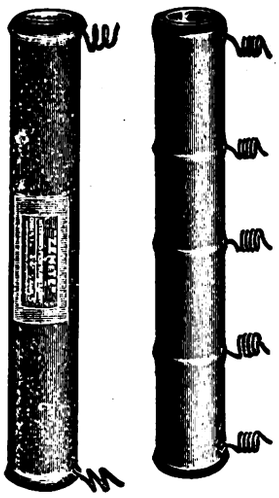

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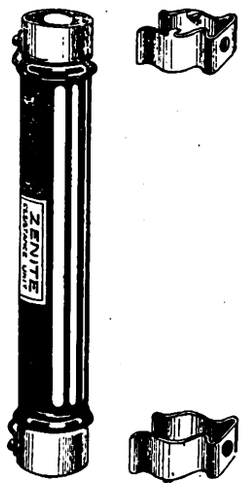

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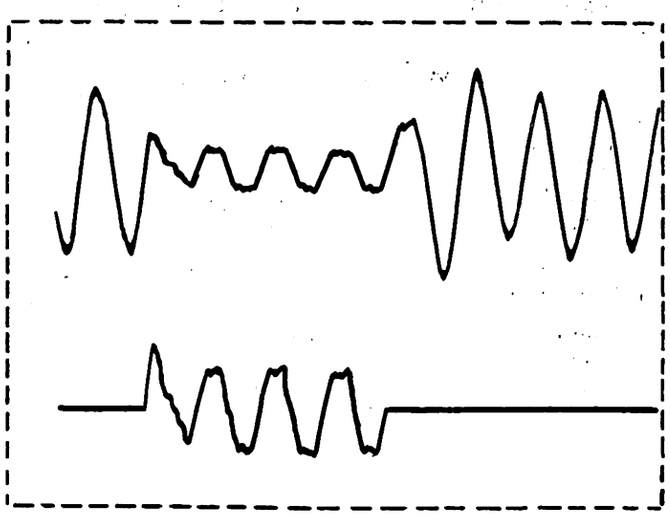

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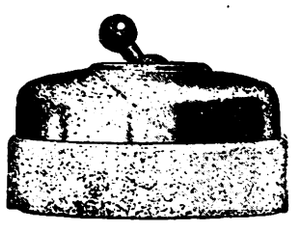

"Tucker" Positive Action Switch.

It is essential that the material right through an installation —to the last lampholder, the last socket point—should be dependable in every way.

Tucker products are reliable productions, they have the confidence of the Electrical Industry by more than 35 years' satisfactory service throughout the World, under the most strenuous and adverse conditions.

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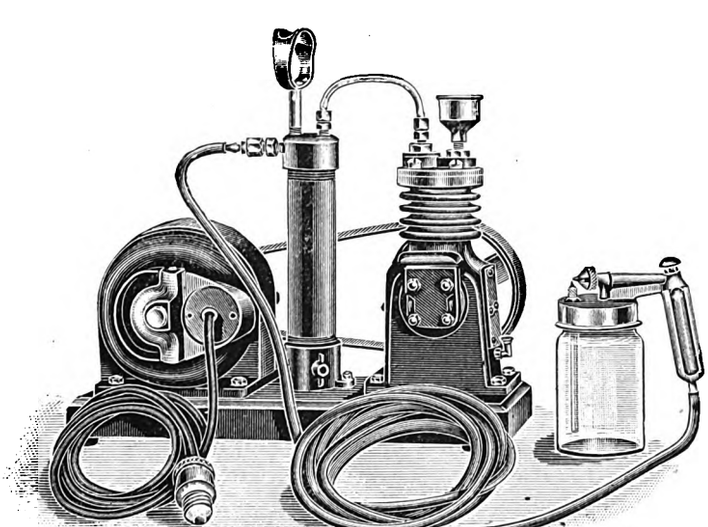
MAY BE PLUGGED INTO ANY ELECTRIC LIGHT SOCKET



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PLEASE SEND YOUR ENQUIRIES.

GRADE 91 MATERIAL is specially suitable for FUSE HANDLES BASES, JUNCTION BOXES, VIOLET RAY, etc., and all mouldings calling for HEAT RESISTING PROPERTIES and HIGH DI-ELECTRIC STRENGTH.

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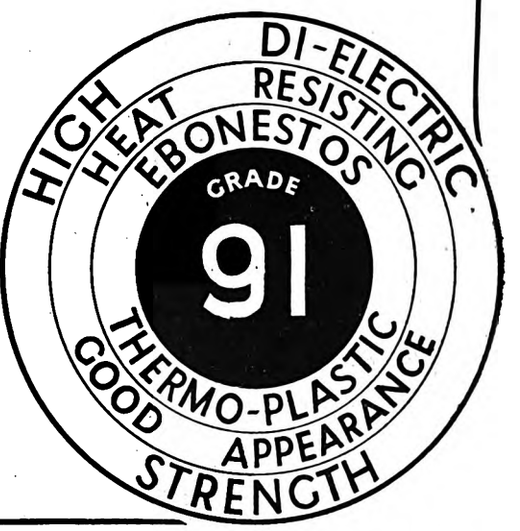

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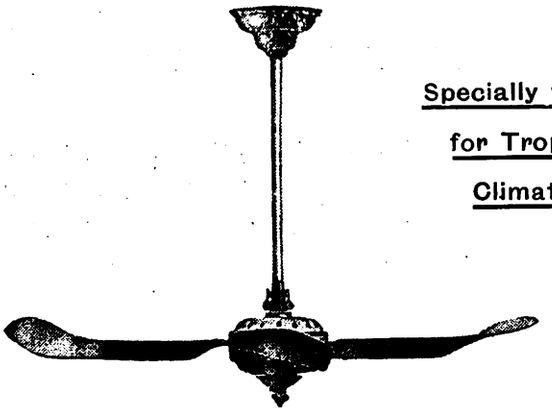

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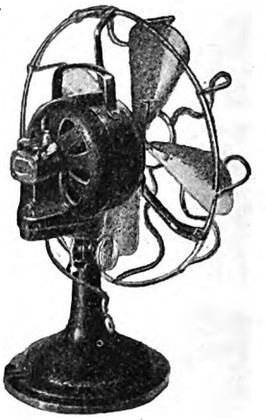

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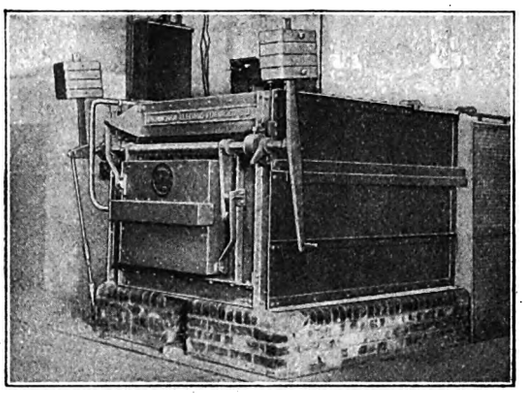

Carburising Furnace—recently installed at The Alvis Engineering Co's Works, Coventry. Rating 55 kW. at 200 volts, 2-phase. Hearth 4ft. 6ins. by 2ft. 6ins. Heated on all sides (including door). Designed for use with Mechanical Charger.
Note the patent parallel motion door.

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Every detail of the Birlec Furnace has been designed to ensure absolutely satisfactory working.

The Birlec combines Laboratory Accuracy with a Robustness that will withstand Practical Service under the roughest workshop conditions.

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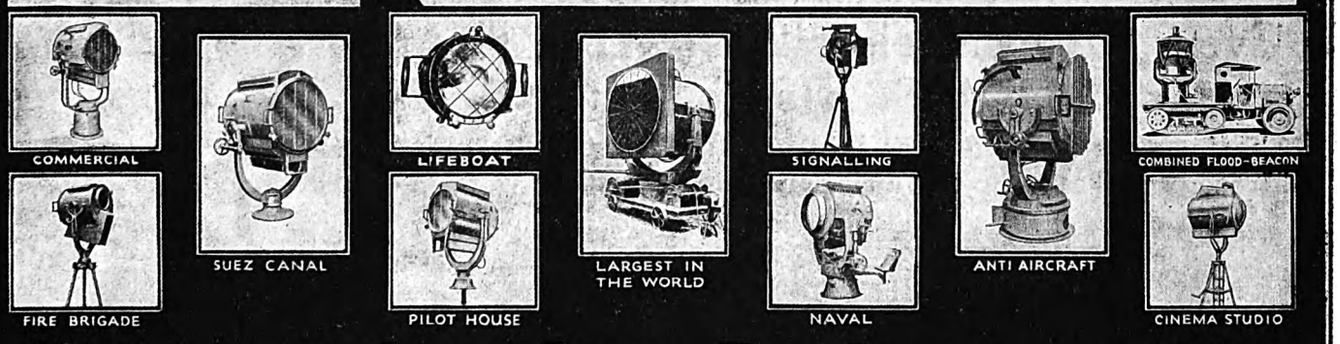

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"ELECT" Products are known all the World over.

ELECT Irons, Fires, Kettles are to be relied upon.

There are thousands of people to-day who will vouch for the excellent quality of "ELECT" products, and will use no others.

THE ELECTRIC HEATING CO., CROYDON.

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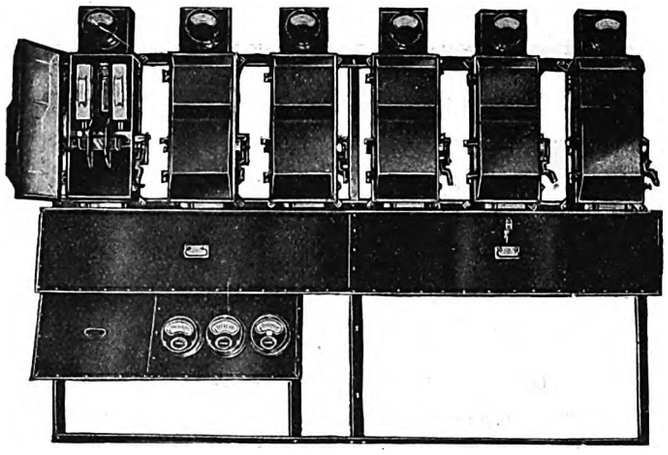

"SAFUSE" Industrial Ironclad Switchboards

For all situations where heavy duty and continuous service is essential.

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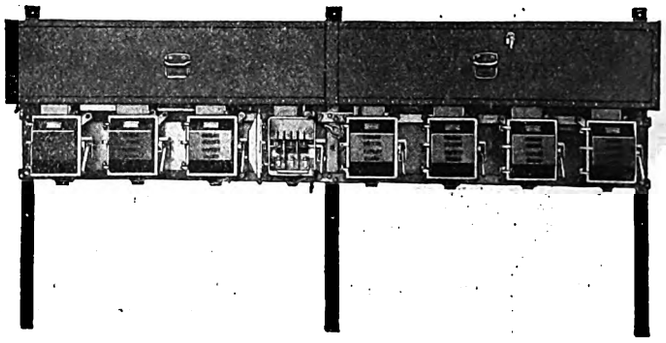

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Everyone, using electric LIGHT, needs HEAT also, for:—

Shaving Water, Morning Tea, Heating Milk, Toasting Bread, as well as for drying, airing and general heating

The "Red Rose" Table Fire is the smallest Fire made. It consumes less than one third of a unit of electricity per hour. It is fitted with an adaptor and two yards of flex, so it can be attached to any lamp holder.

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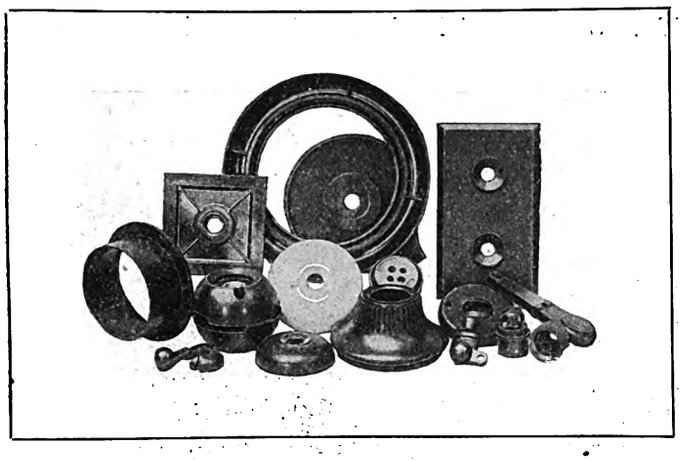

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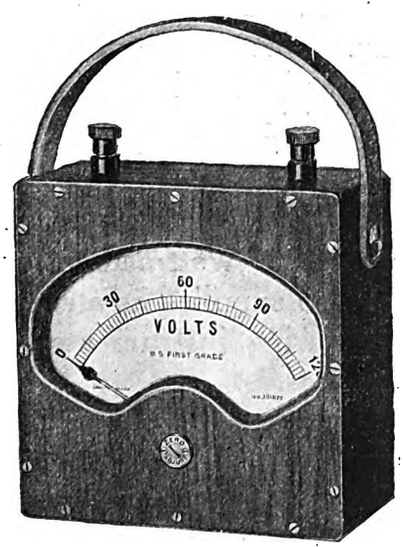
CONVENIENT PORTABILITY

The Ideal for ALL testing purposes.

Although this Wecol type is super-sensitive for testing purposes—it is very "thick-skinned" regarding its usage.

It is very strong—built for real hard wear and can be used in any position.

It is certainly a handy testing unit for real "knock about" use, giving undeniable accuracy under all conditions.



"Wallsall" wood case Long Scale Instrument.

The spring controlled moving system enables it to be used in any position.

The scale is even and open throughout its range.

It is fitted with an external zero adjustment.

With 6" scale.....size 7 × 7 × 3½ inches.

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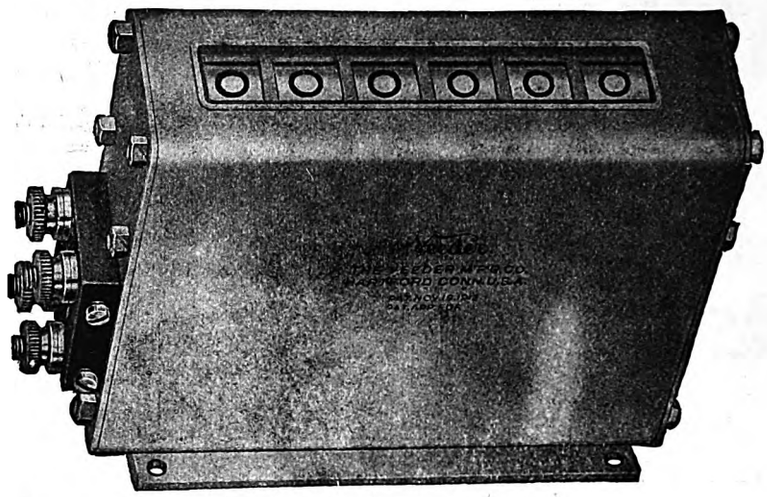
FOR A.C. AND D.C. CIRCUITS

HAVE THE SAME HIGH QUALITY AND FINISH ALWAYS ASSOCIATED WITH **VEEDER** PRODUCTS.

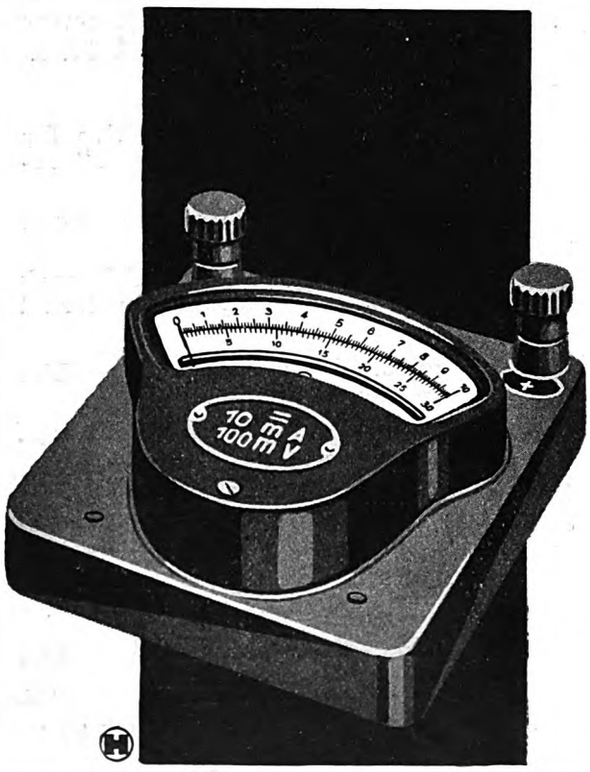
VEEDER Magnetic Counters operate by make and break of an electric circuit—their use and application will readily suggest themselves. The Magnetic Counter is essential under conditions where it is desirable that the counter be placed at some distance from the machine on which the count is to be taken. A number of counters can be grouped together in a central or convenient place. It is also desirable where articles counted are very small or thin or light in weight, making it difficult to count by mechanical means.



F. E. DICKINSON, St. Andrew's House, Holborn Circus, London, E.C.1

'PHONE: CITY 8138. TELE. ADDRESS: VEEDERMETA, SMITH, LONDON.

"Z" TYPE MEASURING INSTRUMENTS



These are equally suitable for the Laboratory, Erection, Inspection Work or general service. They are small, light and handy. Notwithstanding the very low price and small size, the readings are surprisingly accurate.

The "Z" instruments are made as Ammeters, and Voltmeters for A.C. and D.C., as well as Wattmeters for A.C. They are also supplied as a complete set of measuring instruments in strong travelling cases.

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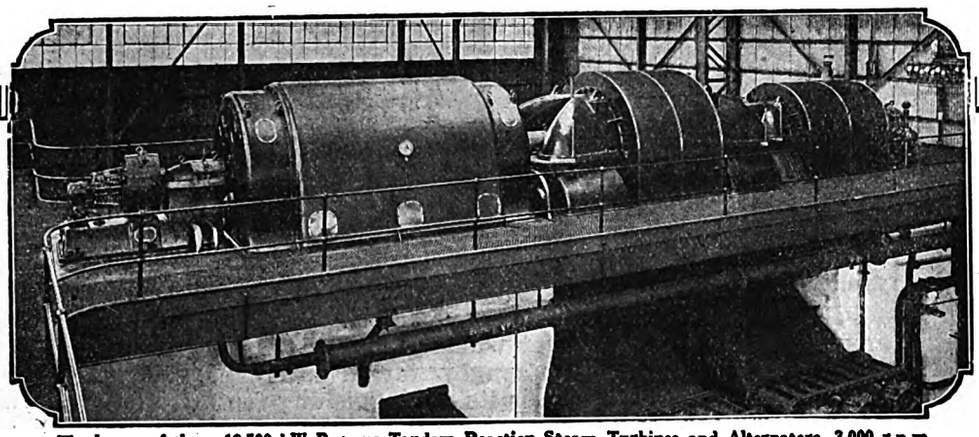

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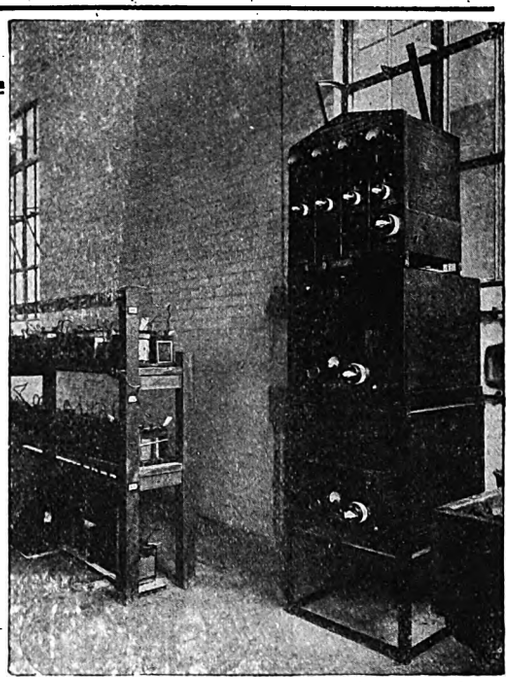

Above is shown a group of Westinghouse Metal Rectifiers used for battery charging at the Electricity Department of the County Borough of West Ham.

Photo by courtesy of the Engineer and Manager.

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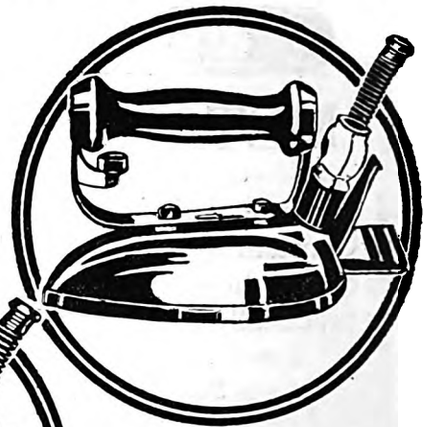

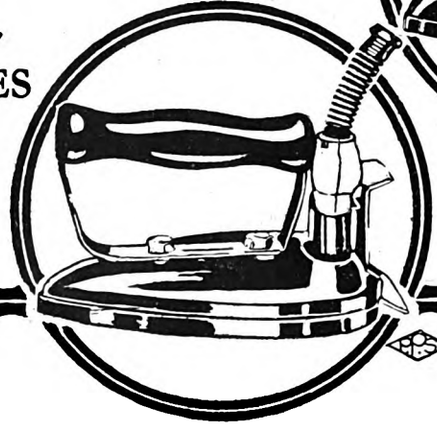

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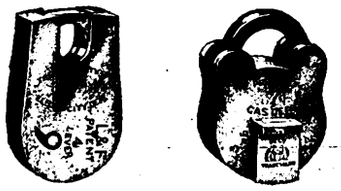

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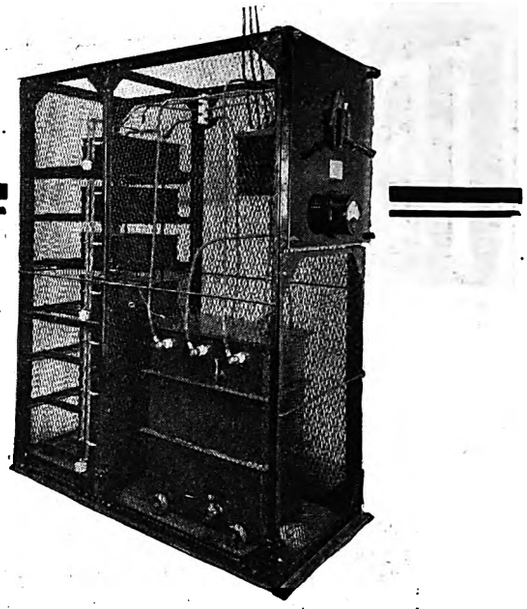

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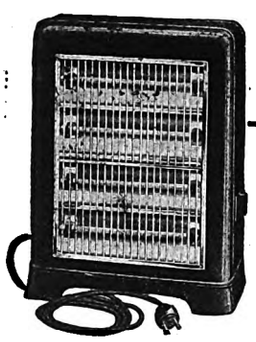

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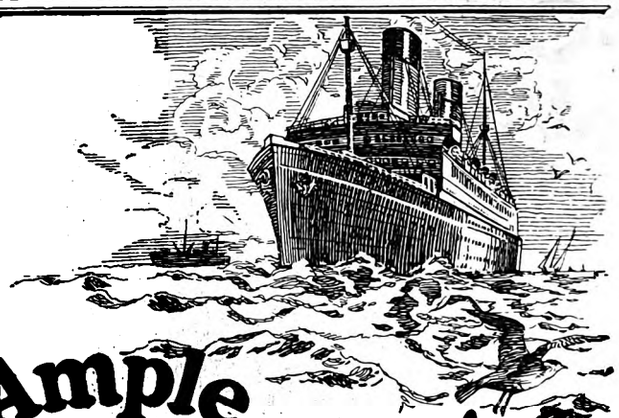

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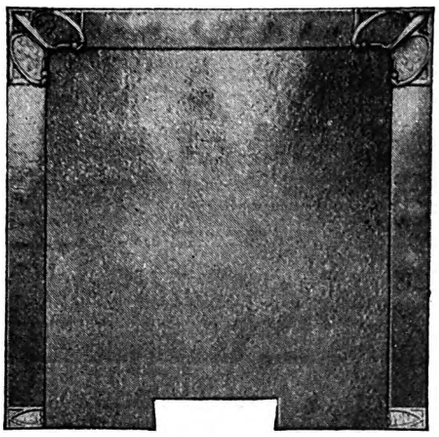

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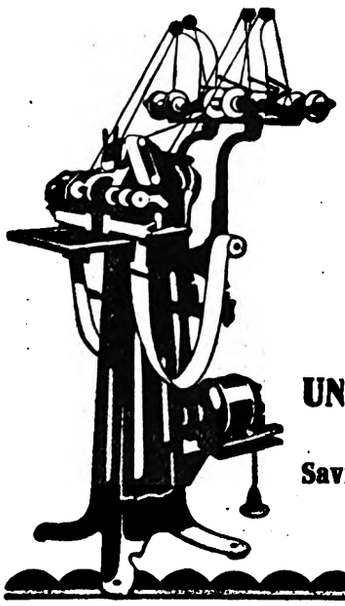

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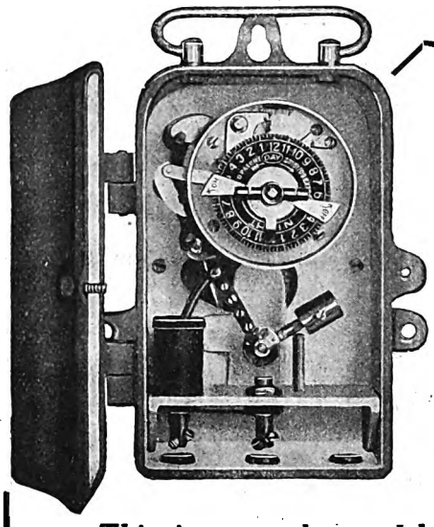

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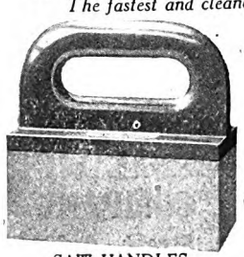

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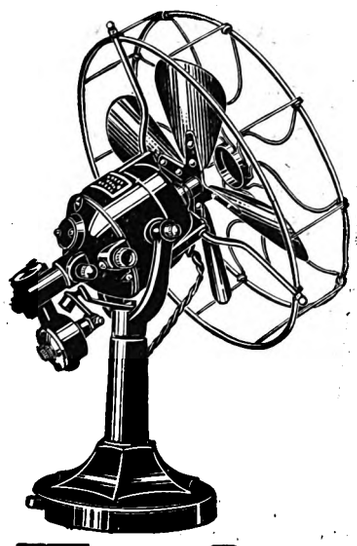

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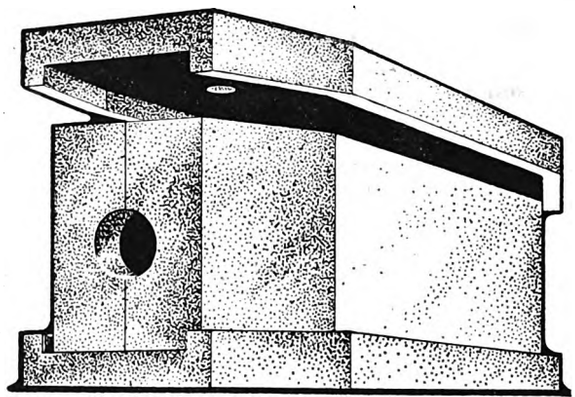

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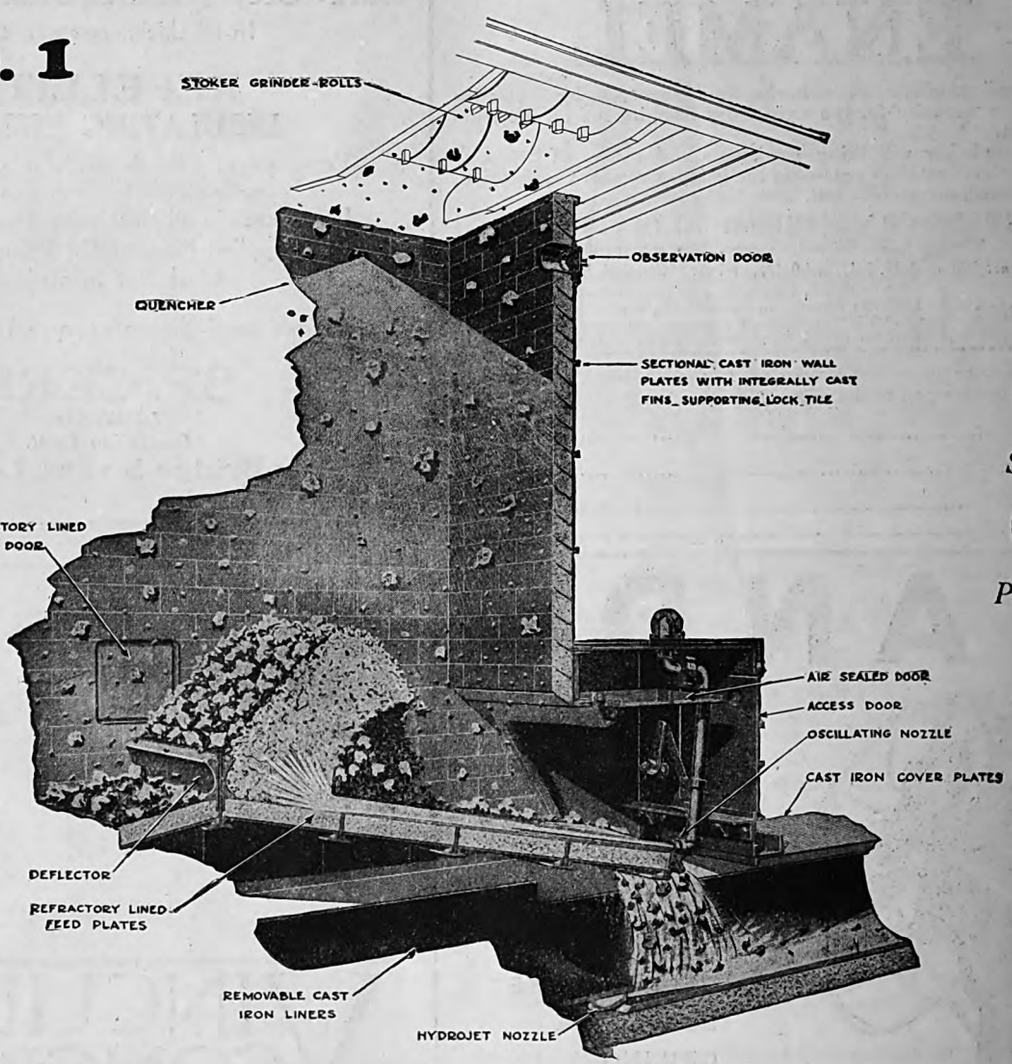
Ash Handling Applications

No. 1



Specify ASH *Products*

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Write for Catalogue

APPLIED TO RETORT TYPE STOKERS FITTED WITH CLINKER GRINDERS OR CHAIN GRATES WITHOUT GRINDING ROLLS

8 to 24 hours Ash accumulation is stored and quenched in specially designed Hoppers. It is then handled to the final point of disposal by one man working for 10 to 15 minutes per Boiler. The system being totally enclosed is absolutely clean and dustless.

THE ASH COMPANY (LONDON), **LIMITED**

63, Lincoln's Inn Fields, London, W.C.2

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GLARELESS LAMPS

Pearl and Opal

Produced by Members of the E.L.M.A. to replace all clear lamps from 15-100 Watts.

The general adoption of these lamps will benefit the user by enabling a higher standard of illumination to be established, and ensure greater profit to the trade

"Glareless Light Preserves the Sight."

ISSUED BY THE ELECTRIC LAMP MANUFACTURERS' ASSOCIATION, 25, Bedford Square, London, W.C.1.

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